CHAPTER - VII

FACETED CLASSIFICATION AND INDEXING -
SCENE AT HOME

INTRODUCTION :

The development of composite specification by assembling terms from different parts of the schedules at the time of classifying poses new problems. Complex subjects are given names that may not actually be enumerated as complexes in the schedules, and this has led to the necessity of developing a technique for 'providing links from all parts of a complex to the complex itself.' In a faceted classification, documents are arranged by the notation for the first facet, and the alphabetical index takes care of the later distributed facets.

1D.J.Foskett, op.cit., p.172.
'Any retrieval system' as expressed by Needham,\(^4\) 'consists of a set of devices for ensuring that demands and documents can be effectively matched. A subject system provides for such matching in terms of the subjects expressed in demand and documents'. We have to ensure that when a reader requests for material on Post Elizabethan Literature, then the documents containing relevant information are retrieved. We may use an index in which subjects are represented by simple terms to be compounded by the searcher (a post-coordinate system), or one with built-in compounds (a pre-coordinate system).

In spite of the numerous non-conventional techniques of subject indexing, classification is accepted as the most important base for indexing. Mills in a paper for the Elsinore Conference in Classification Research (1963)\(^5\) commended "Classification as an indexing device". The ASLIB-Cranfield Project investigation reveals that "the classification scheme is an amalgam of devices through which index language can control class definition but what distinguishes classification is the thoroughness and consistence with which it displays hierarchical linkage".

\(^{4}\)C.D.Needham, op.cit., p.239.

\(^{5}\)J.Mills, Classification as an Indexing Device. Atherton, Ed. Classification Research, 1965; Copenhagen, Munksgaard, pp. 426-441.
"Whatever method of indexing is employed it is clear that the major grouping should be revealed by classification itself, and it must be reiterated that, in a Faceted Scheme the factors involving the achievement of helpful order emerge more clearly than in classification based on the traditional idea of enumeration”.

COLON CLASSIFICATION AND CHAIN INDEXING:

In the Descriptive Account of Colon Classification, a study undertaken by the Rutgers University School, Ranganthan observes,

"The Colon Classification is thus essentially an indexing system, that is, a system pointing to a document. The thought content of an information carrying materials is represented in two index language -- first index language is the colon language, and analytical language of ordinal numbers with class number forming for the ultimate indexing unit of this language. The second index language is the near artificial language, Headings as the Class Index entries”.

CHAIN PROCEDURE:

Definition:

Chain indexing is "Any systematic method of deriving Subject Headings for Specific Subject, involving the determination of chain in which the subject concerned is the Last


Sought Link*. The concept of 'Chain in the context of Universe of subjects, is the foundation of Chain Procedure. A 'Chain' is deemed to be a structural manifestation of a subject. The term 'structure' in this content refers to the parts contributing a subject and their mutual interrelationship. A 'Chain' is thus said to be an immaculated sequence of subclasses or isolate ideas.

The chain, is, therefore, nearly always derived from a classification scheme, and the method is intended to offer general as well as specific information to all information seekers by deriving subject headings from the chain of successive subdivisions that leads from the general to the most specific level needed to be indexed. Dr. S.R. Ranganathan has given the definition of 'Chain Procedure' in his Classified Catalogue Code, Ed. 5, 1964 Section FN 55* which states as follows:

"Procedure for deriving Class Index Entry (that is Subject Index Entry) refers from the name of a class to its class numbers in a more or less mechanical way".

"It is used to derive Class Index Entries in a Classified Catalogue, and Specific Subject Entries, Subject Analyticals and see also Subject Entries in a Dictionary Catalogue".

This method may be used to provide indexes not only to Classified Catalogues and Classification Schemes but also to other systematically organised indexes even when they are arranged alphabetically.

SUBJECT INDEXING:

Steps in Chain Procedure

The Class Number of a compound subject, constructed according to a scheme for classification, forms basis for applying to Chain Procedure.

Steps implied in the construction of the class number:

I. Classification of the Subject of the Document:

The specific subject is determined by analyzing the subject content of the document. This operation provides the Basic Subject idea and other necessary component ideas which are lacking in the title, so that, the name-of-the-specific subject may be co-extensive to the subject content of the document.

The Basic Subject idea will be of help in sensing the absence of the indication of a necessary idea of the compound subject and also help to sense the derived composite term and use to bring into/fundamental constituent terms.

Illustration

I. Thompson, R., On Cardiac Damage in Early Childhood (J. Med. 5, 3; 1976; 50-59)

(a) Index Part (Alphabetical)
(b) Subject Class Index

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9G. Bhattacharya, "Chain Procedure and Structuring of the Subject". In: Library Science, with a slant to Documentation, 9; 1972, Paper ZE.
According to U.D.C.

