10.4. Functional classification

Commentary on an experimental subject configuration for the exploration of interdisciplinary relationships between organizations, problems, strategies, values and human development[1]

A. INTRODUCTION

The *Yearbook of International Organizations* (Volume 1) in 2003 describes or lists over 25,979 bodies which can in some way be considered international organizations. Whether governmental or nongovernmental, their activities interweave in a myriad ways in the processes of the international community. Although organizations are listed in alphabetical order of titles and abbreviations in Volume 1 of the *Yearbook* and a multilingual index is provided, this nevertheless fails to provide an ordered, comprehensible overview of how such activities interrelate. In the absence of any such ordering, tendencies to fragmentation are reinforced and subtler approaches to integration are hindered.

This paper clarifies this challenge and describes the factors entering into the design of the process from which the activity classification in this volume emerged as a **first** product. It is important to note, as is explained below, that it is unnecessary to read or agree with the contents of this paper in order to derive **practical** benefit from the classification in its present form. The concern of this paper is to point out other ways of making use of the classification and the possibilities for its **further development**.

1. Review of classification of organizations in the *Yearbook of International Organizations*

When the predecessor of the *Yearbook of International Organizations* was first produced in 1910, the organizations were classified in it according to the Universal Decimal Classification (UDC) system. This was to be expected given that the person co-responsible for both the UDC and for the organizations publishing the *Annuaire de la Vie Internationale* (as it was first known) was Paul Otlet, often referred to as the "father of international documentation". In 1910, on the occasion of the 1st World Congress of International Associations, he produced a "Tableau de l'Organisation Internationale" grouping organizations (and conferences) by subject area. An improved version of this was produced in 1924 by him, on the occasion of the 4th Conference of International Associations, covering some 400 international bodies with comments on their activities.[2] The practice of using the UDC for classifying international organizations in its archives was in fact continued up until 1960 by the Union of International Associations.

The use of the UDC proved however to be too cumbersome for the organization of the *Yearbook of International Organizations* after its resuscitation in 1949. Between 1951 and 1965 (10th edition), organizations were grouped into some 20 subject chapters and allocated a simple filing number for indexing purposes. The number changed from edition to edition as a result of additions. Intergovernmental bodies were grouped in a separate non-subject chapter. This system proved progressively less satisfactory due to the emergence of organizations which could be usefully allocated to more than one subject chapter.

In the 11th and 12th editions the organizations were ordered alphabetically in an encyclopedia format. A systematic permanent numbering system was maintained in parallel as a development of the earlier subject division. The approach created filing problems so that, in anticipation of the conversion to computer processing, organizations were given a permanent filing number from the 13th edition (1970-71). The subject-based numbering was abandoned from the 14th edition. The original subject "chapter" division was however maintained, with some additions, until 1980, in order to ensure statistical continuity. But from the 15th edition (1974) such statistics proved increasingly suspect due to the problem of overlap between categories and despite the introduction of "secondary" classifications. It was recognized that a totally different approach would have to be used.

2. Review of other approaches to international organization classification

The Union of International Associations is obviously not the only body faced with the problem of classifying international organization activities. In searching for better approaches it is therefore important to take into account other initiatives, even if their focus is not solely concerned with international organizations.

Of greatest potential value is the **Macrothesaurus; a basic list of economic and social development terms.**[3] This was first published in 1972 by the Organisation for Economic Cooperation and Development (OECD) in collaboration with other bodies, including the FAO and the ILO. Unfortunately its value is limited by the range of subjects indicated by its sub-title. It is however adapted to computer processing and exists in a multi-lingual version. It uses a 6-digit subject code.

Also of great potential value is the initiative of the International Federation for Documentation (FID), under contract to UNESCO, to design a **Broad System of Ordering.**[4] This is known as BSO and reflects FID's experience as the agency responsible for the UDC. The BSO was intended as the basis for interconnecting information systems within the framework of the

[1] A J N Judge. Presentation of GPID integration through functional classification of international organizations. (Paper represented to 5th Network Meeting of the Goals, Processes and Indicators of Development project of the United Nations University, Montreal, 1980).
[2] Paul Otlet. Tableau de l'Organisation Internationale; organismes internationaux et activités internationales (2ème partie du Rapport général à la Conférence des associations internationales, Genève, 1924). Bruxelles, Union des Associations Internationales, 1924, 37 pages, UAI Publication Nr 114.
[3] Organisation for Economic Cooperation and Development. Macrothesaurus; a basic list of economic and social development terms. Paris, OECD, 1972.
[4] Fédération internationale de documentation. Broad System Ordering; schedule and index. The Hague/Paris, FID/UNESCO, 1978, 3rd edition.

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Intergovernmental Programme for Co-operation in the Field of Scientific and Technological Information (UNISIST). The most recent draft was published in 1978. It has met with severe criticism and is not particularly well-designed for computer processing. In addition, as might be expected from the priorities of UNISIST, the range of subjects does not respond to the detail or variety encountered in the *Yearbook of International Organizations*.

Simpler in many respects, and therefore of greater practical value, is the inter-organizational exercise within the United Nations system carried out by the Inter-Organization Board for Information Systems (IOB) with the approval of the Administrative Committee on Coordination (ACC). This resulted in the production of a list of **Broad Terms for United Nations Programmes and Activities** in 1979.[5] The 2,500 terms are grouped in 16 activity divisions defined at this stage by a 3-digit code permitting further development. The difficulty here is that the system does not appear to have been further developed and does not yet respond to the variety encountered in the *Yearbook*, especially as reflected in the concerns of nongovernmental organizations.

Also of great interest as a practical approach is the technique used by the publishers of commercial subject directories for multi-lingual users. An example is the "yellow page" directory produced for Belgian telephone subscribers. Subjects are given a 4-digit numeric code which does not however have any classificatory significance except to provide a numeric sequence. Separate indexes in English, Flemish, French and German enable users to locate each subject.

It is significant that none of the above initiatives is especially concerned with the pattern of relationships between activities or subjects. The allocation of numbers to activities is basically arbitrary. The project of Ingetraut Dahlberg, Editor of the journal *International Classification*, resulting in the production in 1981 of an **Information Coding Classification** (ICC) system,[6] therefore merits special attention in a following section. One of its advantages is the use of a 4-digit code. But one difficulty in relation to this project is that the schedule of terms has so far only been published for 3-digits, raising problems in handling other topics with which international bodies are concerned.

3. Possibilities of an alternative approach

Serious attempts were made to use several of the above schemes for the *Yearbook* in the period 1979-81, either singly or in combination. For a variety of reasons they proved impractical. The decision was therefore made to design a new scheme adapted to the specific problem of handling international organizations and their activities.

Once this decision was taken it created the opportunity of responding to many of the less apparent constraints encountered when attempting to use the above general schemes. These have been discussed in a separate paper on anti-developmental biases in thesaurus design,[7] on the occasion of a conference initiated by the Committee on Conceptual and Terminological Analysis (COCTA).

4. Preliminary design considerations

The point of departure was the system, mentioned above, developed by Ingetraut Dahlberg, following proposals first made by her in 1971. The general outline of her ICC scheme may be seen from Figure 1.

The following features of the scheme are of special interest:

a) It is based on a concern for "man's ability to perceive the world, and to construct a system of knowledge units to facilitate his understanding of the world and communication about its nature."[8]
b) It recognizes that the "structuring of man's knowledge about the world may be seen as being related to the optical levels of general, world-immanent objects by an evolutionary sequence which, however, is of a spiralling rather than of a linear nature."[9]
c) It is ordered vertically in terms of 9 optical levels associated with a progressive complexication of perceived reality:
    i. Pure forms and structures (magnitudes, proportions)
    ii. Pure matter and energy (atoms, forces, etc)
    iii. Aggregated matter in motion (cosmic bodies)
    iv. Animated, non-intelligent beings (micro-organisms, plants, animals)
    v. Animated, intelligent beings (individual human beings)
    vi. Aggregated, intelligent beings (human societies)
    vii. Material products (goods and services)
    viii. Intellectual products (documents, information)
    ix. Spiritual products (language, works of art and other meta physical works.[10] These are distinguished by the **first digit** of the ICC code.
d) It is ordered **horizontally** from the non-fundamental disciplines at each level (on the left) to those concerned with application of that knowledge (on the

[5] Inter-Organization Board for Information Systems. Broad Terms for United Nations Programmes and Activities. Geneva, United Nations, 1979.
[6] Ingetraut Dahlberg. ICC - Information coding classification; principles, structure and application possibilities. *International Classification*, 9, 1982, 2, pp 87-93. (Reprinted with 3-digit schedule in: INDEKS GmbH. Classification Systems and Thesauri, 1950-1982. Frankfurt, INDEKS Verlag, 1982).
[7] A J N Judge. Anti-developmental biases in thesaurus design. Fred W Riggs (Ed). The CONTA Conference; Proceedings of the Conference on Conceptual and Terminological Analysis in the Social Sciences (Bielefeld, 1981). Frankfurt, Indeks Verlag, 1982, pp 185-201.
[8] Ingetraut Dahlberg. Ontical Structures and Universal Classification. Bangalore, Sarada Ranganathan Endowment for Library Science, 1978, p6.
[9] idem, p7.
[10] idem, p35.

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right). These are distinguished by the second digit of the ICC code.

e) **Within** any area of the resulting matrix, a structured sequence for the system positions was applied for the repeatable arrangement of the elements of each group. These are defined as follows:
   i. General and theoretical statements (axioms, etc)
   ii. Object-related statements (elements of objects, parts, kinds of object, etc)
   iii. Activity-related statements (states and processes in objects, operations applied to them, etc)
   iv. }
   v. } Statements related to specialities of the objects and/or
   } activities concerned in 2 and 3
   vi. }
   vii. Statements on influences onto 2 and 3 from outside ("instrumental", technical relationship)
   viii. Statements on the use of 2 and 3 in other fields ("potential", resource orientation, application relationship)

   ix. Statements of the knowledge about 2 and 3 in distributing it by human beings, societies, documents, etc ("actualization", synthesizing, environmental relationship). These are distinguished by the **third** digit of the ICC code.

Dahlberg has elaborated, published and applied the scheme[11] using three digits (some 700 classes) and hopes to publish a more extended **four**-digit version (some 7000 classes).[12]

If the four-digit version had been available when the editors were considering a new classification system for the *Yearbook*, it is probable that it would have been used to design the coding system for international organizations. In experimenting with the various possibilities however it became apparent that there was a basic awkwardness and bias in making all the preoccupations of such bodies subservient to "knowledge" of "objects". This problem is particularly striking when a social reality like "homelessness" is classified under an intellectual discipline, namely "sociology", as in the case of the *UNESCO Thesaurus*.[13] Similarly a value and condition of fundamental importance like "peace" is classified under an intellectual discipline such as "political science", or, again, "friendship", "love" and "hatred" are classified under "psychology". Positioning values, conditions and forms of praxis in this way can be seen as reinforcing the dominance of the knowledge function during a period when the international community recognizes a need to enhance action, the "will to change", as well as the emergence of new values. Many organizations perceive themselves as concerned with praxis and do not relate directly to the intellectual disciplines by which their actions are supposedly governed according to university faculties.

In the light of the ICC scheme the question then became one of de-emphasizing this bias in favour of knowledge, whilst at the same time respecting the concerns reflected in the ordering of the matrix. One criterion of an interesting matrix, for example, would be the possibility of mapping onto it at different locations the various agencies and institutions required for the "operation" of a country or the world (e.g. various government ministries, hospitals, factories, farms, airports, military bases, etc). In this way the matrix would become a tool reflecting **operational reality** to a greater degree, rather than responding primarily to the difficulties of designing information retrieval systems to facilitate research and the generation of further knowledge.

