SEMINAL MNEMONICS IN KNOWLEDGE ORGANIZATION: MODERN PRACTICES AND ANCIENT TRADITIONS

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The use of seminal mnemonics implies the identification, at the near-seminal level, of similar subsets or groups of concepts (ideas) in subject domains and deriving a similar pattern of organization of the subsets in different domains. More specifically it consists in having the same digit or digit group to denote seminally equivalent ideas in whatever subject they may occur, even though different terms may be used to denote the ideas in the different subject fields. Seminal mnemonics are helpful in the organization of concepts – in the presentation of ideas in technical writing and in discourses, in designing schemes for subject classification, taxonomy etc. This paper examines the sequence of steps in the thinking process in different contexts, such as, systems analysis, systems design, knowledge management, problem solving, decision making, and the process of classifying subjects. Two main categories of concepts are identified, namely, concepts denoting attributes of the elements of the system studied and concepts denoting actions taken at each step in designing the system. The steps and their sequence are similar and parallel in the contexts examined. To facilitate remembering these systematic steps numerals and their ordinal values are used to organize or 'fix' the sequence. We also indicate the similarity in the association of concepts with numbers in some ancient traditions.

Keywords: Knowledge organization; mnemonics; seminal mnemonics; practices; traditions

Introduction

'Seminal' means germinal, originative, containing seeds of later development. For instance: "seminal ideas of one discipline can influence the growth of another".

'Mnemonics' means a method – a way of doing something, especially a systematic way, implying an orderly logical arrangement, usually in steps – to aid the memory, that is, remembering.

Use of seminal mnemonics in knowledge organization devices implies the identification of similar subsets or groups of ideas (concepts) in subject domains and deriving a similar pattern of organization of the subsets in different domains at the *near-seminal level*. In this paper we elaborate on this implication. In schemes for classification use of seminal mnemonics consists in having the same digit or digit group to 'denote seminally equivalent ideas in whatever subject they may occur, even though different terms may be used to denote the ideas in the different contexts.'[1]

The intuitive application of seminal mnemonics in the coding of unit ideas or groups of them in the schedules for subject classification in different domains can be found in literature[1, 2]. Seminal mnemonics as a pattern for systems analysis examined by Neelameghan[3–5] and Pratap Lingam[6] have demonstrated the usefulness of seminal mnemonics in the presentation of ideas in technical writing. Judge[7] has commented on the difficulties of applying seminal mnemonics and the need to go beyond. Beghtol[8] in a discussion of relationships in classification of concepts

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mentions the need for further examination of the useful concept of seminal mnemonics and its application in knowledge organization.

The application of seminal mnemonics in the organization of ideas / concepts in subject domains helps

- the process of learning about a subject domain, what it is, its contents, boundaries etc.,
- identification of gaps in one's knowledge and/or in the subject domain,
- to promote research and experimentation to close the gaps,
- knowledge discovery, and
- obtaining a holistic view of the subject domain.

The above processes leading to the formation of ideas (concepts) about a system are assisted by systematically asking such questions as follow with reference to the system under study:

- What is it?
- What is it composed of? What are the inputs?
- What are its functions? How the system's functions may be analyzed?
- What are the interlinks among the components?
- What are the features of the environments in which it is expected to function?
- What are its likely defects and deficiencies?
- What are the ways to prevent the defects and deficiencies?
- How the defects and deficiencies be corrected, if they occur?
- What features for further development are inbuilt?
- What are the organizational / managerial concerns to ensure continuity?

Concepts are mainly products of intellection and conceptualization. The above-mentioned queries correspond to the three broad stages in the formation of concepts, namely,: (1) Perception, that is becoming aware of something through the senses, perceptual experience, the representation of what is perceived, which constitutes the basic component in the formation of a concept; (2) Cognition, the psychological result of perception and learning and reasoning; and (3) Consciousness, an alert cognitive state in which one is aware of oneself and one's situation. Ideas /concepts may also be acquired through intuition (trans-sensory, trans-intellectual) and through revelation.