61  Medical
616  Disease
616.053.2  Child
616-053.2:616.1  Cardiovascular system
616-053.2:616.12 (540-18)" 1970 (m) 1970
616-053.2:616.12 (540-18)" 1970:016 Bibliography

Subject headings for different kinds of entries are arranged in a single alphabetical sequence:

(1) Bibliography, North Eastern India, Heart, Child Disease, Medical Science,616-053.2:616.12 (540-18)"1970.016.
(2) Cardiac see Heart. Cardiovascular System, Child, Disease, Medical Science 616-053.2.
(3) Disease, Medical Science 616. Medical Science 616-053.2:616.12.
(4) Heart, Child disease, Medical Science 616-053.2:616.12.
(5) India, Heart, Child Disease, Medical Science 616-053.2:616.12 (540).
(6) Medical Science 61.
(7) North Eastern India, Heart, Child Disease, Medical Science 616-053.2:616.12 (540-18).
(8) Pediatrics See Child, Disease, Medicine.

Chain Index DDC ed. 18.

Child Medicine, Heart, Disease, N.Eastern India, 1970, Bibliography.
**Illustration**

**DDC: 618.921'209 541'016**

6  Technology (UL)
61  Medicine (SL)
618  Other branches of medicine
618 (FL)
618.9  Geriatrics and Paediatrics
618.92  Paediatrics (SL)
618.921  Disease of Cardiovascular System (SL)
618.9212  Of Heart (SL)
618.92120  (FL)
618.921209  (FL)
618.9212095  Asia (UL)
618.92120954  India (SL)
618.921209541  N.E.India (SL)
618.9212095410  (FL)
618.92120954101  (FL)
618.921209541016  Bibliography (SL)

**FL indicates False Link**
**SL indicates Sought Link**
**UL indicates Unsought Link**
Illustration

Colon Classification - Edition 7 (Unpublished)
L-9C, 32; 4.44 = 9\textsuperscript{w}N7\textsuperscript{a}

L Medicine (SL)
L- (FL)
L-9 (FL) Special
L-9C Child (SL)
L-9C, (FL)
L-9C,3 Respiratory System
L-9C,32 Heart
L-9C,32; Disease
L-9C,32;4 (FL)
L-9C,32;4.4 Asia (UL)
L-9C,32;4.44 India (SL)
L-9C,32;4.44=9 (FL)
L-9C,32;4.44=9\textsuperscript{w} N.E. India (SL)
L-9C,32;4.44=9\textsuperscript{w} N7 20th Century (FL)
L-9C,32;4.44=9\textsuperscript{w} N7\textsuperscript{a} Seventees (FL)
L-9C,32;4.44=9\textsuperscript{w} N7\textsuperscript{a} (=L)
L-9C,32;4.44=9\textsuperscript{w} N7\textsuperscript{a} Bibliography

The SL or the sought links are the derived subject headings.
In a faceted classification and its chain index access to a reference is provided from each term in a compound subject, and terms which are related generally are brought together in the catalogue. When the same term appears in more than one genus, all its locations in the catalogue are brought together in the alphabetical index.

Development of Popsi:

Researches on class number based on Chain Procedure gradually led to the realisation that what appeared to be its dependence on class numbers, was in depth its dependence on the postulates about the structure of Names-of-Subjects forming the foundation, design and development of the scheme concerned.

In 1964 Ranganathan demonstrated how the choice of the Name-of-Subject and its rendering can be done by facet analysis based on the set of postulates and principles forming part of the General Theory of Library Classification developed by him.10

The chain procedure could be used without having to interpret the class number, digit by digit. Moreover, it opened the possibility of choosing between two different citation orders which the chain procedure was capable of yielding, Reverse Rendering and Forward Rendering. Its immediate

implications were that Chain Procedure had all the necessary potentialities of being developed into different versions depending upon the variation of several factors—such as, the set of postulates about the names—of subjects, policy of subject indexing, and set of rules for deriving subject headings.

Therefore, FOPSI may be said to be a different version of Chain Procedure of Subject Indexing. The concept of chain is intrinsic in the verbal classification. A.Neelameghan writes, "Chain in classification is shown horizontally for its linear representation of the subject heading; instead of vertically as in notational classification. Both forward and reverse rendering of subject headings, make the system more effective. Moreover, it is not dependent on any classification scheme. The subject heading drawn by FOPSI may be used for entries in Classified Catalogue Index as well as in Dictionary Catalogue/Index." 11

SUBJECT INDEXING BY FOPSI:

Postulate-Based Permuted Subject Indexing:

Subject heading derived through FOPSI system represents co-extensively the subject content of the document indexed. This

11 A.Neelameghan and M.A.Copinath, "Postulate Based Permuted Subject Indexing (FOPSI)", Library Science with a Slant to Documentation, 12, 1975, Paper H.
subject heading may be used as the lease heading for any kind of subject entries in the system — POPSI system follows the postulates and principles of "General Theory of Library Classification" formulated by S.R. Ranganathan.