Another valuable feature of such a matrix would result from ensuring that it told a **developmental "story"**. This feature is to some extent present in the ICC matrix in that the "lower" optical levels reflect the earlier phases in an evolutionary process, whilst the "higher" levels reflect the relatively recent phases of civilization. But it is possible that a more interesting developmental story (or stories) could be embedded in the structure of the matrix. This would be especially valuable if it highlighted the stages at which different functions emerged in society (e.g. social organization, mutual care, shelter, artefact construction, etc). As argued in an earlier paper,[14] this implies a dynamic **emphasis on processes** in contrast to the conventional static emphasis in classification schemes on states and objects. A number of authors are now arguing against the insidious effects of static (Euclidean, Newtonian, Cartesian) descriptions of reality as favoured by the "Western" mode of thought.[15] [16] [17] It can certainly be argued that this emphasis undermines a dynamic approach to development.[18]

Clearly the above features would emphasize the "interweaving" of the cells of the matrix. This approach is to be contrasted with the practice adopted in the design of many thesauri. So little attention is devoted to the relationship between major classes that it is easy to get the impression that any such relationship is totally arbitrary - isolated subject clusters ("science", "religion", "art", "commerce", etc) denoted by digits from 1 to 9, etc. The "lumping" of **major** classes together in this way does not appear to have changed significantly throughout the history of classification schemes from 1200 BC to the recent initiatives of the intergovernmental community.[19] It is not difficult to argue that it is this arbitrariness which deprives the pattern of classes of any

[11] Dahlberg. ICC - Information coding classification; principles, structure and application possibilities.
[12] Stored in machine readable form (for up to 6 digits), but at the time of writing (November 1983) not available in printed form.
[13] Jean Aitchison (Comp.) Unesco Thesaurus; a structured list of descriptors for indexing and retrieving literature in the fields of education, science, social science, culture and communication. Paris, UNESCO, 1977, 2 vols.
[14] Judge. Anti-developmental biases in thesaurus design.
[15] David Bohm. Wholeness and the implicate Order. London, Routledge and Kegan Paul, 1980.
[16] Fritjof Capra. Turning Point. New York, Simon and Schusier, 1982.
[17] Magoroh Maruyama. Mindscapes, social patterns and future development of scientific theory types. *Cybernetica*, 23, 1980, 1, pp 5-25 (see also earlier papers in the same journal).
[18] Judge. Anti-developmental biases in thesaurus design.
[19] E I Samurin. Geschichte der bibliothekarisch-bibliographischen Klassifikation. München, Verlag Dokumentation (now Saur Verlag), 1977.

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Figure 1. Matrix organization of subject fields
(Reproduced from I Dahlberg, ICC – Information Coding Classification)

AREAS	1	2	3	4	5	6	7	8	9
1 FORM & STRUCTURE AREA	11 Logic	12 Mathematics	13 Statistics	14 Systemology	15 Organization	16 Metrology	17 Cybernetics (Controlled & Automatic)	18 Standardiza-tion	19 Testing & monitoring
2 ENERGY & MATTER AREA	21 Mechanics	22 Physics of matter	23 General & technical physics	24 Electronics	25 Physical chemistry	26 Pure chemistry	27 Chemical technology & engineering	28 Energy science & technology	29 Electrical engineering
3 COSMO & GEO-AREA	31 Astronomy & astro-physics	32 Astronautics & space research	33 Basic geo-sciences	34 Atmospheric sciences & technology	35 Hydrosphere & oceanology science & tech.	36 Geological sciences	37 Mining	38 Materials science & metallurgy	39 Geography
4 BIO-AREA	41 Basic biological sciences	42 Microbiology & cultivation	43 Plant biology & cultivation	44 Animal biology & breeding	45 Veterinary breeding	46 Agriculture & horticulture	47 Forestry & wood sciences & technology	48 Food science & technology	49 Ecology & environment
5 HUMAN AREA	51 Human biology	52 Health & theoretical medicine	53 Pathology & medicine	54 Clinical medicine & cure	55 Psychology	56 Education	57 Profession, labour, leisure	58 Sports	59 Household & home-life
6 SOCIO-AREA	61 Sociology	62 State & politics	63 Public administration	64 Money & finance	65 Social aid, social politics	66 Law	67 Area planning, urbanism	68 Military science & technology	69 History
7 ECONOMICS & TECHNO-LOGY AREA	71 General & national economics	72 Business economics	73 Technology in general	74 Mechanical & precision engineering	75 Building	76 Commodity science & technology	77 Vehicle science & technology	78 Transport technology & services	79 Utilities & service economics
8 SCIENCE & INFORMA-TION AREA	81 Science of science	82 Information sciences	83 Informatics, computer sciences	84 Information in general	85 Communica-tion science	86 Mass-communica-tion	87 Printing & publishing	88 Communica-tion engineering	89 Semiotics
9 CULTURE AREA	91 Language & linguistics	92 Literature & philology	93 Music & musicology	94 Fine arts	95 Performing arts	96 Culture sciences	97 Philosophy	98 Religion & secret teachings	99 Christian religion

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significance as a whole. As such it reinforces the fragmentation of society which many authors have deplored, as well as undermining any efforts towards an "integrated", "interdisciplinary" or "holistic" pattern of action.[20]

5. Insights from periodic classification

As a guide to further insights for the design of a more interesting solution, what appeared to be required was some matrix-type model incorporating developmental features reflecting the emergence of a series of qualities organized into corresponding "groups" at a succession of "levels". The richest conceptual scheme of this kind appears to be the periodic table of (chemical) elements. The possibility of generalizing this periodic system seems first to have been explored by Edward Haskell.[21] Inherent in such a scheme are many interdependency relationships. Furthermore, in comparing J W van Spronsen's history of the development of the periodic classification system[22] with that of Samurin's history of the development of the classification of knowledge in general,[23] it is possible to conclude that a scheme such as that of Dahlberg corresponds in structure to the penultimate development phase prior to the emergence of the fully fledged periodic system. Many conventional classification schemes correspond however to much earlier phases in this development with only rudimentary relationships between major classes. In considering the possibility of such a fully-fledged periodic system, it is useful to bear in mind the following remark by A J Ihde in the foreword to van Spronsen's survey:

"Facts soon reach a point where they become less and less manageable unless an attractive and meaningful system of classification is brought into being... Equally important is the role of tools in science...

It is frequently not recognized that tools may be conceptual as well as physical... The Periodic System has fulfilled both of these roles. It has served as a classificatory device but it has contributed much more than mere classification. It has been a conceptual tool which has predicted new elements, predicted

[20] Bohm, op cit.
[21] Edward F Haskell. Generalization of the structure of Mendeleev's periodic table. In: E Haskell (Ed.), Full Circle; the moral force of unified science. New York, Gordon and Breach, 1972, pp 21-87.
[22] J W van Spronsen. The Periodic System of Chemical Elements; a history of the first hundred years. Amsterdam, Elsevier, 1969.
[23] Union of International Associations/Mankind 2000. Yearbook of World Problems and Human Potential. Brussels, UAI/Mankind 2000, 1976. See also: Union of International Associations. Encyclopedia of World Problems and Human Potential. München, K G Saur Verlag, 1986, 2nd edition.

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unrecognized relationships, served as a corrective device, and fulfilled a unique role as a memory and organization device. The periodic table has contained an innate flexibility which has prevented it from becoming frozen into a rigid structure. It lends itself to a large variety of forms. Although many of these are unique only as schemes representative of the author's originality, certain forms have unique value in bringing out particular relationships." [24]

On this last point it is striking to compare the range of experiments with spirals, tables, circles, cones, cylinders and other figures (see Figure 2) in portraying the classification of elements[25] against the seemingly universal preoccupation with simply structured lists in the case of the classification of knowledge.[26] In this sense the Dahlberg scheme is indeed an exception. To clarify the discussion it is useful to note how one frequent form of the periodic table (Figure 3) can also be presented in another way (Figure 4) which resembles more closely Dahlberg's ICC scheme. The "groups" of chemical elements then tend to appear in columns, analogous to those denoted by the ICC second digit. The transformation from Figure 3 to Figure 4 clarifies the distinction between two "sub-groups". This is even clearer in a circular form of the table (Figure 5).

B. DESIGN CONSIDERATIONS

The design envisaged was perceived as a compromise between three major "orientations": production of a practical classified directory; facilitation of experiments on classifications to develop improved versions; and an emphasis on incorporating richer patterns of relationships between activities to facilitate understanding of functional integration. These are detailed separately below.

1. Practical orientation

In the light of the above survey, the factors affecting the design of a practical system may be summarized as follows:

a) it should respond to the progressive increase in number of organizations with multi-subject concerns;
b) it should meet the need for a relatively simple classification scheme;
b) it should facilitate incorporation of changes in organizational activities with the emergence of new issues (environment, energy, etc);
c) it should avoid the production delays associated with conventional methods of classification, particularly with increasing numbers of organizations and with the change in their concerns;
d) in order to facilitate solutions to the above problems, it should use an approach which could be assisted by computer techniques as much as possible;
e) finally, and perhaps of greatest importance, it should result in the production of a practical directory which avoids confronting the average user with levels of significance or complication not required, even though these features may be present for those who wish to benefit from them.

2. Experimental orientation

In contrast to most current classification systems, the design should facilitate classification experiments in the light of the following factors:

f) it was not intended to produce immediately a "definitive" classification scheme for international organization activities;
g) it was expected that different approaches will be explored from edition to edition, possibly with several approaches in one edition;
h) the position of classes or sub-classes in any one matrix pattern might be adjusted between editions in the light of the results to which it gave rise when tested on the range of international organization activities;
i) it was expected that refinements to the computer programmes used would lead to more valuable versions of the scheme;
j) the flexibility necessary for such an experimental approach should be achieved by computer-assisted methods of reclassifying the complete range of organizations whenever a new version of the scheme is required;
k) as an experimental system, risks would necessarily be taken which might give rise to errors, but every effort would be made to minimize their significance for users interested only in the practical value of a given classification scheme.

3. Pattern building orientation

It is hoped that experiments in classifying international organization activities will be carried out to highlight significant patterns of relationships between them in the light of the following factors:

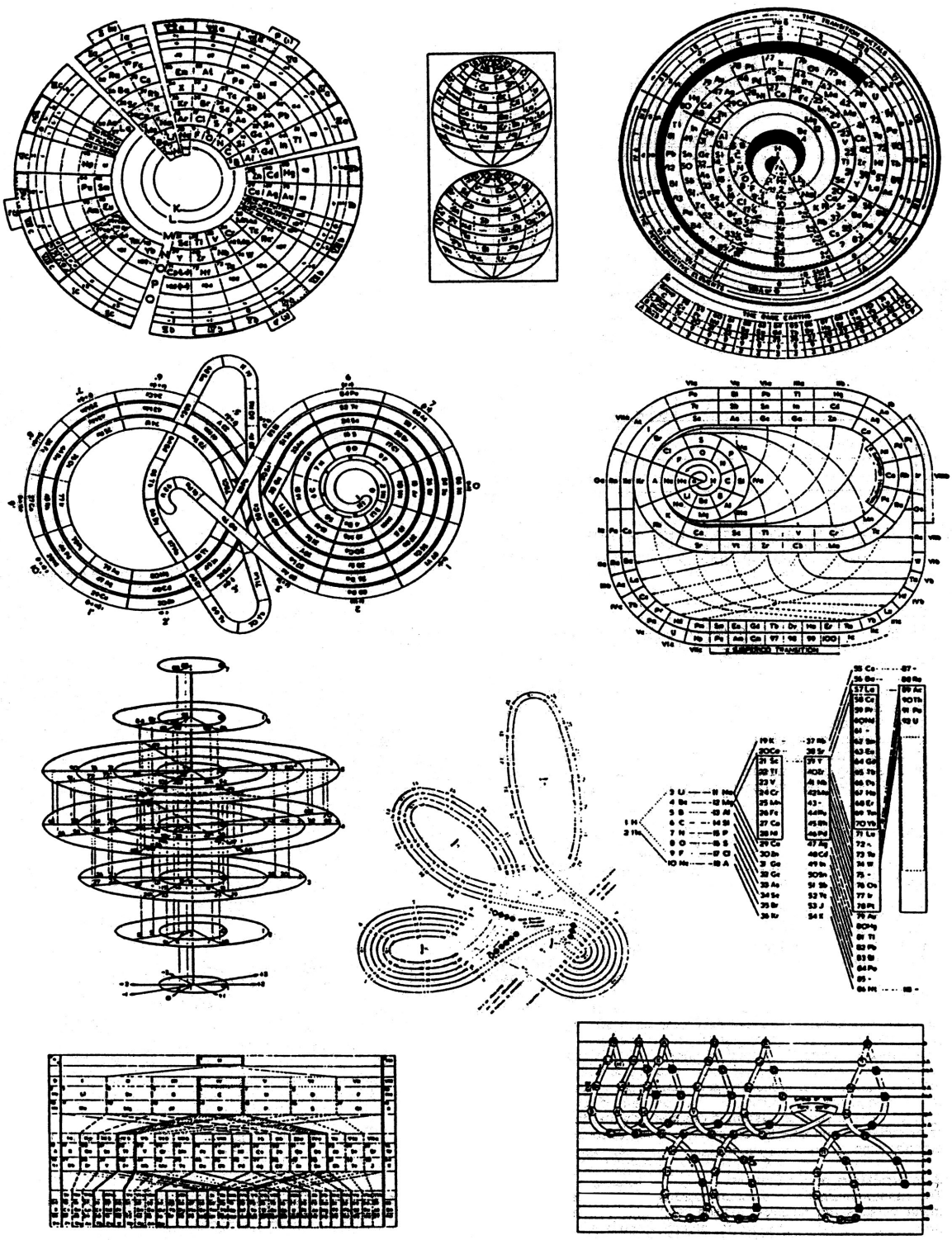
a) an emphasis less on possible bilateral relationships between any two subject areas (e.g. medicine and sport) as on portraying the complete range of classes in some functionally meaningful pattern of relevance to organization activities;
b) the intention to explore ways of ordering the classes within as many simultaneously interweaving patterns as proves feasible;

in developing such patterns a major constraint is that of maintaining and improving the comprehensibility of any such scheme.