We examine the *sequence of steps in the thinking process* in different contexts, such as, systems analysis, systems design, knowledge management, problem solving, decision making, and process of classifying subjects. We note two categories of concepts involved: concepts referring to attributes of the elements of a system studied and concepts referring to actions taken at each step in designing the system. The steps and their sequence are similar / parallel in the contexts examined. To facilitate remembering these systematic steps numerals and their ordinal values are used to organize the concepts in a sequence. We also indicate the similarity in the association of concepts with numbers in some ancient traditions.

Number of Elements and Constraints on Comprehension

In knowledge organization as may be necessary, for example, in a discourse, textual presentation, communication, or a scheme for classification of subjects, the arrangement of component concepts in a sequence helpful to the audience / users facilitates better and easier understanding of the inter-relations among the concepts and the presentation as a whole. One of the factors that vitiates against easy comprehension of a set of entities by a normal person relates to the contents and size or number of elements in the set under consideration. Simon[9] pointed out that "For understanding a set of entities a preliminary step is to study what the set is composed of, that is, to develop a taxonomy." Judge[7] noted "a widespread tendency to formulate insights, proposals or principles ... as made up of a specific number of items usually presented as a list." considered as elements of a set in any particular case. He examines the different kinds of constraints to the distinctions and relationships between elements depending upon the total number of elements in a set.

The elements we consider here are concepts, usually presented as a list, for example, in a scheme for classification, taxonomy, a thesaurus, list of subject headings, and as sections and paragraphs in a discourse or text. Various authors have dealt with the need for forming groups or sub-sets of elements, because of the limitations to the cognitive and creative capacity of normal human beings. For example, difficulty of comprehending all of the components of a laboratory problem which one is attempting to solve[10], the number of issues one can consider simultaneously[9, 11]; the number of parameters of a decision that one can take into account simultaneously, and the number of different positions among which one can discriminate comfortably[12].

Another aspect of the constraint on the number of elements in a set is derived from researches into "the

psycho-physical significance of number as a common ordering factor of the psyche and matter" as noted by Franz[13]. We may also recall here George Miller's *The magical number seven, plus or minus two*"[11]. It is noteworthy that there are also seven divisions, partitions and stages in natural phenomena, e.g. seven colours of the spectrum, seven notes of the musical scale, seven energy centres of the human body, seven spheres of consciousness, etc (see Chopra[14]; Srinivasan[15])

Given the difficulties just mentioned in comprehending a multiplicity of elements, a useful approach is to group the elements of a set into more manageable sub-sets or subgroups, and preferably arrange them in a sequence that shows some relation among the coordinate groups. The arrangement / sequencing on the basis of a selected parameter can be specific to the context or more widely applicable in different contexts. We shall be considering the latter possibility.

Generally Acceptable Sequence of Concepts

An issue to be considered is: Can a sequencing of concepts prevalent or acceptable across most domains of knowledge and cultures be identified?

In human beings, intellectual activity is known to be controlled by the brain. There is considerable similarity in the structure and, therefore, in the functioning of the brain in a majority of normal human beings. Thus, a majority of normal persons have more or less a similar mode of thinking, and leaning – that is forming concepts and in combining them to build knowledge structures. It is further stated that biologically the human being has not changed to any appreciable extent since the emergence of *Homo Sapiens*. This is so because the structure of the genetic material has not appreciably changed since then, that is, for some 500,000 years, although we may have changed culturally (cf. Bertrand Russell[16]). Lazlo[17] points out: "...Regardless of the genetically and empirically induced differences, however, basic modes of thinking characterize all human beings." Therefore, the probability of a sudden change in the mode of thinking and learning in the majority of normal persons is extremely low. It follows that if a pattern in the organization of concepts in thinking, learning and studying a system or set of entities can be identified, that pattern will apply or be acceptable to a majority of normal human beings.

In the following sections the sequencing of ideas in various contexts involving intellection / thinking process, e.g. systems design and systems analysis, problem solving, decision making, knowledge management, knowledge transfer in enterprises, research methodology, postulational approach to classifying subjects, etc. are examined.