Co-existensive subject representation is the expression of the subject content of the document indexed, indicating each of the component ideas, the appropriate interrelation among them, and totality of the expression denoting the precise semantic structure of the subject represented.

**Objectives of Using Postulates and Principles :**

(a) To secure consistency in subject analysis e.g., in facet analysis of a subject;

(b) To determine in a consistent manner the super-ordinate (upper) links, if any, for each component idea of subject;

(c) To identify consistently the interrelation between component ideas of the subject;

(d) To link the component ideas of the subject consistently in a sequence helpful to the majority of users; and

(e) To ensure that work in steps (a) to (d) lead to a coextensive expression of subject.
**Subject Indexing Steps in POPSI**

Subject headings are derived and constructed for three kinds of subject entries:

1. Specific Subject Entry;
2. Subject Reference Entry, or Subject Index Entry;
3. Cross Reference.

Subject Heading for the specific subject entry.

**Step C**

**Title**

"The oral streptomycin treatment of the tuberculosis disease of lungs of adolescent girls in India".

**Step 1. Expressive Title**

The subject content of the document is analysed and the Basic Subject term to which the document belongs is included in the expressive title. In the above example the Basic Subject term is *Medicine*.

**Step 2. Kernel Title**

Kernel terms are terms other than apparatus. Words, such as preposition, conjunction etc. These apparatus words are

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12 A. Neelameghan and M. A. Gopinath, *op. cit.*

13 Kernel title is derived from the Full Title by removing all the auxiliary terms and puffs and replacing all the surviving essential terms in their respective nominative forms. Quoted from S.R. Ranganathan, *Subject heading and facet analysis*. In *Journal of Documentation*, Vol.20, No.3, 1964, p.113.
omitted and Kernel terms are brought to their normative singular forms for example.


Step 3. Analyised Title

This step is important in structuring the specific subject heading through facet analysis of each facet one after another by identification of its role and interrelation with other facets in the subject.

Treatment (IE). Tuberculosis (IMP), Lung (IP) (IPI) Lung. Tuberculosis (IMI).

Undesirable effect (2MPI)

Manifestation of Fundamental Category of Space and Time in India (S) and in 1970 (T). Their sequence level and digit indicating level is decided.

The Speciator Ideas are linked with their respective facet(s) after deciding their sequence, if more than one, with role indicator digit. The speciators are then linked with the Basic Facet this will give rise to a compound in Basic Subject,
the sequence of speciators is also determined before it is
linked with role indicator digit.

For example:

   Medicine - Girl - Adolescent.

The whole analysed title is written in the sequence of facet-
analysis after mentioning the role indicator digit against each
Fundamental Category.

Illustration:

   Medicine - Girl - Adolescent (BF): Treatment -
   Streptomycin - Oral Administration (I.E.):
   Evaluation (2E), Tuberculosis (IMP), Lung (IF1):
   Undesirable Effect (2MPI). India (SI) '1970 (TI).

Step 4. Transformed Title

The Kernel terms are rearranged to suit the Syntax\textsuperscript{14} of
Subject Heading.

   Medicine - Girl - Adolescent (BF), Lung (IF1);
   Tuberculosis (IMP): Treatment - Streptomycin -
   Oral administration (IE); Undesirable Effect

\textsuperscript{14}A. Neelameghan, \textit{Absolute Syntax}, Bombay Conference,
1975. A consistent syntax is evolved for the sequence of the
words in a multiple subject heading - that is, the syntax of
the artificial language of subject headings.
Step 5.

If any kernel term is not a standard term or a term of current usage it is replaced by the term in use. For example, 'girl' is replaced by 'female'.

Step 6. Subject Heading for the Specific Subject Entry.

The subject headings are used for the specific subject entry of the document indexed or catalogued. It is used as the lease heading for developing subsequent subject headings for subject Reference or Index Entry and Cross References.

Preparation of the Subject Heading(s) for the Subject Reference Entry, or Subject Index Entry:

In order to determine the broader or super-ordinate ideas or upper links implied by each of the component ideas in the specific subject heading a scheme of classification or a thesaurus is used.

Specific Subject Heading:

Step 1.

Specific Idea Superordinate links (Indicator digit)
Lung ___ Respirator system ___ Human body ___ Medicine.
Tuberculosis ___ Disease ___ Mycobacterium tuberculosis ___ Mycobacterium ___ Bacteria.
Treatment
Streptomycin ___ Antibiotics ___ Drug
Oral ___ Route (of administration)
Undesirable effect ___ Side effect ___ Effect
India ___ Asia

Step 2. The facet ideas and speciator illustrated ideas separately:

Facet Type Idea Speciator type ideas
Lung Female Adolescent
Respiratory system Mycobacterium
Human body Medicine Mycobacterium tuberculosis
Tuberculosis Bacteria
Disease Streptomycin
Treatment Antibiotics
Undesirable effects side effect Drug
Effects Oral
Asia
India Oral
Evaluation Route
Step 3.