[24] Dahlberg. ICC - Information coding classification; principles, structure and application possibillities. p ix.
[25] van Spronsen, op cit.
[26] Samurin, op cit.

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Figure 2. Examples of past attempts to present the periodic classification of chemical elements
(Reproduced from J W van Spronsen, The Periodic System of Chemical Elements)



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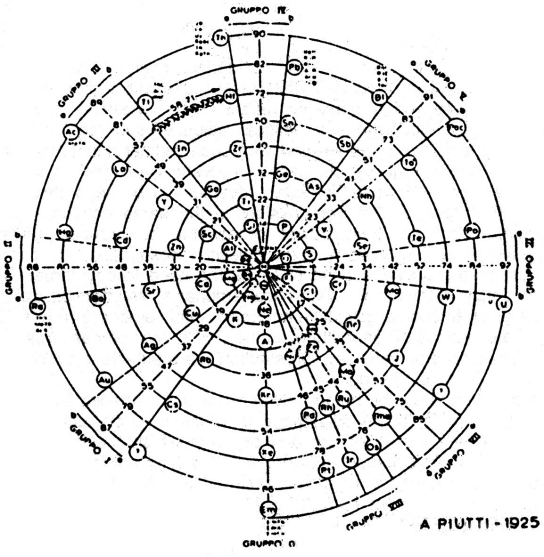
Figure 3. Conventional presentation of periodic table of chemical elements
(inverted and with "lanthanides", 58-71, and "actinides", 90-103, not shown)

$7a^1$ Fr 87	$7a^2$ Ra 88	$6d^1$ Ac 89	104														
$6a^1$ Cs 58	$6a^2$ Ba 56	$5d^1$ La 57	$5d^2$ Hf 72	$5d^3$ Ta 73	$5d^4$ W 74	$5d^5$ Re 75	$5d^6$ Os 76	$5d^7$ Ir 77	$5d^9$ Pt 78	$5d^{10}$ Au 79	$5d^{10}$ Hg 80	$6p^1$ Tl 81	$6p^2$ Pb 82	$6p^3$ Bi 83	$6p^4$ Po 84	$5p^5$ At 85	$6p^6$ Rn 86
$5a^1$ Rb 37	$5a^2$ Sr 38	$4d^1$ Y 39	$4d^2$ Zr 40	$4d^4$ Nb 41	$4d^5$ Mo 42	$4d^5$ Tc 43	$4d^7$ Ru 44	$4d^9$ Rh 45	$4d^{10}$ Pd 46	$4d^{10}$ Ag 47	$4d^{10}$ Cd 48	$5p^1$ In 49	$5p^2$ Sn 50	$5p^3$ Sb 51	$5p^4$ Te 52	$5p^5$ I 53	$5p^6$ Xe 54
$4a^1$ K 19	$4a^2$ Ca 20	$3d^1$ Sc 21	$3d^2$ Ti 22	$3d^3$ V 23	$3d^5$ Cr 24	$3d^5$ Mn 25	$3d^6$ Fe 26	$3d^7$ Co 27	$3d^8$ Ni 28	$3d^{10}$ Cu 29	$3d^{10}$ Zn 30	$4p^1$ Ga 31	$4p^2$ Ge 32	$4p^3$ As 33	$4p^4$ Se 34	$4p^5$ Br 35	$4p^6$ Kr 36
$3a^1$ Na 11	$3a^2$ Mg 12											$3p^1$ Al 13	$3p^2$ Si 14	$3p^3$ P 15	$3p^4$ S 16	$3p^5$ Cl 17	$3p^5$ Ar 18
$2a^1$ Li 3	$2a^2$ Be 4											$2p^1$ B 5	$2p^2$ C 6	$2p^3$ N 7	$2p^4$ O 8	$2p^5$ F 9	$2p^5$ Ne 10
$1a^1$ H 1	$1a^2$ He 2	◄															$1a^2$ He 2

Figure 4. Alternative presentation of periodic table of elements, highlighting chemical groups
("lanthanides" and "actinides" not shown)

a	$7a^1$ Fr 87	$7a^2$ Ra 88	$6d^1$ Ac 89	104						
b	$5d^{10}$ Au 79	$5d^{10}$ Hg 80	$6p^1$ Tl 81	$6p^2$ Pb 82	$6p^3$ Bi 83	$6p^4$ Po 84	$5p^5$ At 85			$6p^6$ Rn 86
a	$6a^1$ Cs 58	$6a^2$ Ba 56	$5d^1$ La 57	$5d^2$ Hf 72	$5d^3$ Ta 73	$5d^4$ W 74	$5d^5$ Re 75	$5d^6$ Os 76	$5d^7$ Ir 77	$5d^9$ Pt 78
b	$4d^{10}$ Ag 47	$4d^{10}$ Cd 48	$5p^1$ In 49	$5p^2$ Sn 50	$5p^3$ Sb 51	$5p^4$ Te 52	$5p^5$ I 53			$5p^6$ Xe 54
a	$5a^1$ Rb 37	$5a^2$ Sr 38	$4d^1$ Y 39	$4d^2$ Zr 40	$4d^4$ Nb 41	$4d^5$ Mo 42	$4d^5$ Tc 43	$4d^7$ Ru 44	$4d^9$ Rh 45	$4d^{10}$ Pd 46
b	$3d^{10}$ Cu 29	$3d^{10}$ Zn 30	$4p^1$ Ga 31	$4p^2$ Ge 32	$4p^3$ As 33	$4p^4$ Se 34	$4p^5$ Br 35			$4p^6$ Kr 36
a	$4a^1$ K 19	$4a^2$ Ca 20	$3d^1$ Sc 21	$3d^2$ Ti 22	$3d^3$ V 23	$3d^5$ Cr 24	$3d^5$ Mn 25	$3d^6$ Fe 26	$3d^7$ Co 27	$3d^8$ Ni 28
	$3a^1$ Na 11	$3a^2$ Mg 12	$3p^1$ Al 13	$3p^2$ Si 14	$3p^3$ P 15	$3p^4$ S 16	$3p^5$ Cl 17			$3p^6$ Ar 18
	$2a^1$ Li 3	$2a^2$ Be 4	$2p^1$ B 5	$2p^2$ C 6	$2p^3$ N 7	$2p^4$ O 8	$2p^5$ F 9			$2p^6$ Ne 10
	$1a^1$ H 1	$1a^2$ He 2	◄							$1a^2$ He 2
Chemical groups	1	2	3	4	5	6	7	8		0

Figure 5. Circular presentation of periodic table of chemical elements
(Reproduced from A Piutti 1925)



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C. DESIGN PROCEDURE

The current procedure resulted from design interaction between the following steps or approaches.

1. Activity word list

Since the preoccupation of international organizations extends beyond the ranges of the specialized thesauri noted above, one point of departure was to extract (by computer) all significant keywords from the names of organizations listed in the current edition of the *Yearbook of International Organizations*. To these were then added words extracted from the multi-disciplinary publication, *Encyclopedia of World Problems and Human Potential*,[27] resulting, after suppression of prepositions and other non-essential words, in a total of some 20,000 words, including 1,000 word pairs (see below, "Procedural revision"). A particular merit of this list is its comprehensive coverage of active concerns of the international community, whether problem, discipline or value oriented. The computer system is designed so that this list can be re-extracted at any time to capture new words associated with new organizations or preoccupations.

2. Interrelating major classes

The various international thesauri noted above were used to isolate major classes (e.g. science, religion, etc) which have traditionally proved to be a practical basis for grouping concepts. Particular attention was however paid to "awkward" classes which did not fit naturally into such groupings (e.g. standardization, design, and systemology are treated as "general" or "interdisciplinary" classes in the case of the *Unesco Thesaurus*). Also of interest were classes that had for convenience been forced within other classes even though they represented a relatively distinct concern.

3. Elaborating a matrix of distinctions

Using the major classes derived above in the light of the variety reflected in the extracted word list, considerable time was spent in juggling items into some sort of matrix form. This process, as an exercise in design, was very much a blend of science and art as described in Christopher Alexander's *Synthesis of Form*.[28] The matrix was not perceived as being a purely logical clustering of fields of knowledge but rather a pattern of activity domains in which the degree and quality of objectivity varied. Constraining factors that emerged as useful in this process include the following:

a) The avoidance of entrapment in a purely linear sequence by somehow including a non-linear patterning feature. This was achieved by considering neighbouring columns and rows of the matrix as functional complements of a mutually counterbalancing nature, rather than simply as members of a logically defined set.
b) The perception of matrix cells as representing functional domains of which only some might have a cognitive emphasis. The words that can currently be placed "in" such a "semantic cell" do not therefore necessarily exhaust the meaning that may come to be associated with that cell. The words are indicators of significance but they do not delimit it.
c) Following Dahlberg's approach, the use of rows of the matrix to distinguish different functional "levels". The order is then such that the "lower" or more fundamental levels must first "emerge" prior to the "higher" levels for which they provide a foundation. The succession of levels thus constitutes a developmental sequence.
d) At any given level, the representation by the cells of the row in question of a set of interdependent functional domains whose interaction is essential to the stability of that level, in effect the expression of one evokes the expression of the others.
e) The ordering of the cells of the matrix, in the light of the previous points, to go some way towards reflecting the attitudes and behaviour of those associated with them as in: the "pecking order" of the sciences; the "non-scientific" nature of certain domains; the less "concretisable" characteristics of some domains.
f) When appropriate, the ordering of the cells to reflect the order of "emergence" of functions, either as they become explicit in a community (in roles or programmes, for example) or as they can be explained in the stages of some coherent educational programme.
g) In contrast with the usual practice in classification schemes, the avoidance of grouping everything associated with a given subject into a class that primarily reflects the expression of some intellectual discipline (e.g. political science, sociology). When appropriate, words associated with such distinct orientations as social praxis, material conditions, theoretical approaches, value expression and modes of awareness should be separated into different levels, although possibly in the same column. Thus "love", and "sex" would not necessarily be grouped under "psychology" (as is done in the *Unesco Thesaurus*).
h) Just as the previous point stresses the need to counteract the tendency in favour of a theoretical emphasis, so attention would be given to counteracting an anthropocentric emphasis (e.g. "fish" as a sub-class of "agriculture" in the *OECD Macrothesaurus*) or a legalistic emphasis (e.g. "prostitution" as a sub-class of "crime" in the *Unesco Thesaurus*).
i) Distinction would be made between levels constrained by nature or patterns of behaviour, those at which category boundaries were called into question, and those at which the initiation of change or development was emphasized. This offers a means of separating functions concerned with analyzing or reacting to the human environment from those concerned with various forms of development, whether individual or social.
j) With regard to the levels related to social praxis, the cells would each be associated with characteristic institutional features of society such as: government ministries or portfolios (in simpler and more developed administrations), university faculties and functionally specific buildings (e.g. hospital, factory, military base, school, laboratory, etc).
k) The size of the matrix needs to be constrained by its comprehensibility, as determined by human difficulty in dealing with more than approximately seven

[27] Union of International Associations. Encyclopedia of World Problems and Human Potential. München, K G Saur Verlag, 1986, 2nd edition.
[28] Christopher Alexander. Notes on the Synthesis of Form. Cambridge, Harvard University Press, 1964.