In his widely acclaimed book *Six Thinking Hats*[18], Edward de Bono presents a positive and practical approach to decision making and exploring new ideas. His philosophy and methodology, adopted by a large number of managers in small and big corporations, educators and governments in many countries with success and positive results, help one to think better. The processes involved in each of the steps and the sequence of the steps can be used in the arrangement of concepts. A brief description of the Thinking Hats follows.

White Hat Thinking used at the beginning, is concerned with assembling of data and information - facts and figures - about the situation, the background, etc. needed at the start of the discussion / thinking exercise, to identify or focus on the core and boundary. The facts are presented without comments, neutral and objective. (Starting point). This step marks the *start* or *beginning* of the process. White Hat Thinking is also for mapping, organizing and structuring the facts and information. The map helps to consider such questions as: What information do we have? What information do we need; what are the gaps? What irrelevant data may be filtered out? What questions should be asked to get information to fill the gaps? This step relates to *components, map,* and *structure*.

Red Hat Thinking is used for acting or reacting to the situation / proposal, expressing feelings and is based on hunches, impressions and intuition. The feelings may be categorized into two broad types:

1. Ordinary emotions ranging from strong emotions, such as, fear and dislike to the more subtle ones, such as, suspicion; and
2. Complex judgments that go into such types of feelings as hunch, intuition, sense, taste, aesthetic feeling and other not visibly justified types of feelings.

This step relates to *analysis* and *study of functions.*

Black Hat Thinking considers risks, dangers, obstacles, potential problems and the downside of a suggestion, the negative aspects. Suggests caution and carefulness and points to matters that need attention. It is very much about fit: Does the suggestion fit the enterprise's past experiences, policies and strategy, ethics and values; available resources, and known facts and experiences of others? Black Hat thinking can be an assessment of the proposal. This step relates to considering possible *deficiencies, risks and faults*

Yellow Hat Thinking considers the positive and beneficial aspects of a suggestion. The positive spectrum may range from the logical and practical at one end to

dreams, visions, and hopes at the other. Related to creativity and constructive thinking; how to put an idea into practice by overcoming the risks and dangers noted by Black Hat. Concerned with generation of new proposals and their positive assessment, and building up of the proposal and further construction. It is speculative, looking into the future. Asks 'If' questions. Needs value-sensitiveness and examines the reason for the value put forward. Considers questions such as: What are the values? For whom? Under what conditions and circumstances? How are the values delivered? This step relates to the study of the operating *environment* of the system, and its *protection and prevention from possible risks and dangers that might arise in the future.* This step is also concerned with bringing things about, the operational aspects, taking an idea that is used elsewhere and putting it to work; generating alternative approaches to a problem; and defines opportunities.

Green Hat Thinking is concerned with change, innovation, invention, new ideas, and new alternatives. It is the energy hat, growth and creativity hat. To put forward new ideas, lay out options; seeks to modify and improve upon the suggestions or proposals.

Suggestions to overcome some of the difficulties put forward or noted under the Black Hat Thinking, such as modifying an idea to overcome the problems, suggests the need for additional ideas. Progress arises from analysis of information, and logical deduction within a framework of possibilities. This step relates to finding *solutions to problems* encountered, and moving forward. Some of associated factors are:

- Human natural habits of thinking, that is, brain function: Recognition, judgement and criticism; fitting ideas to an existing pattern, rejecting those that do not fit.
- Creativity involves provocation, exploration, experimentation, and risk taking.
- Lateral thinking can help

Blue Hat Thinking involves overview of what has been achieved. Summarization and conclusions. Also experience-based monitoring and programme design and management. This step relates to *integrated and holistic view* of the total situation.

At this stage, White Hat Thinking may be used again to provide data and measures for *assessment / evaluation* of what has been achieved.

Sequence of Principal Steps in System Study and System Design : A systematic approach to the study of an existing system and in designing, developing and managing a new system would involve a series of steps mentioned below. At each step in the design and development process, the factors / elements involved can be categorized as those belonging to the idea plane and those to the practical plane.