Link up the Speciators with the respective facet ideas which they modify with their superordinate links. The display of the components of the subject representation can be either (i) linear, or (ii) non-linear. The symbol ( ) is used to represent that the entity immediately following it, an immediate subdivision of the entity preceding it.

Medicine - Female - Adolescent, Human body > Respiratory system > Lung; Disease - Bacteria Mycobacterium > Mycobacterium Tuberculosis = Tuberculosis; Treatment - Drug > Antibiotic > Streptomycin - Route of administration Oral; Effects > Side effect > Undesirable effect; Evaluation, Asia > India' 1970.

Lead Term:

For a facet term occurring as Lead Term the immediately preceding most specific facet term is suffixed omitting all its Speciators.

If the term denotes the Basic Facet term, then there will be no further context specifying term suffixed to it, for example,

Medicine
Lung, Medicine
Tuberculosis, Lung
Treatment, Tuberculosis
Undesirable effect, Treatment
Evaluation, Undesirable effect

(Contd....)
Human body, Medicine
Respiratory system, Medicine
Disease, Lung
India, Evaluation
Effect, Streptomycin.

Specific Subject Heading:
Lung, Medicine
Medicine - Female - Adolescent.
Lung; Tuberculosis; Treatment -
Streptomycin - Oral administration;
Undesirable effect: Evaluation.
India's 1970.

Similar entries are drawn from all the lead terms enumerated.

Some significant results of Current Classification Research in India, in the Field of POPSIS

There are three distinct interrelated contributions originating out of current classification research in India. These are as follows: (i) A General Theory of Subject Indexing Language (SIL) developed through logical abstraction of the structures of outstanding SILS - such as, those of Cutter Dewey, Kaiser and Ranganathan; (ii) the language of the Pasulate-based Permuted Subject Indexing (POPSI) developed through logical interpretation of the deep structure of SIL forming part of the General Theory of SIL; and (iii) the Classaurus -

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that is, a faceted systemated scheme of hierarchical classification having all the necessary attributes of a conventional thesaurus excluding the enumeration of so-called other Related Terms (RTs); and it is especially meant to facilitate the practice of POPSI. In 1964 Ranganathan demonstrated a new line of thinking regarding Verbal Indexing based on facet analysis and the following research is based on this line of thinking.

SUBJECT INDEXING LANGUAGE (SIL)\(^{16}\)

Subject:

The term 'Idea' is used to refer to percept, or an association of percepts, or a concept. Concepts are the products of reasoning generalizing mental operation, mental reflection, imagination, and intuition. "Information" is the message conveyed or intended to be conveyed by a systematized body of ideas, or its accepted or acceptable substitutes. The universally recognizable varieties of information are: (1) discursive information, (2) non-discursive information or unit facts. Unit facts may be either qualitative or quantitative. A "subject" is essentially a unit fact, and it is conveyed by an indicative formulation that summarized in its message what a particular body of information is about.\(^{17}\)

\(^{16}\)G. Bhattacharya, Fundamentals of Subject Indexing Languages. In Ordering systems for global information networks, ed. by A. Neelameghan, 1979, pp. 63-89.

Indexing:

Indexing is a record specifying an existent along with its address an "Entry". A set of methodically arranged entries is an Index. The process of preparing an index is "Indexing". The methodical arrangement forming the essential element of an index is intended to generate "Groups" -- specially groups of what they refer to. In this sense, indexing is a process of grouping. The purpose of "Classification" as a process is to recognize or to generate "Groups". In this sense classification also is a process of grouping. Teleologically therefore, indexing is a process of classification. Classification may either be (1) "Organizing Classification", or (2) "Associative Classification". In organizing classification the classes are grouped on the basis of four kinds of mutual relationship among themselves: (1) Coordinate, (2) Superordinate, (3) Subordinate and (4) Collateral.

The result of organizing classification is always a hierarchy. A hierarchy may consist of either "whole" and "Types" - that is Genus and Species, or it may consist of "Whole" and "Parts". In Associative classification, a group is recognized because of association of each of its members to a common factor.