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categories unless extensive patterning features are incorporated as mnemonic coding devices.[29] There is an obvious practical advantage in computer processing if the cells can be defined in terms of the decimal system, as in the case of Dahlberg's proposal.

l) Although the pattern of matrix cells is conceived as being complete, the representation of the content of those cells should be open to continuing development. Thus the range of words reflecting the significance of each such cell may change (aside from the possibility that words may be allocated to more appropriate cells). In particular the cells corresponding to more existential or value-related concerns should be open to future clarification (possibly in the light of the very extensive Eastern reflection on such categories). As noted earlier, it is the words signifying dimensions awkward to associate with the earlier cells which raise the possibility that they should be associated with some other cell to which few words have been previously allocated. In this sense, it is the "earlier" portion of the matrix which is "complete", whereas the open-endedness is primarily associated with the "higher" levels.

The process of distinguishing qualitative attributes and their analogies to one another bears an interesting resemblance to the documented history of the manner in which chemical elements were slowly juggled into a meaningful periodic pattern.[30] As in that case, part of the problem lies in the fact that words often refer to qualitative "compounds" of two or more elements although the distinction between an element and a compound may well be unclear.

D. FUNCTIONAL SELF-ORGANIZATION

With the switch in emphasis from pure classification to one in which functional relationships are to be highlighted, it is clear that any resultant matrix can usefully be compared with models of human social systems. One of the most interesting theoretical explorations of this kind is the investigation of Erich Jantsch as reflected in three volumes.[31] [32] [33] The special merit of his approach is that it developed from an initial involvement in management, planning, systems and the policy sciences, subsequently to include non-dualistic insights and recognition of the significance of hemispheric specialization of the brain. In his final work,[34] he provides a scientific foundation for a new world view which emphasizes process over structure, non-equilibrium over equilibrium, evolution over permanency, and individual creativity over collective stabilization.

Of special relevance is his elaboration of a number of tabular presentations that distinguish levels in a manner similar to that advocated here. For example, one table concerns "Multi-level planning in relation to a multi-level reality" in which the levels of planning correspond to different time horizons and different levels of logic and system paradigms. The five levels he distinguishes are: resources, products and services, social functions, policy and values.[35] In an earlier book he has tables organized in terms of areas of "basic human experience", namely what we: are, feel, perceive, know, want, conceive and can do.[36] Information from these tables has been combined into a modified presentation (see Figure 6).

Jantsch stresses the significance of the new area of systems thinking concerned with "self-organization" of human systems. In effect his tabular presentations may be considered as self-organizing patterns of functions. In the presentations in his books special stress is laid on the relationships between the elements of the table through feedback loops. It is in this light that it is valuable to explore the organization of the matrix discussed here. The emergence of classes in the matrix is in this sense an organic response to the macro-organization of the pattern. The process whereby major classes of functions emerge (e.g. "science", "education", etc) in society is then a conceptual equivalent to "macron" patterning, as described by Ralph Abraham in one of Jantsch's books.[37] Such new order emerges through fluctuation, and it is on the basis of such fluctuation that the system evolves. One of Jantsch's most important contributions is to draw attention to the relevance for social systems of Ilya Prigogine's investigations into this phenomenon.[38] It is for this reason that it is considered desirable to build an element of fluctuation or alternation into the matrix pattern on which the classification is based.[39] [40]

[29] A J N Judge. Representation, comprehension and communication of sets; the role of number. *International Classification*, 5, 1978, 3, pp 126-133; 6, 1979, 1 pp 16-25; 6, 1979, 2 pp 92-103 (Also University HSDRGPID-22/UNUP-133, 1980).
[30] van Spronsen, op cit.
[31] Erich Jantsch. Design for Evolution; self-organization and planning in the life of human systems. New York, Braziller, 1975.
[32] Erich Jantsch and Conrad H Waddington (Eds). Evolution and Consciousness; human systems in transition. Reading, Addison-Wesley, 1976.
[33] Erich Jantsch. The Self-Organizing Universe; scientific and human implications of the emerging paradigm of evolution. Oxford, Pergamon, 1980.
[34] idem.
[35] idem, p268.
[36] Jantsch. Design for Evolution; self-organization and planning in the life of human systems. p235.
[37] Ralph Abraham. Vibrations and the realization of form. Quoted in: Alexander. Notes on the Synthesis of Form. pp 134-149.
[38] Ilya Prigogine. Order through fluctuation; self-organization and social systems. Quoted in: Bohm, op cit. (See also: From Being to Becoming; time and complexity in the physical sciences. San Francisco, Freeman, 1980).
[39] A J N Judge. Alternation between development modes; reinforcing dynamic conception through functional classification of international organizations. *Transnational Associations*, 34, 1982, 5, pp 339-349. (Paper originally prepared for a meeting of Integrative Group B of the Goals, Processes and Indicators of Development project of the United Nations University, Athens, 1982).
[40] A J N Judge. Development through Alternation. Brussels, Union of International Associations, 1983, 173 p (Augmented version of a paper originally prepared for Integrative Group B of the Goals, Processes and Indicators of Development project of the United Nations University,Colombo, 1982).

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Figure 6. A presentation of inter-relationships of different levels of inquiry and modes of experience
(Adapted from tables of Erich Jantsch, *Design for Evolution*)

		Rational level of perception/inquiry			Mythological level of perception/inquiry			Evolutionary level of perception/inquiry		
Spiritual space	Policies	Iconological determination			Imagination, creativity			Objective will, love		
	Design concepts	Regulation, centering			Learning, hope			Paradigms (religions, ideologies)		
	Norms	Regularities			Values			Purpose, faith		
Social space	Policies	Social control, governmental			Participation, subjective will			Union, sharing		
	Design concepts	Behaviour, system forces			Role-playing expectations			Normative ethics		
	Norms	Behavioural patterns			Individual ethics			Ethics of whole systems		
Physical space	Policies	Physical control			Environmental quality			Continuity of life		
	Design concepts	Predictability			Interaction, possession			Harmony, aesthetics		
	Norms	Measure			Quality, wholeness			Oneness		
		Right-brain	Integrated	Left-brain	Right-brain	Integrated	Left-brain	Right-brain	Integrated	Left-brain
Basic experience ("What we...")	Are	Creative (Being)	Self (Becoming)	Ego (Doing)	Drifting	Cybernetic actor	Homo Faber	Empty channel	Evolutionary agent	Rebel (Prometheus)
	Feel	Instinct (Grounded-ness)	Continuation (Beauty)	Intellect (Mobility)	Compassion	Communication (Morality)	Rectitude	Eros	Communion (Truth)	Logos
	Perceive	Contents	Change	Form (Measure)	Gestalt (Quality)	Process	Structure	Attraction	Order of process (Evolution)	System
	Know	Viability	Efficiency (Know-how)	Utility	Dynamic forces	Goals (Know what)	Connections	Flow, change of regime	Purpose (Know where-to)	Defined regime
	Want	Basic drives (Needs)	Possession (Static security)	Achievement of targets	Non-attachment	Expectations	Demands	Self-abandonment	Hope (Dynamic security)	Clarity
	Conceive	Conservation	Force (Replacement)	Progress	Adaptation	Roles	Investment	Finding	Syntony (Tuning-in)	Invention
	Can do	Instinctual response	Behaviour (Learned response)	Leverage (Technology)	Receptivity	Action	Creativity	Inactivism (Man of Tao)	Regulation (Control of powers)	Activism (Don Quixote)

E. IMPLEMENTATION

1. Matrix (1983-85)

As stressed above the classification is designed to be modified. For the 1983-85 editions the design can best be described in terms of the classification matrix and specifically in terms of the definition of its "semantic cells" on the basis of the levels (rows) and columns in Figure 7. As pointed out above, the choice of levels, columns and cells resulted from an iterative process aimed at ensuring an interesting and functionally meaningful balance within the pattern as a whole. As pointed out in an earlier paper, [41] this process could perhaps be best described as analogous to "tuning" a "semantic piano". Clearly different tuning systems are possible, none of which balances qualities in a totally satisfactory manner. This problem of balance and tuning has been highlighted elsewhere[42] [43] in an attempt to reconcile the qualitative results, from different cultures, of exercises in classifying the same range of attributes into 1,2,3,... or N categories.[44] The situation here is of course complicated by the heterogeneous nature of this approach.

It is for this reason that the level and column headings should be considered as tentative indications of dimensions that it seemed valuable to distinguish. Similarly the terms attached to individual "semantic cells" of the matrix were selected as recognizable common terms indicative of some percentage of the significance to be associated with each such cell. At this stage no attempt was made to modify the discipline-oriented terms conventionally used for many common subject areas. The consequence is that the lower half of the table, at least, has familiarly named major classes.

General structure

Before discussing the structure in more detail it is appropriate to note a general structuring device which was used. As pointed out above in discussing the work of Jantsch, there would appear to be value in attempting to "capture" some aspects of the alternation on which the organization of self-organizing systems is based. It provides a means of acknowledging the functional reality of the operational hostility frequently experienced by those concerned with "mutually irrelevant" functional

[41] A J N Judge. Networking alternation. *Transnational Associations*, 35, 1983, 4, pp 172-181.
[42] A J N Judge. Patterns of N-foldness; comparison of integrated multi-set concept schemes as forms of presentation. (Paper for meetings on Forms of Presentation of the Goals, Processes and Indicators of Development project of the United Nations University, Geneva, 1980). Quoted in: Judge. Patterns of Conceptual Integration.
[43] A J N Judge. Beyond method; engaging opposition in psycho-social organization (Paper for Methodology Meeting of the Goals, Processes and Indicators of Development project of the United Nations University, Bucharest, 1981). Quoted in: Judge. Patterns of Conceptual Integration.
[44] A J N Judge. Patterns of Conceptual Integration. Brussels, Union of International Associations, 1984.

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domains (e.g. science, religion, commerce), whether as expressed in relations between international agencies, between university faculties or between their departments.[45] This phenomenon is also reflected in the manner in which categories may be conceived or perceived. For example, current investigations are demonstrating the complementary roles of modes of perception associated with the right and left hemispheres of the brain.[46] These can be linked to such dichotomies as qualitative/quantitative, art/science, "soft"/"hard", image/text, context/structure and process/stasis.

Levels 0-7 and columns 1-8 were therefore organized in an alternating manner to reflect the extremes of these dichotomies. In levels 8-9 and column 9, areas were reserved for the "transcendence" of these dichotomies. Where the row and column dichotomies do however "interact", cells of three distinct types were defined: quantitative/quantitative (crossed cells), qualitative/qualitative (circled cells), and quantitative/qualitative (unmarked cells). The resulting pattern is an interesting first approximation, especially when the crossed cells are seen as primarily associated with well-defined categories and text, whilst the circled cells are seen as primarily associated with fluidly defined categories and imagery. The unmarked cells are then associated with a blend of art and science (e.g. design, artefact production by industry, or technology as a useful art).

Level (row) structure

The levels may first be considered in pairs as: nature (0-1), praxis (2-3), theory (4-5), developmental principles (6-7), and existential experience (8-9). Here "nature" is split into the physical sciences and the biosphere. "Theory" and "developmental principles" may also be grouped as the "noosphere". This approach has the merit of preventing innovative change and development from being obscured and denatured by including them under descriptive sciences and theory. It also provides space for the values and experiential conditions in the name of which change is proposed and implemented, rather that disguising them as the subject matter of psychology or philosophy.

Levels 0-3 constitute the "material world", its description, and the more concrete forms of action in society. Levels 4-7 provide space for the reflections and interpretations of those acting in the "material world", whereas levels 8-9 provide space for experience in its own right. As such it is the least tangible but the most intimate, figuring in much of the current debate on human values and non-material human needs. [47]
Levels 0-1 are also associated with the natural sciences and as such figure prominently in university departments. Levels 2-3 may be directly related to government agencies, public services and institutions. Levels 4-5 correspond to the "soft sciences" whose subject matter tends to be defined rather than given. It is at levels 6-7 that new directions of social change are defined.

The reservation of cells in levels 8-9 for values and conditions of awareness must necessarily be considered extremely tentative given the lack of attention to the problems of classifying experiences in their own right.

Column structure

The columns may also be first considered in pairs in terms of a possible set of (social) patterning implications: establishment and consolidation (1-2), maintenance and appreciation (3-4), adaptation and propagation (5-6), and innovation and exploitation (7-8). Column 9 is concerned with the resulting symmetry or imbalance. Column 0 is used for formal concepts calling for qualifiers.