Step 1: The idea of a *Starting Point, Beginning, or Origin*. Thus, in this step, in the idea plane, the system is brought into existence as it were, into the conscious level of thinking about it. In the practical plane, this may be provided for by a Problem, a Hypothesis, a set of Normative Principles, a Statement of Objective, or of Purpose, or of Goals, or of Policy.

In a study of an existing system, this step would consist of examining these attributes of the system – the starting point, *genesis, purpose*, etc.

Step 2 : Having recognized and stated the objectives of the system, in Step 2 the designer may consider the input necessary to achieve the objectives. In the idea plane, this would amount to considering the particular *components of the system and their inter-relation*, with a view to securing a helpful arrangement and coordination of the components of the system in the subsequent steps. Thus, in Step 2, in the idea plane, the system takes a *form and structure*. In the practical plane this may be provided for by working out the *constitution*, or *enumerating parts* and their interrelation. It may be mentioned that a study of the structure or constitution of a system is a basic "source of information" about the attributes of the system itself.

In a study of an existing system, this step would consist of examining the attribute form / structure / architecture of the system.

Step 3 in designing a system would generally involve, in the idea plane, a consideration of the *functions of each of the components* in relation to the function of the system as a whole. In the practical plane, such a consideration may be aided by a detailed analysis of the different parts, their respective attributes, namely, functions, responsibilities, and limitations, or setting up a *model or equation* to represent the *relation between the different variables* involved.

In studying an existing system, this step would consist of examining the functional attributes of the system.

Step 4: In designing a system the factors securing maximum efficiency and economy of operation of the system should necessarily receive attention. The designer will also recognize that an artifact may not be perfect.

This realization leads to a consideration of the possible deviation of the system from the initially set norms of operation. In the practical plane, the result of *deviation from the norm* may be recognized as a potential *pathological state, wastage, error, or failure* of the system. Following the analytical step 3, step 4 would also involve *interlinking* of data.

In a study of an existing system, this step would consist of examining such attributes as faults, deviation from norm, errors etc. in the system.

Step 5: The economical and efficient working of a system is dependent on the influencing factors in its internal and external environment. In Step 4 the possibility of wastage due to deviation of the system from the norms set has been recognized. In Step 5, therefore, the designer would consider the *environment in which the system is to function* and the factors arising from the interaction of the system with the elements in its environment, affecting the design, development, and operation of the system. In the practical plane, the consideration may be providing a *feedback mechanism* and to *protect* the system from the environmental factors that adversely affect the efficiency of the system.

In a systems analysis / systems study, this step would consist of examining the environmental factors, feedback mechanism and protection features provided.

Step 6: In Step 6, in the idea plane, the designer may think of extending the life of the system. This may be considered in terms of the environments in which the system may have to work in future. The ideas developed at Step 5 may indicate that the system must adapt and evolve itself to meet the requirements of the future environments. For this purpose, an *inner self-driving, self-perpetuating mechanism* may have to be built into the design of the system itself. The genetic mechanism in the biological world is an analogy. In the practical plane, a method for extending the life of the system may be by developing methods for *correcting / treating any failure or fault,* or *finding solutions to problems wherever they occur,* and bringing the system back to its normal state of functioning.

In a system analysis / system study, this step would consist of examining the built-in attributes that enable the system to evolve.

Step 7: The different steps in the design of the complete system are covered in Steps I to 6. However: Steps 2 to 6 are concerned with the details of the structure and function of the components of the system. Each of them gives only a truncated view of the system. Good management requires taking a total view of the system, which may present characteristics of its own, not found in the components. Therefore, in Step 7, the designer may consider, in the idea plane, an *integrated total view* of the system. In the practical plane, this may consist in examining the successive stages of the growth and elaboration of the system, from the rudimentary to the fully developed stage.

In a system analysis / system study, this step would consist of examining the total personality of the system.