Language:

The essential ingredients of a language - natural or artificial -- are (1) elementary constituents; & (2) rules for
the formulation of admissible expressions. SIL is used to summarize in indicative formulations what the contents of a source of information is about. The purpose is to create groups of sources of information to facilitate expeditious retrieval of information about them by providing necessary and sufficient access points. By implication, therefore, a SIL is a classificatory device; and in that sense, a classificatory language. The classification forming the basis may be either organizing, or associative, or a combination of both. To serve the whole purpose of exhaustive retrieval, an organizing classification must be complemented by an associative classification, or vice versa. An organizing classification can serve as the source for deriving associative classifications.

STRUCTURES OF SUBJECT PROPOSITIONS:

(a) Semantic Structure

That is the structure in the dimension of denotation or comprehension. This structure is intrinsic to subject-propositions. The structure is based on "Genus-Species", "Whole-Parts", and "Inter-facet" relationships.

(b) **Elementary Structure**

That is, the structure in the dimension of elementary categories to which the different substantive constituents of subject-propositions belong. This structure is recognized on the basis of the semantic significance of the substantives. But to a large extent, this structure is artificially postulated.

(c) **Syntactic Structure**

That is, the structure in the dimension of the horizontal sequence of the elementary constituents of subject-propositions meant to generate the intended pattern of grouping in their vertical sequence.

**Requisites of an Efficient and Effective SIL**

A SIL should

(a) make provision for all possible terms-of-approach;

(b) ensure as far as possible, organizing classification in general, and under each terms-of-approach.

(c) ensure all possible associative classifications going with the different terms-of-approach, or its effect as far as possible; and

(d) make the structure of subject-propositions for organizing classification to serve simultaneously the purpose of systematic grouping by juxtaposition, and creating organizing effect by referencing.

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Deep Structure of SIL:

The structure of a specific SIL may be deemed to be a surface structure of the deep structure of SIL. The deep structure of SIL may be presented schematically as follows:

TABLE 7.1

Postulates and Principles:

There are four elementary categories namely (D) Discipline, (E) Entity, (A) Action and (P) Property.

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Annotation:

1. **D = Discipline** is an elementary category that includes conventional fields of study, or any aggregate of such fields, e.g. Social Sciences, Education, Political Science, Political Sociology, Ocean Science, Physics, Biology, etc.

2. **E = Entity** includes manifestations having perceptual correlates, or only conceptual existence, as contrasted with their properties and actions performed by them or on them, for example, Industry, Community, Political Systems, Place, Time, Environment, Energy, Light, Environment, etc.

3. **A = Action** includes manifestations denoting the concept of "doing". Action may be Self Action or External Action, e.g., Function, Migration, etc. are self Action, Selection, Evaluation, Organization, etc. are External actions.

4. **P = Property** denotes the concept of "attribute" - qualitative or quantitative, e.g., Property, Effect, Power, Capability, Efficiency, Form etc.

**m = Modifier.** In relation to a manifestation of any one of the elementary categories, D, E, A, and P, the term 'Modifier' refers to an idea used or intended to be used to qualify the manifestation without disturbing the

*The term manifestation has been used here to a specific idea falling in any one of the elementary categories.*
conceptual wholeness of the latter, e.g., "Infections" in "Infectious Diseases". Any manifestation of any elementary category may serve as the basis for deriving a Modifier.

A modifier can modify a manifestation of any of the elementary categories, as well as combination of any two or more manifestations of two or more elementary categories. For example, the entity-based common modifiers 'Environment', 'Place' and 'Time' have the property of modifying a single manifestation or a combination of two or more manifestations so also in the case with the property based modifier 'Bibliographic form'.

Bhattacharya states, "To the Information Scientist, a classification scheme is a specific purpose-oriented Subject Indexing Language (SIL) which he uses to establish a special communication between users and sources of information".  

Hence "POPSI is a subject indexing language".

A Subject is essentially a piece of non-discursive information or a unit facet; and it is conveyed by an indicative formulation that summarises in its message what a particular body of information is about. POPSII provides:

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23 Ibid., Paper BA 34.
(i) rules for decisions about the Base and the Care;
(ii) rules for eliminating redundant categories;
(iii) rules for analysing categories;
(iv) rules for merging categories;
(v) rules to ensure compromising economy;
(vi) rules for decisions about the style of presentation of subject-propositions; and
(vii) rules for decisions about terms-of-approach.

POPSI TABLE FOR AIDING ANALYSIS AND SYNTHESIS

POPSI as a process or operation for preparing subject-propositions consists primarily of (a) Analysis; (b) Synthesis; and (c) Permutation. The task of analysis and synthesis is largely guided by the following table:

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\(^{24}\) G. Bhattacharyya, \textit{op. cit.}, Paper BA 34.
**TABLE 7.2**

<table>
<thead>
<tr>
<th>Form modifier</th>
<th>General treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase relation</td>
<td>General</td>
</tr>
<tr>
<td>Bias</td>
<td>Comparison</td>
</tr>
<tr>
<td>Similarity</td>
<td>Difference</td>
</tr>
<tr>
<td>Application</td>
<td>Influence</td>
</tr>
</tbody>
</table>

**Common modifiers**

| Time modifier | Environment modifier | Place modifier |

**6**

<table>
<thead>
<tr>
<th>Entity (E)</th>
<th>Action (A)</th>
<th>Property (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discipline (D)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proceded by the number of the manifestation in relation to which it is Action/Property</td>
<td></td>
</tr>
<tr>
<td>Part species/type</td>
<td>Special modifier</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** A & P can go with another A and P also. In that case, the number is to be preceded by that of its related manifestation.