Taken singly the columns may be tentatively described as follows: domain definition (1), organized relations (2), differentiated order (3), contextual renewal (4), controlled movement (5), communication reinforcement (6), redistribution of resources (7), and environmental manipulation (8). Needless to say, such descriptions are indicative rather than exhaustive.

Individual cells

In the matrix some cells call for special comment:

Fundamental sciences (00): The special situation of the "fundamental sciences", including mathematics, physics and chemistry, can be usefully modelled by the peculiar situation at the beginning of the periodic table of chemical elements (see Figure 3 and Figure 4). Without stressing the resemblance, special status has been given here to "00" treating it as a kind of formal precondition or "pre-level". Within it are to be found the fundamentals of relationship (as partly reflected in mathematics) and of matter (as partly reflected in physics and chemistry).

Society (21): This is distinguished from sociology (41) to separate the function of reflection about society from the entities acting within society. Note that such a separation is not called for with respect to levels 0 and 1, in which the subjects of attention are to a much greater extent taken as given.

Health care (32): Treatment in general, and its necessary infrastructure, is distinguished from the analysis of disease under medicine (18).

Societal problems (29): This is used to group problems of imbalance in the functioning of society, including crimes and disasters. It also includes preventive measures such as safety and hygiene.

[45] Judge. Beyond method; engaging opposition in psycho-social organization.
[46] P Perron (Ed). The Neurological Basis of Signs in Communication Processes (Proceedings of a symposium). Toronto, Victoria University (Toronto Semiotic Circle, Monographs, 1981, 2-3).
[47] Katrin Lederer (Ed). Human Needs; a contribution to the current debate. Koningstein, Verlag Anton Hain, 1980. (Proceedings of a sub-group of the Goals, Processes and Indicators of Development project of the United Nations University).

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Figure 7. Integrative matrix of human preoccupations

Experimental subject configuration for the exploration of interdisciplinary relationships between organizations, problems, strategies, values and human development

	Cosmo-, Geo-, Hydro-, Atmo-sphere	Biosphere	Socio-techosphere		Noosphere				Existential experience
	Nature		Praxis		Theory		Developmental principles		Value experience
	Phenomena-constrained physical action		Convention-constrained social action		Paradigm-constrained intellectural action		Value-constrained innovative action		Identification-constrained experience
	Phenomena as significance		Social interaction as significance		Determination of meaning inherent in phenomena by definer		Redefinition of meaning attributed		Identification with meaning
			Reaction in place of criticism		Non-self-referential criticism		Self-referential critical reason		Non-criticism
	Explicit sensations called into question		Explicit feelings called into question		Explicit reasons called into question		Explicit values		Experienced states of consciousness called into question
	Pattern recognition		Pattern maintenance		Pattern adaptation		Pattern innovation		Identification with patterns experienced
	Change through physical crisis		Change through social crisis		Change through idea clarification		Change through innovation reformulation and re-assessment		Change through re-embodiment
<— Columns	Left-brain	Right-brain	Left-brain	Right-brain	Left-brain	Right-brain	Left-brain	Right-brain	Left/right brain integration
	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative	
	Science	Art	Science	Art	Science	Art	Science	Art	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft	
	Structure centered objects	Context sensitive process	Structure centered social action	Context sensitive social action	Structure centered concept formation	Context sensitive concept formation	Structure centered principle formation	Context sensitive principle formation	

Levels (rows) —>

	0	1	2	3	4	5	6	7	8	9
	Formal concepts	Pattern establishment and consolidation		Pattern maintenance and appreciation		Pattern adaptation and propagation		Pattern innovation and exploitation		Pattern (im)balance
9	Precondition	Domain definition	Organized relations	Differentiated order	Contextual renewal	Controlled movement	Communication reinforcement	Resource redistribution	Environmental manipulation	Condition of the whole
		Constitutive embodiment	Binding processes	Informed comprehension	Environmental harmony	Disciplined integrity	Imprinting significance	Transactional advantage	Fabrication and cultivation	Resources
		Standards	Enwholement	Knowledge	Expression	Mobilization	Orientation	Government	Industry	Order
		Left-brain	Right-brain	Left-brain	Right-brain	Left-brain	Right-brain	Left-brain	Right-brain	Left/Right-brain
		Quantitive	Qualitative	Quantitive	Qualitative	Quantitive	Qualitative	Quantitive	Qualitative	Integration
		Science Hard	Art Soft	Science Hard	Art Soft	Science Hard	Art Soft	Science Hard	Art Soft	
		Structural, static	Contextual processes	Structural, static	Contextual processes	Structural, static	Contextual processes	Structural, static	Contextual processes	
		General	Specific	General	Specific	General	Specific	General	Specific	
9	Consciousness 90	Leadership (Authenticity) 91	Love (Compassion) 92	Comprehension 93	Creative expression 94	Vigilance (Courage) 95	Transcendence (Detachment) 96	Freedom (Liberation) 97	Perseverance 98	Oneness (Universality) 99
8	Principles 80	Purpose 81	Solidarity (Cooperation) 82	Idealism 83	Harmony 84	Integration 85	Meaning 86	Sharing 87	Resourcefulness (Inventiveness) 88	Equanimity 89
7	Innovative change 70	Logics 71	Emotional fulfilment 72	Philosophy 73	Aesthetics 74	Security 75	Morals, ethics 76	Community 77	Coevolution 78	Peace (Justice) 79
6	Development 60	Policy making (Futurology) 61	62	Language 63	Design 64	Inter-disciplinarity 65	Individuation, psycho-analysis 66	Co-operative 67	Invention 68	Conservation 69
5	Noosphere 50	Science 51	Experiential activities 52	History 53	Culture 54	Strategy, logistics 55	Theology 56	Metapolitics 57	Agroscience 58	International relations 59
4	40	Sociology 41	Management 42	Informatics, classification 43	Ekistics (Architecture) 44	Cybernetics (Systems) 45	Psychology (Behaviour) 46	Economics 47	Technology 48	Environment 49
3	30	Research, standards 31	Health care 32	Education 33	Recreation (Arts, sports) 34	Defence (Police) 35	Religious practice 36	Government, politics 37	Agriculture, fisheries 38	Law 39
2	Action 20	Society 21	Social activity (Employment) 22	Information (Documentation) 23	Amenities (Necessities) 24	Transportation, telecommun. 25	Communication (Media) 26	Commerce (Finance) 27	Industry (Production) 28	Societal problems 29
1	Life 10	Biosciences 11	Plant Life 12	Zoology 13	Invertebrates 14	Fish, reptiles 15	Birds, mammals 16	Mankind 17	Medicine 18	Geography (Ecology) 19
0	Fundamental sciences 00	Astronomy 01	Earth 02	Meteorology 03	Climatology 04	Oceanography 05	Hydrology 06	Geophysics 07	Geology 08	Resources (Energy) 09

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Science (51): This includes science in the broadest sense (e.g. humanistic sciences) as well as science as a phenomenon in its own right (science of science) and as such is appropriately distinguished from the natural sciences (levels 0-1).

"Harmonic" relationships

Given the alternation of levels, although semantic cells in the same column have qualities in common, the relationships between those in odd-numbered levels or in even-numbered levels is stronger. This is most evident from the second level. For example: religious practice (36), theology (56), morals and ethics (76), transcendence (96). This series clearly goes from tangible manifestations of religion, through associated beliefs, to transcendent experience. In this sense the cells in the higher levels bear a "harmonic" relationship to those in the lower ones.

Complementary relationships

The set of cells at any given level can be seen as representing functional complementaries. The expression of one in a society calls for the expression of the others to complement or counter-balance that function. This is most clearly seem at levels 2 and 3. Each function would seem to be necessary for the society to be viable at that level, whatever the views of those who identify with the categories of a particular function. For example, despite the words chosen to label cells 31 ("research, standards") and 36 ("religious practice"), a society will engender an investigative, "normalizing" function, as well as some measure of ceremonial, even if it is only to celebrate secular values.

"Empty" cells

It is important to emphasize that although most cells have words associated with them, those words may only signify a very small percentage of the meaning that could come to be associated with the cell. In this sense many of the cells are effectively "empty", especially those at the less tangible levels (from 4-9), as well as those in column 9.

Given the importance attached to guidance from the historical development of the periodic table, empty cells can be welcomed as a provocative challenge. Cell 52 may be expected to correspond (in part) to the theory of health care and health improvement (as opposed to the treatment of disease), given that cell 72 corresponds (in part) to sensitivity training of an individual in groups. Cell 62 may be expected to correspond to enlightened management techniques in which the worker-employer relationships is redefined in a new form of partnership. Cell 78 may be expected to correspond (in part) to enlightened forms of agriculture, such as organic farming and similar experiments.

2. Initial word coding (1983)

Using the computer-extracted word list (at that time containing 11,000 items) a procedure was adopted for the 1983 edition whereby significant words were first given a 2-digit code according to Figure 7. After resorting, these words could then be regrouped within each semantic cell taking into account their frequency of occurrence, namely the number of organizations with a particular preoccupation. Sub-classes were thus created using a 3rd and 4th digit, resorting whenever a new overview of the result was required. In the final run some 7,500 words were used, the remainder being proper names or insignificant, or else having too many distinct connotations (polysemes).

Clearly allocating a single code to a word assumes that a given word cannot be associated with several semantic cells. This is certainly not true in the case of homonyms. But given the practical orientation of this project, the question is whether it produces a useful result in a sufficiently high percentage of cases. If obvious mismatches do result but the user can easily eliminate them by visual inspection, then the approach continues to have merit. Such mismatches are after all inherent in current word-oriented information retrieval systems in which the user is obliged to filter what is supplied. The allocation of codes to single words (e.g. "economic" or "development") rather than to multi-word terms (e.g. "economic development") has advantages and disadvantages. It increases the problem noted in the previous paragraph, since qualifiers reduce the incidence of mismatches. It does however create the possibility of highlighting links between distinct semantic cells, namely interdisciplinary or inter-functional links. This is discussed further below.

Recalling the periodic table once again, a basic difficulty in elaborating it was that for centuries the distinction between a chemical element and a compound of several chemical elements could not always be clearly established. As a result attempts were made to classify compounds on the basis of their properties, which were thus confused with those of chemical elements. It was consequently difficult to produce a meaningful table. It would seem that a very similar problem exists in elaborating a classification scheme for the societal functions with which international organizations are associated. There is a need to distinguish between those that can be considered as “elements” and those that should be treated as "compounds" of such functional elements.

The question is obviously not just one of considering single words as denoting such functional elements. Many such single words, even when they are not compounds in their own right (e.g. psychosocial), should appear only under cross-subject headings because of their multi-functional nature.

At this stage there is clearly a problem in determining whether it is more appropriate to associate the word "art", for example, with its manifestations in performances and works (e.g. level 3), the intellectual study of it (e.g. level 5), its transformative function (e.g. level 7), or the experience of artistic creativity (e.g. level 9). These of course bear a harmonic relationship to one another as discussed above, but the word "art" may be used indiscriminately to describe all of them. Indeed it could be considered a compound of them which could be more appropriately located within the framework of cross-subject headings. Such distinctions have been made wherever possible in order to highlight the functional significance of levels 6 to 9. A balance was however sought between emphasizing this harmonic spread and locating the word where the user might expect to find it in the light of past classification schemes.

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In contrast to Dahlberg's approach discussed earlier, the organization of the word coding within the semantic cells is not systematic at this stage. Grouping within the cells has often been done on the basis of word frequency. In the case of levels 8 and 9, no grouping has been attempted within the cells. It is possible to envisage the organization within the 2-digit cells being analogous to that within the matrix as a whole. This would, for example, make it possible to distinguish at levels 8 or 9 between values and experience that are more concrete and those that are more transcendental.

3. Initial section generation (1983-85)

Once the word coding was complete for what then constituted a computer-based thesaurus, this was used to determine with which codes each organization should be associated. Here a distinction must be made between what was then the three main sections of Volume 3 of the *Yearbook* (W, X, and Y).

Where only one code was associated with an organization, the latter was allocated to Section W, X or Y, depending upon the letter associated with that code in the thesaurus. Where several codes were associated with an organization, that organization was allocated to all the corresponding categories in the volume. In addition the codes were combined to select "interfunctional" preoccupations with which the organizations could be associated in the categories of Section X. The "combination" has been done on the following basis. If the codes for the organization all corresponded to the same 2-digit semantic cell, they were not combined. Where the first two digits of codes were different, they were combined. For example: W3310 ("schools") and W3900 ("law") were combined to create the additional codes X3339 ("schools/law") and X3933 ("law/schools"). If in addition the code Y5000 ("Europe") was present, then additional codes Y5039 ("Europe/law") and Y5033 ("Europe/education") were generated. On the basis of these, the organization entry was allocated to the relevant categories in the different sections of Volume 3.