Step 8: Having completed the conceptual planning and design of the system in Steps 1 to 7, in Step 8, the designer may consider, in the idea plane, the means to implement the findings and to ensure the necessary inputs and maintenance of the system for its continued efficient working. In the practical plane, the purpose may be sought to be achieved by setting up an *agency for administering* or *managing* the system.

In a systems analysis / systems study, this step would consist of examining the provisions for managing the system.

Parts of the Knowledge Process : Arthur Anderson (U.K) Assurance and Business Advice assigns responsibilities for different parts of the knowledge process for defining knowledge management skills and development requirements. These are enumerated in the following sequence (quoted in Abell and Oxbrow[19])

1. Define context for knowledge (purpose, objective...)
2. Define what is required (components, inputs required...)
3. Identify the options (involves analysis)
4. Select / use appropriate options
5. Integrate knowledge obtained (synthesis)
6. Share knowledge
7. Develop / maintain knowledge content (Knowledge developer's function)
8. Develop knowledge option (Knowledge manager's function)

Steps in the Knowledge Transfer Process in an Enterprise : Carla O'Dell and Jackson Grayson Jr.[20] of the American Productivity and Quality Center in their discussion on cycle / spiral of knowledge transfer, present the following steps:

Create; Identify; Collect (Select); Organize; Share; Adapt; and Use

The principal elements of the enabling environment are deemed to be infrastructure, technology, culture, and measure of impact.

Steps in Scientific Method in Research : Research methodology in science generally follows a series of systematic steps and involves intellection.

The objective - starting point - may be the verification or refutation of a prevalent theory, a conjecture, or an assumption, or to find a solution to a problem.

Relevant data are collected through experimentation, observation, survey and / or obtained from various other sources. "There is progression towards particularization and concreteness and, regression form generalization and abstraction."

The raw data *per se* may not by itself be useful. The data needs to be analyzed, classified, organized, and tabulated; and using statistical methods and computing facilities the underlying relationships among sub-sets of data may become explicit or deduced. Inductive logic, normal equations, simulation and model ling help in formulating a few inductive or empirical laws. The move is towards generalization and abstraction, and regression from particularization and concreteness...

In the next stage, the accumulated empirical laws are further generalized and abstraction to yield one or a few more general laws (theories) or fundamental laws. In this process intuition may play a greater role than intellection..

Next, the implications of the fundamental laws is explored in different practical situations to test their usefulness and verifiability. The limitations of the laws in certain situations may be evident. Logic and computers may be of assistance in this step. The progress is toward particularization and regression from generalization and abstraction. Deduced laws may be derived which will include all of the inducted empirical laws.

A new cycle may begin through experimentation and observation to verify empirically the validity of the new deduced laws. And the cycle continues.

Managerial Action for Improvement of Product Quality : The following table mentions the steps I to 8 in the design, development, and management *of* a quality control programme. This is based on the observation / study by a quality control expert in several organizations and as recommended by the bodies concerned with quality control in USA.

TABLE 1: Steps in Managerial Action

Step	Managerial Action	
	Idea Plane	**Practical Plane**
1	Management commitment	Statement of the quality policy goal of the corporation
2	Quality improvement team	Formation of team to carry out program. Enumeration of components of the program
3	Quality measurement	Analysis of operations to be done. Determining the data to be collected
4	Cost of quality	Wastage: Its kinds, causes and cost of each
5	Quality awareness	Awareness of the environmental factors affecting quality of product. Prevention of deviation from prescribed standards
6	Corrective action	Systematic method of resolving the problems sensed
7	Defect prevention audit	Taking an integrated view of all the components involved, to define the ability of the system to produce quality goods/ services
8	Carrying out the quality improvement programme	Supervisory training for implementing programme

General Steps in Problem Solving : Problem solving requires systematic intellectual procedure. The general steps involved are mentioned below.

TABLE 2: General Steps in Problem Solving

Step	Particulars
1	Sensing of problem by decision maker. Starting point
2	Formulating the problem contours: (Complete identification of the components of the problem)
3	Model construction: (Establishing functional relation among the variables with the aid of, e.g. equations)
4	Consideration of possible risks, deviations, errors
5	Study of affecting factors
6	Solution from model. Resolution of problem
7	Consideration of model and solution as a whole
8	Implementation of solution.