**8**

| Core (C) | Features analogous to 6 Entity/7 Discipline/Action/Property |

**9**

| Base (B) | |
Explanations:

1. A manifestation of Action (A) follows immediately the manifestation in relation to which it is an A.
2. A manifestation of Property (P) follows immediately the manifestation in relation to which it is a P.
3. A species/part follows immediately the manifestation in relation to which it is - species/part.
4. A modifier follows immediately the manifestation in relation to which it is a modifier.
5. The notation to be assigned to the manifestation of Discipline or Base is always omitted.
6. When arranged in the increasing sequence of their ordinal values, the punctuation marks, hyphen (-), full-stop (.) and comma (,) fall in the same sequence.

Steps of POPSI Procedure:

1. Analysis of the Subject Indicative Expression (Analysis).
2. Formalisation of the Subject-Proposition (Formalisation).
3. Standardization of the Subject-Proposition (Standardization);
4. Modulation of the Subject-Proposition (Modulation).
5. Preparation of the Entry for organising classification (Preparation of EOC).

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6. Decision about Terms of Approach (Decision about TA).
8. Alphabetical arrangement of Entries (Alphabetisation).

In steps 1-5, the special interest at each step is to arrive at an Organising Classification. The foundation of these steps are predominantly the postulates about the structure of different subject propositions. Therefore, this part of the procedure is said to be 'Postulate based'.

In steps 6-8, the special interest is to arrive at various Associative Classification or its effect. The foundation of these steps is predominantly the technique of 'Permutation'. Therefore, this part of the procedure is referred to by using the term 'Permuted'.

Hence, the whole scheme has been designed as 'Postulate-based Permuted Subject Indexing'.

CLASSAURUS :

It will be evident from the methodology of POPSI that it is necessary to have a standard tool for vocabulary control for this system of indexing. This tool can be designed before applying it to indexing; or, it can be designed along with indexing work. Whatever it may be the case, this tool for POPSI would call for some special features of its own. It has to be a faceted systematic scheme for hierarchical (organizing)
classification incorporating all the necessary features of a thesaurus. In other words, it has to be a combination of "Faceted Classification", and "Thesaurus". Because of this reason, it has been called "Classaurus". It consists of a systematic part complemented by an alphabetical index part. The different schedules in the systematic part include the following:

0 Form modifiers
1 Action (A)
2 Related subjects
3 Property (P)
4 Time modifiers
5 Environment modifiers
6 Place modifiers
7 Entities (E)
8 Disciplines (D).

"Under each category", states Bhattacharyya, "each term displays consecutively all its synonyms and subordinates in successive orders. The subordinates, wherever warranted, are enumerated in the sequence -- parts of successive orders, followed by types (species) of successive orders." A special modifier of a term, if it is not convenient to present it as compact species-terms, is enumerated as a combination of the term and the modifier with a hyphen (-) in between. Every species term is enumerated only

with one modifier based on a single characteristic. For indexing purpose, the use of more than one modifiers is prescribed along with guiding principles and rules. No attempt is made to enumerate the non-hierarchically related terms. The implication of the faceted structure is that a term in one category, in many cases, has a high chance of being non-hierarchically related with another term in another category. The task of showing what is non-hierarchically related to what, and how they are related is left to the care of the indexing procedure. They are all brought together under each term-of-approach by the permutation technique of the indexing procedure. Each term in the systematic part is assigned a unique address, which can be a class number also.

Example -

Anatomy  
Medicine 6 Man 6.2 Anatomy

Bibliography  
Medicine 0 Bibliography

Child  
Medicine 6 Man. Child  
Medicine 6 Man. Child 6.2 Disease  
Medical 6 Man. Child 6.2 Disease (-)  
Infections disease  
Medicine 6 Man. Child 6.2 Disease  
(-) Infections Disease 6.2.1. Treatment  
Medicine 6 Man. Child 6.2 Disease  
The alphabetical index part contains each and every term occurring in the systematic part along with its address. All possible synonyms of each term occur in the index. The address refers to the systematic part where all synonyms, superordinates (broader terms), and subordinates (narrower terms) of the term concerned are found.