Where the kinds of keywords in the name of an organization made the above procedure inadequate, these were supplemented or by-passed by the traditional form of "manual" allocation of codes directly to the individual organization rather than to words in the thesaurus (e.g. in the case of "trade unions", or "international relations").

4. Procedural revision (1984-1996)

The results of the above exercise were reproduced in the first edition of the *Yearbook, Volume 3: Global Action Networks* in 1983. As planned, those results were reviewed as part of the production of subsequent editions.

In **1985** the thesaurus was automatically extended by incorporating words from names of new international organizations and world problems. The major modification made was to remove limitations in the computer programme used to identify words on the basis of which subject codes were associated with the organization. The pattern of codes in the matrix was also reviewed.

Three techniques were used to reduce the percentage of mis-allocations:

a) Words generating an excessive number of mis-allocations were eliminated from the active part of thesaurus.
b) The mis-allocation of specific subject codes to some selected organizations was inhibited.
c) Allocation of some subject codes to specific organizations was forced where it would not normally have occurred. In addition some subject groups, not well defined by particular words, were deliberately created in this way (e.g. "religious orders", "trade unions", "regional studies", "intergovernmental organizations").

Following the 1985 revision two developments resulted in further modifications to the procedures used. The first of these was the transfer of the database onto an in-house local area network with many more software possibilities, in addition to those which were specially designed to facilitate production of this particular publication. In 1986 these procedures were further rationalized and modified to remove system errors. The second development was the completion of the 1986 edition of the *Encyclopedia of World Problems and Human Potential*, from which information on world problems, strategies and values was drawn in order to clarify their relationships to the fields of international organization activity.

The main modifications in **1986** were therefore as follows:

a) Whereas the previous editions were based on the allocation of subject codes based on single words, the software was developed at this time to permit subject coding based on word pairs in an organization title. The addition of such word pairs to the thesaurus avoided the earlier need for manual intervention to resolve such coding problems as "flying saucers" or "brain drain".
b) Whereas in the previous editions the subject codes allocated for a single organization were based on the title only, the software was developed in 1986 to permit the allocation of codes to specially italicized words text in the "Aims" paragraph of the description in Volume 1 of the *Yearbook*.
c) Because of the cruder procedures employed in the past, many words had been maintained in the inactive portion of the thesaurus to prevent them from generating ambiguous or misleading subject codes. With the above-mentioned procedures these inactive words were reviewed and many were activated.
d) The new software permitted a much more flexible approach to any necessary fine-tuning of the pattern of allocated codes. A more sophisticated approach was possible to forcing the allocation of codes (whether forcing into a subject area or out of it). With the introduction of word pairs into the thesaurus, fewer such interventions were necessary.
e) Relatively few changes were made to the central portion of the code matrix (Rows 0 through 6). Major changes however were made to Rows 7, 8 and 9, as part of the continuing exploration of ways of incorporating human values and strategies in the light of the work on the 1986 *Encyclopedia of World*

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Problems and Human Potential. Given the inherently ambiguous nature of the words associated with those rows of the matrix, a much higher proportion of words was forceably associated with particular codes, partly in an effort to take advantage, at least provisionally, of the groupings which emerged in the *Encyclopedia*. In particular the 1986 edition explored the use of polarities as categories whereby values or strategies can be grouped. This approach offers some advantages in handling words that are usually an embarrassment to any scheme of subjects, despite the importance attached by society to the concepts to which they may refer. The value and strategy polarities of the *Encyclopedia* (Sections VP and SP) were therefore used as categories in Rows 7 and 8 in the 1986 edition.

In **1987** work continued on rationalizing rows 7, 8 and 9. The value and strategy polarities (Sections VP and SP of the *Encyclopedia of World Problems and Human Potential*) continued to be used as categories in rows 7 and 8, with value words from Sections VC and VD being grouped under the row 8 polarities and strategies form sections SS and ST under row 7 polarities. To improve transparency, all other row 7 and 8 headings were grouped as W70 or W80 terms; organizations, problems or strategies indexed under such headings therefore appear together, rather than interspersed with strategy and value polarities. In line with the structural philosophy of the matrix, the third digit of the heading code reflects the overall headings of the matrix columns. A number of minor changes were made to the central portion of the code matrix.

The main innovation in **1988** was the inclusion of a proportion of items from the Human Development section (Section H) of the *Encyclopedia of World Problems and Human Potential* (1986, 2nd edition), as a result of work for the forthcoming third edition of the *Encyclopedia*. Other modifications in 1988 focused on further refining the thesaurus. Among the "active" terms included since the previous edition were a number of abbreviations, proper names and non-English words. Further minor changes were also made to the matrix.

A massive expansion of the thesaurus was undertaken in **1989** and **1990**, with the inclusion of terms from the text of organization and problems descriptions. A particular innovation was the additional inclusion of major subject terms in other languages, notably French, Spanish, German and Russian. Terms in Russian were included under two different systems of transliteration.

The main effort in **1991** and **1992** was the manual forcing in or out of entries under the various subject codes where ambiguities of meaning (often arising from non-English titles) had caused mis-coding.

Building upon the changes of the previous years, several items were rationalized in **1993** to avoid repetition. New items were added, including a list of UNESCO bodies (under Culture/UNESCO Bodies). Considerable effort went into improving the multilingual character of the thesaurus.

The thesaurus was augmented considerably between **1994** and **1996**, largely from the new strategies volume of the 4th edition of the *Encyclopedia of World Problems and Human Potential*, and in conjunction with the preparation of a French-language version of the *Yearbook* on CD-Rom. Amendments to the classification included several new headings.

F. PATTERN INTERPRETATION POSSIBILITIES

Part of the original intention was to experiment with patterns that highlight and clarify functional relationships. Ideally the matrix should help to show how different functional concerns are related to, or distant from, one another. In its present form it offers a healthier approach to the insidious problems created by the "pecking order" in the sciences. This is reflected in university departments and the perceptions of intergovernmental agencies (or their divisions) of the relative "relevance" of certain functions. Clearly it is easier to focus on functions at lower "tangible" levels, even though any action may be taken (at least in public statements) in the name of values associated with cells at higher "intangible" levels.

As a form of map, it is useful to recognize how agencies can get "locked into" the functions associated with a particular cell (e.g. information), without recognizing how dependent that cell is on neighbouring cells if its activities are to be usefully integrated into the pattern of functions. On the other hand some agencies may engage in a form of functional empire building by focusing on a "zone" of neighbouring cells (e.g. 27, 28, 37, 38), only accepting the significance of other cells under considerable pressure. Development may also be narrowly conceived by agencies as only in terms of cells at higher levels in the same column as that of their initial preoccupation. In this way an agency becomes "locked into" a column of functions. On the other hand some agencies may simply reject as irrelevant functions at some other levels, for example those corresponding to "theory", "praxis", or "values".

In terms of an organizational or management perspective, there is a need for the diversity of functions corresponding to the different columns in order for any programme or community to be viable. In this sense the matrix offers an interesting series of reminders for organizational design and development. On the one hand it is a representation of management functions (styles or skills), as suggested by the work of Jantsch. And on the other, it can be considered an indication of the order in which complementary functions tend to become explicit in the development of any community. Recalling briefly the periodic table model in which the cells at higher levels correspond to elements of higher

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atomic weight, it may be asked how the analogy permits such intangible elements as value-related experiences to be placed at the higher levels in the matrix. Although possibly pushing the analogy too far, it is however precisely such values that are conceived as constituting the "weightier" issues in contemporary society. Certain values such as "freedom", carry "great weight" in social interaction. They are quite capable of "displacing" material concerns of seemingly greater import.

As noted earlier, a periodic classification scheme necessarily has a predictive element built into it. In the case of chemical elements, these were each "discovered" at a particular time, although the existence of many has been predicted since the periodic table was produced. In the international community issues are "recognized" from time to time (e.g. energy, environment, employment). It would be of great value to predict the discovery of new ones in order to explore their policy implications. As the matrix stands, it would appear that there are few new functional elements to be discovered. The difficulty is that although it is possible to associate words denoting certain functional properties with certain cells, it is as yet entirely unclear whether this exhausts the functional significance which could in future come to be associated with the corresponding cell, as was pointed out earlier in the discussion of cells and their relative "emptiness". Using the periodic table again, it is possible that whilst a functional element may have been discovered many of its "isotopes" may yet remain to be discovered. This in turn raises the question of the relative stability of the "weightier" elements and the recognition of what are known as "islands of stability" in the sequence of such elements which man is attempting to create. It is the periodic table which has given credibility to the search for isotopes with half-lives ranging from a millionth of a second to over a million years. It is possible that a functional classification could give credibility to creative "flashes of insight", not to mention mystical experience, temporarily altered states of consciousness, or the states of awareness described in much Eastern literature in which the interaction of positive and negative forces is appropriately balanced. It is not too far-fetched to accept that such a framework could well be relevant to understanding the possibility for bringing about a stable peace in society. In generating the framework for Section X by combining the cell names from the matrix used for Section W, space is effectively created for a large range of functional compounds. Clearly from nearly 100 cells in the matrix, nearly 10,000 categories are created in Section X. Only a few of these are used at this stage as can be seen from the statistics at the end of this volume. The remainder are filtered out by computer. One of the miracles of modern science has been the development of the ability to design and make new chemical molecules, of which over 5 million are now known. Seen in this light the functional classification can usefully raise questions as to whether certain functional compounds already exist (possibly ineffectively named or confused with others), should exist (because of their desirable properties in social processes), or could exist (even though their properties could be highly undesirable), and under what conditions.

An interesting problem, which emerges in the attempt to allocate a single code to a word, is the tendency for words appropriately associated with one cell to be used as metaphors with connotations for another cell, usually at a higher level. It is even possible to question to what extent words can be assumed to be metaphor-free and incapable of signalling the existence of functions having a "harmonic" relationship to the most concrete use of the word. Whether more insightful metaphors can be said to be associated with higher cells in the same column remains to be investigated. This would be one way of improving the integration of the lowest levels (0 and 1), which are a rich source of metaphors, into the pattern as a whole. Metaphor merits much more attention in relation to the problem of representing classification schemes in a memorable manner.[48] It needs to be seen as being of vital significance to information users and not just to number-oriented document cataloguers. Again there is much to be learnt from Eastern systems of classification in which metaphor and number patterning of classes and sub-classes are combined to constitute a powerful mnemonic aid to comprehension.[49] It is for this reason that a section on metaphor appears in the 1986 and 1991 editions of the *Encyclopedia of World Problems and Human Potential*.

An interesting related problem is the tendency for action-oriented organizations to denote their concrete preoccupations by using terms for intangible values (e.g. "security" in place of "defence". This situation can be considered the reverse of that described in the previous paragraph.

Another concern for any classification scheme which purports to be of multi-cultural significance is whether it avoids being locked into the purely Western approach to classification in the Cartesian tradition. This reflects a preoccupation voiced by a number of contemporary authors[50] [51] [52] including a Rector of the United Nations University.[53] It is therefore useful to speculate on a "confrontation" between the matrix in its present form and that associated with a thoroughly Eastern perspective, such as the Chinese classic the *I Ching* or *Book of Changes*.[54] Aside from being a deliberate attempt to classify processes and conditions of change (as opposed to "objects" and "subjects" of knowledge), this is organized into a 8 x 8 matrix of 64 cells. It is not to be excluded that a relationship could be found between these and the 8 levels and 8 columns of Figure 7. This could offer new insight into the sub-patterns of functional relationship within the pattern as a whole. This possibility has been partly explored elsewhere.[55] A related approach was used to classify "human values" in the 1986 and 1991 editions of the *Encyclopedia of World Problem and Human Potential*.

[48] A J N Judge. The territory constructed as a map; in search of radical design innovations in the representation of human activities and their relationships. *Transnational Associations*, 35, 1983, 2, pp 80-89.
[49] Judge. Representation, comprehension and communication of sets; the role of number.
[50] Capra, op cit.
[51] Maruyama, op cit.
[52] Herb Addo. World-system critique of Euro-centric concepts of development. Trinidad and Tobago, University of the West Indies, 1981, unpublished manuscript. (Prologue un UN Univerity doc HSDR/GPID69/1982).
[53] Declaration by Soedjatmoko, Rector of the United Nations University. *The Chronicle of Higher Education*, 26, 25 May 1983.
[54] I Ching, or Book of Changes. Princeton University Press, 1950 (Translated by Richard Wilhelm).
[55] Judge. Networking alternation.