Postulate-based Procedure for Classifying Subjects : The Postulate-based Method of Classifying a subject gives a step-by-step *systematic procedure* for classifying [23]. It would, therefore, be useful to examine the work involved in the successive steps in the method. The following table presents, in brief, the 8 steps involved:

TABLE 3: Steps in Classifying Subjects

Step	Particulars
1	Raw Title (The first step is to take the Raw Title from the title-page of the document). (Starting point)
2	Expressive Title (The Title is to be structured so as to express co-extensively the subject of the document by bringing out all the necessary component ideas). (Structuring)
3	Kernel Title (Determining the substantive functional terms, and dropping the puffs and auxiliary terms). (Analysis).
4	Analysed Title (Correlating each with the Fundamental Categories in determining the typology of the component ideas). (Correlation)
5	Transformed Title (Placing each Kernel Idea denoted by each Kernel Term in its appropriate context, so as to express the correct strength of bond among them) (Context and environment)
6	Title in Standard Terms (Correcting, the non-standard terms with the aid of the schedule, thesaurus, etc). (Correction)
7	Title in Kernel Numbers (Assembly of the elements into the Kernel Number preparatory to forming the Class Number). (Form whole)
8	Class Number (Omitting the labels and forming Class Number (Organizational work)

Summary of Groups of Concepts and Their Sequence : In the thinking process involved in the above examples (situations, contexts), there appears to similar steps, the arrangement of which follow in a similar sequence. Applied to Study of System, that is, study of attributes of an existing system and the Actions involved in Designing a System, may be summarized as follows:

TABLE 4: Summary Table

	Concepts denoting Property	Concepts denoting Action
1	Starting point (Goal to be reached, statement of objective, purpose, policy, problem, hypothesis; conception nomenclature, preliminaries, definition, origin, and cognate concepts	Create, originate, begin, and cognate concepts
2	Structure, morphology, constitution, composition, raw material, source, and cognate concepts	Input, supply, sourcing, design, classify, produce, cause, collaborate, and cognate concepts
3	Function, organization, role, physiology, syntax, process, and cognate ideas	Analysis, diagnosis, and cognate concepts
4	Deviation from norm/normal, error, disease, risk, damage, controversy, and cognate concepts	Correlate, interlink, synthesize form study of causes, and cognate concepts
5	Ecology, environmental, beauty, aesthetics, passion, energy and cognate concepts	Prevent, protect, control, and cognate concepts
6	Capacity for propagation, future, genetics and cognate concepts	Treat, cure, nurture, resolve, measure, adapt, and cognate ideas).
7	Total personality, yield, result, developed stage, holistic view, and cognate concepts	Conserve, assemble, integrate, develop, overview, and cognate concepts
8	State of fitness, domination, achievement and cognate concepts	Manage, monitor and control, manipulate, evaluate, and cognate concepts

Seminal Mnemonics

Ordinal Numbers and Sequence of Steps : Judge [7] points out that the special problem in comprehending complete sets lies in the relationships between the interdependent elements... even if the member elements can be comprehended singly and in groups in serial fashion, remembering them is increasingly difficult and their relationships are lost as is any grasp of the totality."

An approach to a solution to this problem is to apply the concept of Seminal Mnemonics. As already mentioned, the use of Seminal Mnemonics consists in having the same digit or digit group to' denote seminally equivalent ideas in whatever subject they may occur, even through different terms may be used to denote the ideas in the different contexts. The identity of the ideas is said to be recognizable at great depths beyond the reach of natural language. As and when the idea is recognized in the phenomenal level in a particular context, a term in the natural language is used to denote it in that context. Assigning the ordinal numbers 1,2,3....8, to each of the groups of concepts (Attributes and Actions) as indicated in the Summary Table in section 4, it will enable (a) fixing the sequence of the groups of concepts, and (b) use of seminal mnemonics.