A classaurus can serve all the purposes of a conventional thesaurus; but its volume becomes considerably smaller than that of the latter because of the style of presentation. It can be used as a tool for any system of indexing. Moreover, it can be made to be a faceted scheme of notational classification like CC by assigning notation to each standard term according to the integrated theory of notational language.²⁸

CONCLUSION:

As it has been seen that a SIL is always specific purpose-oriented. Any purposeful system for its efficiency and effectiveness, must satisfy the condition of being based on sound logic, as one of its first essential criteria. Any SIL is a purposeful system. The logic of the General Theory of SIL is self-revealing in its systematic and coherent set of working concepts, postulates, principles, and rules of procedures.

²⁸G. Bhattacharyya, "Towards an Integrated Theory of Notational Language". In Library Science with a Slant to Documentation, 10, 1973; Paper U.
POPSI-Basic has been derived from this theory; and the Basic Version can be manipulated to generate POPSIBasics to meet specific requirement being guided by the theory itself.

Features of POPSI-Basic:

One such feature is its technique of generating organizing classification by juxtaposition of subjectpropositions in the verbal plane. No other SIL has this feature. But that argument is not enough to justify the redundancy that is introduced for this purpose. Justification of this feature lies in a different mode of thinking about the evolution of SILs.

For a direct reference to specific subjects, there is no better tool than the alphabetical index. Access to each subject is directly by means of the words of a natural language - no transformation in a class or code symbol is necessary. There is freedom to introduce new terms whenever and wherever they are needed. However, it is often found necessary to control the terms and relations used. This control can be based on facet analysis.

In considering a compound name such as Agricultural Chemistry, Cutter was concerned to enquire, under which word in the compound would the user be expected to look if he sought this particular topic? The rules that he discussed were, therefore, concerned with specific entry, not with classing.
Cutter, from all points-of-view, is to be regarded as the pioneer who formalized the procedure of generating organizing classification effect in the verbal plane by referencing. Kaiser followed him. But the innovative features that Kaiser introduced, have all the necessary attributes to establish his contribution as a landmark in the evolution of SILs. Dewey again, from all points-of-view, is to be regarded as the pioneer to bring about a revolutionary change in the mode of thinking about SILs. He, before anybody else, formalized the procedure of generating organizing classification in the notational plane; and associative classification in the verbal plane. Ranganathan followed the path shown by Dewey. But again, the innovative features that Ranganathan introduced, brought about revolutionary improvement upon the contribution of Dewey.

Creating organizing classification effect in the verbal plane by referencing has always been criticised as a case of "running from pillar to post". The formulation of the search-strategy for exhaustive search, and carrying out such an exhaustive search on the basis of such an index has all along been experienced to be difficult and time-consuming. The finding of what are all related to a specific term-of-approach, and how they are related to each other remained a problem in

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spite of many innovations. Dewey tried to solve it by introducing the generation of organizing classification in the notational plane; and associative classification in the verbal plane. Ranganathan improved upon Dewey's approach considerably. But, notation has its limitations. It works alright with macrosubjects so long its length remains optimally efficient and effective. In the region of microsubjects, the length of notation crosses its optimum size; and it becomes more a problem than a solution. Realization of this fact has led to the development of microthesaurus meant to be used for indexing in the verbal plane alone. A thesaurus aims at enumerating broader terms, narrower terms, other non-hierarchically related terms, any synonyms, quasi synonyms and antonyms, if warranted, for every possible term-of-approach. For this purpose, both a-priori and pragmatic approaches are made. In practice, the thesaurus features may be made to form part of the index itself; or for the sake of economy, these factors may be kept confined only to the thesaurus for developing the search-strategy. But the fundamental basis of conventional thesauri is the idea of generating organizing classification effect by referencing. As a result, the use of these thesauri does not solve the problem of "running from pillar to post". Computerized information retrieval from machine readable data-bases organized on the basis of some thesauri of this type seems to be a solution because of speed and least effort on the part of operators or users. But this solution is more apparent than
real. For, there has been no substantial improvement in the thesaurus approach over what Cutter did.

If Cutter's rules for specific subject indexing are analyzed, especially his prescription of synoptic table, it will be seen that his ideas of ascending references, descending references, and illustrative references are the same as those of broader terms, narrower terms, and related terms respectively. Besides, Cutter's rules for synonym and antonym control are the same as those of today's synonym-control.

'Kaiser' states Vickery, "separates terms into two types: Concretes-Substances, equipment, things, forms of energy; and Process- static or dynamic conditions of the concrete. He constructed headings by putting the concrete first, e.g.,

<table>
<thead>
<tr>
<th>Calico</th>
<th>Printing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>Analysis</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Poisoning</td>
</tr>
<tr>
<td>Liver</td>
<td>Injury</td>
</tr>
</tbody>
</table>

In Kaiser, Cutter's ascending reference and descending references have become higher collectives and lower specifics respectively. Synonyms are controlled in Kaiser's system by recognizing equivalence relationship.