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G. ENVISAGED DEVELOPMENTS

As indicated above, it is highly probable that improvements will be made to the procedure for coding words, to the classification schemes used, and to the various computer programmes used in selecting organizations for allocation to one or more categories. It is also expected that greater use will be made of "manual" coding methods to handle the more subtly defined subjects as well as categories of organizations. This will permit better treatment of subjects denoted by compound words.

In restricting attention to keywords appearing in the names of organizations, however these are supplemented, this volume is far from touching on the activities of the commissions, departments and programmes of such bodies, not to mention their special-theme conferences. This problem is partly solved by the presence of Sections E and K organizations. It is also possible that some attempt will be made to relate this volume to the *International Congress Calendar.*[56] The problem will be partially remedied in future editions by increasing use of the "hidden" keywords which appear in the organization descriptions (e.g. under "aims") in italics, and are extracted by computer. Obviously however a distinction has to be made between bodies specifically concerned with "peace", for example, and the many which choose to claim that their activities contribute towards peace.

Also envisaged is the possibility of providing written commentaries on the range of organizations associated with particular levels, columns or cells of the matrix. The intention would be to clarify how groups of these bodies relate to one another, what distinct functions they perform, and the nature of their limitations. Finally, work continues on the creation of computer-generated maps of the networks of relationships between organizations and world problems.

H. COMMENTS

1. Classification as a political act

a) The construction of a thesaurus or classification scheme is not a neutral process but a political act, as was well demonstrated by the encyclopaedists in the 18th century. A thesaurus which treats "homelessness" as an aspect of "sociology", and "war" as an aspect of "political science" is taking a strong political position. This is also true of an encyclopedia which omits any entry on "torture".[57] A totally exploitative attitude towards the environment is suggested by an institutional information system concerned solely with "fisheries", "fishing" and "fish processing, production, storage and utilization", but not "fish" as having an important role in planetary ecosystems.[58]
b) Classification schemes tend to denature and neutralize the functional significance of categories, by excising their non-conceptual component. This is clearly seen from the treatment of "homelessness" and "war" in the previous section. Such schemes are concerned with reflection and verbalization as opposed to action, which is thus rendered impotent.
c) The political dangers of classification are not discussed amongst the specialists concerned with the design of international information systems. Aside from their treatment of minorities and the disadvantaged, most of these systems are simply reflections of a western world-view. As such they can only do violence to non-western cultures in their present form.
d) Classification schemes tend to encourage "functional empire-building", as may be seen in the treatment of "economics" disciplines in relation to "other social sciences" in the ILO classification of occupations, for example.[59] Many existing systems are allowed to "bulge" in favour of hyperactive functional development (technology, industry, etc) at the expense of functions that are politically insignificant (religion, ethics, art, etc) at the present time.
e) Positioning, or failing to position, a term in a thesaurus is a political act, which contributes to some kind of "functional story". There is no concern for the stories being told in this way or for the political education to which they contribute.
f) The process of embodying a term in a classification scheme has a benumbing effect, which tends to render passive the users of the scheme and to deactivate the information and the users by changing their relationship to the scheme.
g) Designers of a classification scheme necessarily engage in a process that may in part be justifiably labelled as "scheming". The scheme imposes a pattern of perception against which there is very little possibility of appeal. A new approach is required which gives users some power over the process. "Who classifies for me?" is an important political question.
h) The functional control of society (or its absence) is implicit in the emphasis and juxtaposition of categories in a classification scheme. This is especially true when the excesses of one function can only be corrected by another. If the latter is absent from the scheme, or unrelated to the former, then the "spastic" processes of arbitrary control are reinforced.
i) There is a need to "liberate" nodes of significance from the domination of particular ways of apprehending reality. A specific concern is the politics of term appropriation, for example in French "development" and "cooperation" are virtually unusable in the political arena, except in relation to the Third World.
j) The above considerations suggest the need for a politically "aggressive" approach to classification, which does not simply accept the result of disciplined political activity, empire-building, or blinkered manipulation of other functional domains. A political stance is required with regard to the need to "see things whole".

2. Flexible open-ended approach

a) This initiative is funded largely because of the value of the resulting check-lists by function of "subject", **not** because of the significance of the pattern as a whole. This is a considerable advantage given the design of the computer programme. It means that at

[56] Union of International Associations. International Congress Calendar. Quarterly.
[57] Encyclopaedia Britannica, 15th ed.
[58] Inter-Organization Board for Information Systems, op cit.
[59] International Labour Office. International Standard Classification of Occupations. Geneva, ILO, 1969.

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any time the word coding can be modified to produce an improved balance within the matrix. It will thus continue to be an essentially experimental system despite its ongoing use in processing current international organization data. In contrast to conventional classification schemes, the investment in this scheme does not "freeze" the coding pattern.

b) Clearly this approach also permits alternative patterns to be explored in parallel, possibly for different purposes. It may be applied as rigidly or as loosely as required.

c) Because of the experimental nature of this approach, it opens up the interesting possibility of exploring the potential of a classification scheme where a non-zero error rate is acceptable. This may well be much more fruitful than where the error rate is required to be zero.[60]

d) This approach responds to the requirement that integration itself should not be closed and final - or else the integration scheme is itself an obstacle to change rather than flowing with it.

e) Given that the scheme is designed to "open up" cells for which there are as yet undetected or poorly defined functions, this predictive possibility should provide valuable feedback on functional integration.

3. Distinguishing functions

a) Given that much effort has been devoted in the past[61] to isolating clusters of "subjects" and that these clusters are still used in modern systems, it is appropriate to assume that they reflect some degree of functional clustering. This exercise therefore, as far as possible, respects such clusters. Doing so has the considerable advantage of making the result more readily acceptable. The main modifications therefore lie in the positioning of clusters relative to one another and in giving greater or lesser weight to some of them. This corresponds to the view discussed above that the difficulties and opportunities lie not within the clusters but in how they are understood to be related.

b) The process of distinguishing and interrelating functions within a framework is one of design. As such it necessarily involves both art and science, right hemisphere and left, and some measure of synthesis resulting in a decision. This process is guided by previous practice and is especially sensitive to constraints. In seeking to generate a fruitful set of overlaid patterns, materials obtained and processed in earlier papers[62] [63] were used as possible guidelines, as was the structure of the periodic table itself.

c) This paper is based on the assumption that an entirely rational approach would lead to a sterile result. The aim was therefore to interrelate patterns of agreement and disagreement as discussed in an earlier paper.[64] The process may be likened to tuning a musical instrument in which the significance of a tone only emerges in its relationship to the other tones. This analogy highlights the significance of harmony and discord between tones. The difficulty is that, given the matrix form, the "strings" take the form of an array of columns and rows. The tuning must thus be achieved in two dimensions to distinguish a tone appropriately. The process may also be likened to stretching a rubber sheet (of "seamless significance") over a curved frame in such a way as to eliminate the creases whilst giving equal prominence to each node in the pattern. It is also worth reflecting on the generation of Chladni interference patterns in this context.[65] [66]

d) A special effort is made to open up locations for "awkward" topics which tend to be forgotten or grouped in miscellaneous categories. Finding any position for them in conventional schemes is such a relief that there is no desire to open up any discussion about the justification of the pigeon-hole finally used. Why is it that a list of hard-to-classify topics does not seem to have been published? It is the process of fitting in the concept for which there is no natural place which should creatively redefine the significance of the whole pattern.

e) A cluster is not necessarily rejected because it is "fuzzy". The property of being well-defined may well be a characteristic of certain kinds of cluster but not of others.[67]

f) Words located in the cells of the resulting matrix are merely approximations to the concepts or functions to which they refer. The cell as a whole cannot be adequately named. Much of its significance derives from its status within the functional pattern as a whole.

g) A distinction is made between complementary or competing functions at the same level (row) in the matrix. These are alternative modes relating to different content. A different distinction is made between functions of the same type (column) concerned with similar content. These two dimensions open up the possibility of two kinds of functional substitution and development.

h) Deliberate efforts were made to avoid the distractions of currently fashionable topics which cause current classification schemes to "bulge". These are considered a reflection of short term functional imbalance.

i) Deliberate efforts were made to avoid the anthropocentric emphasis in classification schemes, which reinforces a totally exploitative misunderstanding of the interacting forces in the planetary ecosystem in a form of "environmental apartheid". The aim is to ensure a "fair deal" for bugs, plants, and animals, as well as people. Fish are not only to be understood as humanly "fishable". It is regrettable that plants and animals are converted by classification schemes into pests, foodstuffs, or industrial products. Nutrition, health, habitat, and migration are not just a human problem. In addition, such narrowness closes off any possibility of interspecies understanding, ignoring such questions as animal education and the intelligence of dolphins and whales, with all that could imply for their rights on the planet in a more enlightened culture.

4. Function pattern

[60] Donald Michael. On the requirement for embracing error. In: On Learning to Plan and Planning to Learn. San Francisco, Jossey-Bass, 1973, p31.
[61] Samurin, op cit.
[62] Judge. Beyond method; engaging opposition in psycho-social organization.
[63] Judge. Patterns of N-foldness; comparison of integrated multi-set concept schemes as forms of presentation.
[64] Judge. Beyond method; engaging opposition in psycho-social organization.
[65] Mary D Waller. Chladni Figures; a study in symmetry. London, G. Bell, 1961.
[66] Abraham, op cit.
[67] Maruyama, op cit.

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a) "Subject" categories selected for classification schemes tend to conceal functions by using noun descriptors. It is appropriate to ask whether such static categories facilitate development processes.
b) As suggested by Bohm[68] and Thom,[69] a more realistic approach is to use verb "descriptors", thus emphasizing the essentially dynamic processes of development.
c) Descriptors in current use can only adequately express a percentage of the functions with which they are associated. Categories are not completely bounded by available descriptors. Language is essentially incomplete and approximate - as is evident when descriptors from different languages are compared.
d) An integrated pattern of categories is essential if functional integration is in any way a reality. In many classification schemes categories are grouped arbitrarily with little, if any, concern for the relationship between functions.
e) Classification schemes tend to conceal the absence of categories that do not relate to the functional preoccupations of those elaborating the scheme. Such categories are signalled naturally in an integrated pattern.
f) An integrated pattern should lend itself to perception through different "cuts", according to depth of interest and level of complexity tolerated.
g) To contain complexity and range of differences, the pattern of integration should highlight differences as well as similarities.

5. Recovering functional emphasis

As has been stressed, conventional classification schemes focus on "subjects". This term covers many "objects" in the material world and the world of ideas. If these subjects are perceived as functions, as advocated here, it should be possible to give greater reality to the functions by clarifying how they are manifested through such special kinds of subjects as those noted below. In each case the cells of the matrix should reflect some corresponding element. To be specific, corresponding to many of these functions there should be:
– Occupations or professions that together reflect the pattern of human resources in an integrated society.
– Institutions, organizations and groups. Of special interest is the correspondence with government ministries and agencies, especially as the country develops.
– Types of building (or parts of a town), as well as rooms (or parts) of a home.
– Organizational or community roles.
– Information systems or styles of information processing.
– Characteristic human needs and satisfiers associated with many of the functions. Together these should reflect an integrated pattern of human needs.
– Characteristic values and possibly characteristic mind-sets, ways of being or *weltanschauungen*.
– Characteristic events, objects, and processes and their associated characteristic concepts of change.
– Characteristic methods, tools, distinctions and problems.
– Characteristic human activities. These should correspond to the elements in a time budget analysis.
– Characteristic symbols or rites. For certain traditional cultures there would be divinities manifesting appropriate qualities. Together these are an important guide to viable functional integration.
– Characteristic images of man.
– Characteristic educational processes. Together these would make up an integrated educational programme, corresponding to the organization of curricula and sets of university faculties.
– Characteristic decision criteria, constraints, blind spots, biases, strengths and weaknesses. In many cases there would also be things that are considered self-evident or inconceivable.
– Characteristic social and other indicators.
– Characteristic constituents of a system.
– Characteristic associated verbs, possibly based on such action oriented suffixes as: "-ization", "-izing", "-icizing".[70]

6. Dynamic relationship between functions
a) As has been repeatedly stressed here, for integrative purposes the functions should not be considered in isolation one from the others. Some functions clearly substitute for one another under some conditions, others complete with each other. It is important to arrive at some understanding of this dynamic pattern.
b) Several analogies may provide useful guidelines to explore these relationships:
   i. *input/output matrix:* as in the standard analysis of economic sectors, there is value in exploring the pattern of exchanges between the functions
   ii. *periodic table:* as with chemical elements, the pattern of possible interactions, the degree of reactivity, and the resulting composites are worth exploring
   iii. *mythical patterns:* as with the well-elaborated patterns of relations between divinities responsible for different functions, "stories" about how the functions relate to one another over time can usefully be explored
   iv. *psycho-cultural patterns:* the pattern of relations may usefully be compared with that of the Chinese classical Book of Changes, whose constituent hexagrams can also be presented together as a matrix of inter-transforming elements.[71] [72]
   v. *time budget:* the pattern of interactions can also be explored in the light of time budget analysis.
c) The computer programme is designed in such a way that co-present terms signifying distinct functions result in the generation of a separate matrix of relationships between functions. From this it should be possible to develop a clearer idea of the frequency pattern of interaction as well as the possibility of relationships not explicitly activated within the international community.