Seminal Mnemonics in Ancient Traditions : In his *Prolegomena*, Ranganathan[1] wrote: "In the mystic tradition of Chaldea and India, many such equivalences [concepts and numerals] are believed to have been recognized. It gives seminal mnemonic significance to letters as well as numerals. A correct knowledge of it will make the use of digits conform with seminal mnemonics. The forgotten tradition needs to be recaptured. As the deep region of seminal equivalences transcends expression in words alone, communication through the written or printed word is difficult. Seminal equivalences are ineffable, but they get permeated by personal association and communication in a School"

Levels / Planes of Consciousness (Hinduism, Mahayana Buddhism, Zen Buddhism) : Ken Wilber [21] in his book *The Spectrum of Consciousness*, identifies commonality of concepts in the evolution of consciousness (cognitive state) and attempts at a synthesis of the various traditions - religion, philosophy, and psychology - relating to the individual's progression from the 'unreal to the Real'.

Taking Vedanta tradition as a basis Wilber writes: "Vedanta psychology is founded upon the experimentally verifiable insight that the Brahman-Atman is the sole Reality, and its primary concern is to provide a pragmatic explanation as to 'why' man fails to realize his basic and supreme identity with Brahman.... Psychologically, this ignorance of Brahman is marked by the superimposition (*adhyasa*) of what are technically called "sheaths" (*kosas*) 'over" or 'upon' the underlying reality of Brahman-Atman, so that man identifies himself with these *kosas* and thus apparently (i.e. not actually) obscures his real identity with the Absolute." (Wilber, Ch. 6).

In Vedanta psychology, metaphorically the sheaths are compared to the layers of skin of an onion, the reality of the Atman being "buried" in the very centre of the onion. The progression from the unreal to the Real or Liberation entails peeling away or seeing through these layers / levels of mis-identification and finally merging with the centre, the Real, the actual ground of the various illusory layers.

1. **The Starting Point:** The world constituting the environment of the individual.
2. **Annamayakosa:** The outermost sheath / layer. The sheath of material existence, represents man's ordinary waking consciousness (*jagaritha-sthana*), his primitive identification with a self embodied in his physical body, the gross body (*sthula sarira*). The activities here are supported with *data input* about the external world via the senses.
3. **Pranamayakosa:** The sheath of vitality: The sheath of vitality roughly corresponds to the functionality of the human being's will to live, the urge / energy to survive
4. **Manonmayakosa:** The sheath of discrimination. The root tendency, partly innate and partly acquired, to discriminate, differentiate.
5. **Vijnanamayakosa:** The sheath of ratiocination.. Tendency to use language and logic to analyse / dichotomize existence, to overlay the Real with 'dualities.'
6. **Anandamayakosa:** The innermost layer, the sheath of bliss, comprises of the "causal body" (*karana sarira*) and is the experience of everyone in the state of deep, dreamless sleep (*susupti*), and during certain forms of meditation, Dualities and discrimination are not completely eliminated at this level but they are harmonized so completely that this state is experienced as one of profound relaxation and bliss (*ananda*). It is preparation for complete liberation and merger with the Atman. It is also called the "causal body", the ground and cause of all other sheaths.

   Pranamayakosa, Manonmayakosa and Vijnanamayakosa constitute the "subtle body" (*suksma sarira*)
7. **Atman-Brahman**: Beyond the sheaths. When Anandamaya sheath is peeled away, what remains is the pure Reality of the Creator, "absolute non-duality, ineffable, Brahman-consciousness, underlying the other five sheaths and the three bodies"

This compares with Meher Baba's[22] exposition of the evolution of consciousness in Human beings.