30 Charles Ammi Cutter, op.cit.,
31 B.C. Vickery, Classification Indexing. In, op.cit., p.104.
These ideas, in the context of a SIL, are indeed classic in nature. This is especially for reasons that in response to a specific subject query, it is necessary to retrieve.

1. All references to the specific subject concerned;
2. All references to the specific subjects of greater extension than that of the specific subject, and having parts devoted to the specific subject concerned;
3. All references to subjects of smaller extension than that of the specific subject, and dealing with some parts of the latter; and
4. All references to subjects collaterally or illustratively related to the specific subject in some way or another.

But the question is, "How to accommodate them in the subject index?". It has been found from Dewey and Ranganathan's experiences that their accommodation in the notational plane has special advantages. It has also been found that this advantage loses its significance with the increase in the length of class numbers. These findings suggest to search for the solution in the verbal plane. A verbal accommodation analogous to notational accommodation bears some promise for the future. For example, the modulated chain "Medicine 6 Man, Digestive system, Stomach 6.2 Disease. Cancer. Carcinoma."
Adenocarcinoma 6.2.1 Treatment. Chemotherapy (= Chemical
treatment) parallels the notational accommodation of
broader terms, and other non-hierarchically related terms.

This way of looking towards the issue would suggest
changes in the conventional structures of thesauri. The
General Theory of SILs provides us with the appropriate
guidelines. According to the implications of this theory,
the thesaurus should necessarily be a faceted one; and for
this purpose, under each of the elementary categories
"Discipline", "Entity", "Action", and "Property", the super­
ordinates (broader terms) of successive removes; the subordi­
nates (narrower terms) of successive orders; and synonyms,
quasi-synonyms, and antonyms of each manifestation should be
enumerated. Obviously, the most economic way would be to emu­
merate each block systematically. Such a system may be
conveniently described as a "Classaurus" -- that is, a
systematic scheme for classification having all the features
of a thesaurus, supplemented by a single alphabetical index
giving the address of each manifestation in the systematic
scheme.

The classaurus is to be used for precoordinate indexing
according to a set of postulates for syntactic structure
formulated on the basis of decisions about the Base and the
Core. The task of recognizing non-hierarchically related terms
should be left largely to the care of the formalized subject-propositions. The style of control of the vocabulary by the classaurus, by implication, would simply suggest that the probability of a manifestation belonging to a particular elementary category being non-hierarchically related to any other manifestation belonging to any of the other elementary categories is very high. Of course, the meaningless combinations of manifestations of different categories are automatically excluded from the purview of this consideration.

By implication of the faceted structure, the Entities, Actions, and Properties going with a Base are related to each other. But what is non-hierarchically related to what, will be revealed by the subject-propositions themselves through their alphabetical arrangement. Attempts to enumerate non-hierarchically related terms of a particular manifestation have created confusion only. No two specialists agree in the choice of the so-called "Related Terms". But if this part of the activity is left to the care of the subject-propositions themselves, no two specialists can disagree; for, in this process two terms are said to be related because they have occurred as related in the sources of information. Consider the example cited above. Chemical treatment of the adenocarcinoma of stomach:

Base (B) = Adenocarcinoma
Modifier of Base (mof B) = Stomach
Action on Base (A on B) = Chemical Treatment = Chemotherapy.
There is no point in saying that "Stomach" is not related to "Chemotherapy", and "Adenocaucinoma"; or the latter is not related to "Chemotherapy". No amount of alertness seems to be adequate for recognizing and enumerating horizontally and non-hierarchically related terms of a particular manifestations; nor is that necessary at all when there is more efficient and effective means to reveal them. To PCFSI language incorporates all these features for the specific purpose of information retrieval. This new line of thinking about the design of the classaurus is the contribution of the General Theory of SILs. Besides, it provides all the necessary guidelines for constructing a classaurus.

The idea of a purpose-oriented, postulate-based organizing classification serving as the source of derivation by permutation of all possible associative classifications to complement in a definite contexts is the characteristic feature of the PCFSI Language based on the General Theory of SILs. Bhattacharya states, "It has a highly generalized, hospitable, versatile, and therefore, adaptable intellectual foundation capable of guiding the formulation of consistent specific procedures for subject indexing for retrieval of

1. Information qua information;

32_G. Bhattacharyya, op. cit., paper BA 59.
2. *Information about the location of a body of information in the text of a document;* 
and 
3. *Information about the surrogates of sources of information*. 

PCPSI is fully amenable to computerization. The potentiality of PCPSI, as discovered till today, suggests that it can be regarded as an all-purpose indexing procedure so far as "Information retrieval" is concerned.