Religious Mysticism (Hinduism, Buddhism, Taoism, Judaism, Christianity, Islam) : Religious mysticism is concerned with the nature of and communion with, Ultimate Reality, the struggle of the individual to attain a clear vision of that Reality, and the transformation of consciousness that accompanies such vision. (Bhashyananda[23]; Meher Baba[22], Platt[24]). The major religions of the world – Hinduism. Buddhism, Taoism, Judaism, Christianity, and Islam – have common elements in their mystical traditions, the movement and progress of the individual / seeker from the unreal to the realization of the Ultimate Reality, even though there may be differences in the prescriptions to reach the goal in the different religions. The common elements in the traditions in the path of the progressive movement of the individual / seeker toward the Real may be broadly categorized as follows:

1. **Goal** to be realized – vision of and communion with **Ultimate Reality**
2. **Attributes / characteristics / morphology** of the Reality – Uncreated, all-pervading, omniscient, etc.
3. **Functions** of the seeker, how he/she may conduct himself/herself in taking the steps toWard realizing Reality – Distinguishing between ego from true self; being humble and devoted; understand the nature of desire; detachment, letting go personal gain and preferences;

4. **Inter-relating** with Reality – Surrendering to and involving that Reality

5. **Synthesis** - How the Reality may touch the seeker? through grace and guru / teacher

6. **Re-generation, transformation** of the seeker

7. **Clear vision of** and **Union with Ultimate Reality** – release and liberation.

Chinese, Roman and Greek Traditions : The practice of associating concepts / groups of concepts with numbers can be found in different traditions, and there are parallels / similarities to the number association list presented in the Summary Table above. There may also be some differences in the numerals assigned to different groups of concepts. Summarizing the practice in Chinese, Roman and Greek traditions, Carol Adrienne[25] presents the following list:

Numeral 1 symbolizes the principle of *Beginning.*

Numeral 2 symbolizes the principle of *Coming together with another; partnership.*

Numeral 3 symbolizes the principle of *Energy in action; growth.*

Numeral 4 symbolizes the principle of *Putting ideas into form, intellection.*

Numeral 5 symbolizes the principle of *Multiplicity, progression, passion.*

Numeral 6 symbolizes the principle of *Nurturing, caring, harmony.*

Numeral 7 symbolizes the principle of *Deep inner need to find depth, meaning and* spiritual connection

Numeral 8 symbolizes the principle of *Domination, control, achievement*

Numeral 9 symbolizes the principle of *Universal philosophy, consciousness*

Concluding Remarks

The representation and presentation of groups of ideas parallel to the sequence of steps in system study and system design is a helpful approach to organizing ideas. The concept of Seminal Mnemonics enables deriving a general systematic procedure for system study and analysis. In the widely accepted definition of a "system," the following attributes of the system are recognized:

1. A system has an *objective* or *goal.*

2. A system may have one or more *components.*

3. Each of the components is designed for a specific *junction.*

4. In a dynamic system, there is interaction among the components themselves and between the components and their external environment, which put *pressure on the functioning* of the system and thereby affect it sometimes adversely.

5. At different stages and levels of functioning of the system, there is a *feedback from the environment* to and between the appropriate components of the system.

6. On the basis of the feed-back, the system *corrects* itself or is corrected so as to put it along the line of maximum efficiency or normal working.

7. The development of a system requires consideration not only of the structure and function of each of the components of the system, but also taking a *whole view'* of the system.

8. To ensure continuous and consistent working of the system at maximum efficiency, there needs to be an agency for *management* of the necessary input, maintenance, etc.

It may be possible to work out different sequences for the various groups of ideas denoted by each of the numerals. One such sequence has been discussed above from the angle of the design, development, and management of a system. The assignment of mnemonic significance to numerals, that is, the use of Seminal Mnemonics can aid rational planning of applied research and system development. It is true that brilliant, critical, intuitive insight cannot be planned. But the systematic application of theories and techniques in the pursuit of an objective or in finding solution to a problem can be planned to a large extent. Such a systematic approach increases productivity in work, relieves the intellect of thinking out the routines, and promotes its concentration on the deeper aspects of the problem on hand.

The helpfulness of Seminal Mnemonics in structuring the text of a document - such as, a book, an article. and a technical report - has been discussed elsewhere (Neelameghan[5]) The particular advantage is the helpful sequence in which the ideas get arranged and the increase in productivity in formulating the work

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