7. Non-linear and oscillatory functional relationships
a) The point was made earlier that to be meaningful the pattern must provide for the presence of

[68] Bohm, op cit.
[69] René Thom. Modèles mathémitiques de la morphogénèse. Paris, Christian Bourgois, 1980.
[70] Thom, op cit.
[71] I Ching, or Book of Changes.
[72] A J N Judge. Networking Alternation; an alternation network of 384 pathways of organizational transformation interpreted for networks in the light of the Chinese Book of Changes. Brussels, Union of International Associations, 1984.

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essentially incompatible functions, namely functions which cannot co-exist passively (e.g. "science" and "religion", "industry" and "environment"). The weakness of existing classification schemes is that they develop a framework which implies that such "subjects" are compatible, thus deactivating/neutralizing the dynamic nature of the relationships. This is one reason for the sterility of such schemes.

b) In order to be hospitable to discontinuity the scheme must somehow encompass the non-rational character of disagreement.[73] This implies at least a distinctly non-linear relationship between such functions.

c) The most accessible indication of the possible nature of this relationship is that between right- and left-hemisphere modes,[74] and the essential difficulty of integrating them. The functional consequence is an oscillation between the two modes according to the task to be performed.

d) On this basis, it is useful to consider the disposition of functions in the rows or columns of the matrix as involving alternatively a right or left-hemisphere type of mode. The result is that the matrix then takes the form of a "chequerboard" of functions. It is this chequerboard effect which could be one vital feature for adequate function integration. The point can be seen as remarkably obvious. Humanity does not function in terms of one mode alone, just as it is difficult to walk on one foot - although this may be what history will see as characteristic of this period.

8. Implication of modes of comprehension

a) A major defect of existing classification schemes is that there is no concern with how they are comprehended or whether this is of any significance. As has been demonstrated,[75] people and groups with similar concerns tend to disagree violently because of temperamental, pre-logical biases. These have been related to the psychology of types. Functional integration can clearly not be envisaged until this essentially human-centred concern is taken into account. It could well be argued that taking it into account is vital to the credibility of any scheme that purports to facilitate human and social development. The question may even be asked whether the existing range of functions does not result from a special form of collective psychological projection patterned by the distinctly favoured modes of comprehension.

b) It could therefore be very fruitful to explore how psychological types are reflected in the classification scheme. The work of C G Jung and his school is very suggestive in this respect:
   - extrovert/introvert distinction, as related to
   - thinking, feeling, sensation, intuition types, as reflected in
   - positive and negative male archetypes (Father, Warrior, Youth, Wiseman) and in corresponding
   - positive and negative female archetypes (Mother, Amazon, Hetaira, Medium).

   The material on these matters could suggest a much richer understanding of the relationships between functions and the challenge of comprehending them. One of Jung's major points is that a given individual does not have equal comprehension of each of the above modes. Some are repressed. The same could be true with collectivities (e.g. the "science" or "business" communities) with all that would imply for the dynamics of their relationships and the problems of the development and maturation of such collectivities.

c) It is interesting to note, in the light of the above comments, the basic division between those committed to social change. One group favours a scientific, structured, establishment-planned, rational approach and rejects sloppy, disorganized, spontaneous, person centred approaches. The other favours such participative, person-oriented, organic, casually-planned approaches "from the heart" and abhors the manipulative impersonality of the "head" approach.

d) The extremes noted in the previous point have dramatic implications for who can work with whom. The challenge is to move beyond such simplistic extremes, as it is in the case of individual maturation. It is not one or the other, but how each can be used in an integrated dynamic pattern whenever appropriate. It is in this sense that there is a special relationship between the structure of the classification scheme required and the nature of individual human development, **especially** in its "subjective" psychological dimensions.

e) The present need is really for a more meaningful classification scheme with which people can more readily identify in ordering their world view. The interesting difficulty is that it is psychologically necessary to **reduce** the number of categories to approximately seven to maintain continuity of understanding of the whole[76] - whence the value of the single digit number of rows/columns and the coherence of Jung's set of types. But, when it is necessary to encode the "10,000 things" recognized in the environment, the number of categories must be **increased** considerably - which necessarily results in a fragmentation of integrated awareness. This states the basic dilemma of classification scheme design. It indicates the importance of interrelating patterns of small and large numbers through factors as discussed elsewhere.[77] Single digit sets of types, such as advocated by Jung, are principally relevant as **dimensions** of multi-digit function coding schemes. They provide the necessary weft and warp which creates the comprehensible framework through which greater degrees of variety can become apparent within an integrated pattern. Examples of such patterns have been collected together in a earlier paper.[78]

f) The alienating irrelevance of present classification schemes is apparent when set against the challenge of producing a scheme in which recognition of the attributed code gives the same sense of here-and-now significance as the following:
   - player positions and attack patterns in a football game

[73] Judge. Beyond method; engaging opposition in psycho-social organization.
[74] Perron (Ed). The Neurological Basis of Signs in Communication Processes.
[75] W T Jones. The Romantic Syndrome; toward a new methodology in cultural anthropology and the historic of ideas. The Hague, Martinus Nijhof, 1961.
[76] Judge. Representation, comprehension and communication of sets; the role of number.
[77] Judge. Patterns of N-foldness; comparison of integrated multi-set concept schemes as forms of presentation.
[78] Judge. Patterns of N-foldness; comparison of integrated multi-set concept schemes as forms of presentation.

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- pieces and attack/defence patterns in interpersonal combat
- katas and attack/defence patterns in interpersonal combat
- recognized tactical and strategic ploys in military combat and business competition
- diagnosis of a particular disease
- recognition of a plant or animal species in the wild
- recognition of a pattern of music or dance.

Like the immense popularity of astrological typing (however illusory), each of these opens the way for a functional response within a (perhaps momentarily) stabilized world view. They introduce the dimension of time in its most positive, liberating sense, whereas conventional "pigeon-hole" classification introduces time in its most negative and repressive sense.

9. Need for a development "container"

a) The final points above suggest some additional properties desirable in a classification scheme. These essentially qualitative properties are difficult to build into the simple structure of a matrix. The grid pattern can even be considered as a stereotype of alienating technocracy. The defect of the grid pattern is that it suggests no sense of direction or convergence towards a unique location with which the observer can identify as a kind of "homobase" or goal. As such it is a fundamentally anti-developmental form of representation, despite its obvious convenience and efficiency.

b) At best the matrix is meaningful in relation to one half of the functions, namely those associated with left-hemisphere comprehension. Essentially it "freezes" the "objective" world, whilst neglecting or denying the significance of "subjective" interaction with it, although it is the latter which is responsive to qualitative conditions. Even by ensuring the simultaneous presence of incompatible functional alternates, the stasis effect of the left-hemisphere framework still ensures only a limited value for the scheme.

c) Going to the other extreme, right-hemisphere thinking would advocate use of particular images to which people can relate (e.g. starving child or sunny beach posters), or possibly symbols (e.g. as or each UN "year"), or a person (e.g. Mère Thérèse). Such forms, whilst valuable in themselves for "mobilizing" people in the short-term, are completely unable to convey any sense of structure or pattern within which the symbolized concerns are related to the other concerns of the international community. Nor are they able to provide any balanced ordering of the sub-concerns which together make up that which is represented by the image.

d) Once again there is a dilemma, namely the choice between the limitations of "flatland"[79] and the problems of focused fascination. Can the dilemma be seen in a fruitful light to provide a way beyond this sterile dichotomy, which engenders such "spastic" international activity?

e) In both cases it would seem that it is a question of how attention is channelled, focused or manipulated. In the matrix case, attention is forced along well-defined pathways and easily becomes exhausted because it is not regenerated in any way. There is little possibility for creative interaction, and increasing orientation to proceduralism. In the image case, attention is excited and attracted, but is not offered any channels through which the enthusiasm can be discharged in an orderly, constructive manner. The initial enthusiasm therefore decays quickly into indifference, apathy or cynicism, or is transformed into dogma. Both extremes are therefore attention "traps", "prisons", or even "cemeteries", whatever their limited merits. It is possible to alleviate this imprisoning effect by seeking some form of synthesis between the two modes.

f) In the case of the left-hemisphere mode, curvature may be introduced into the matrix through a third dimension. The value of this has been argued in earlier papers.[80] [81] It ensures a sense of focus and introduces the observer into the scheme. This step may also be justified in terms of the implications of quantum logic for classification[82] [83] [84] [85] and the related essential problem of the inadequacy of particular conceptual languages[86] to "contain" the complexity of experience.

g) In the case of the right-hemisphere mode, complementary images may be grouped into sets, as has been done very successfully in many traditional cultures with divinities governing complementary qualities and powers.[87] Note the advantage of personalizing these powers in order to permit an individual relationship to them. It is curious that UN symbol posters are never juxtaposed in this way to constitute a set of complementary images, rather than the current practice of emphasizing politically-timebound, fragmented concerns.

h) The seemingly obvious next step is to relate the curved left-hemisphere pattern of functions to the sets of right-hemisphere images in order to synthesize the two modes. If this could be successfully done it would be the ideal "container" for human and social development. Attention would be appropriately regenerated and focused to that end. As described here, however, this step constitutes a further trap and an even more effective prison. Examples of initiatives in this direction can be seen in efforts to build a "world city" or a "world centre" in which the architecture, imagery and organized information would reflect and reinforce a unified world view.[88] This in fact overemphasizes the left-hemisphere mode. The right-hemisphere mode is to be found over-emphasized in the proposed design of certain process-oriented (utopian) communities. None of these initiatives "liberates" attention sufficiently to constitute a "container" for effective human and social

[79] Edwin A Abott. Flatland, a romantic of many dimensions. Oxford, Blackwell, 1962.

[80] Judge. The territory constructed as a map.

[81] A J N Judge. The future of comprehension; conceptual birdcages and functional basketweaving. *Transnational Associations*, 34, 1982, 6, pp 400-404.

[82] Bohm, op cit.

[83] P A Heelan. The logic of changing classificatory frameworks. In: J A Wojciechowski (Ed). Conceptual Basis of the Classification of Knowledge. München, K G Saur, 1974, pp 260-274.

[84] C A Hooker. The impact of quantum theory on the conceptual bases for the classification of knowledge. In: J A Wojciechowski, op cit.

[85] Kinhide Mushakoji. Scientific revolution and inter-paradigmatic dialogues. Tokyo, United Nations University, 1979 (HSDR/GPID-14/UNUP-75).

[86] A de Nicholas. Meditations through the Rg Veda; four dimensional man. Boulder, Shambhala, 1978).

[87] Judge. Patterns of N-foldness; comparison of integrated multi-set concept schemes as forms of presentation.

[88] Paul Otlet et Le Corbusier. Mundanuem, Bruxelles, Union des Associations Internationales, 1928.

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development, whatever their merits for some people in the short-term.

10. Intrinsic uncertainty and paradox

a) The synthesis outlined in the previous point is basically sterile. This is because the advocated juxtaposition of the two modes results in essentially mechanical, static "compromises". The "logical" nature of the step proposed is precisely what identifies it as a left-hemisphere linear extrapolation, even though it is supposedly encompassing incompatibles. It seems that once again it is necessary to find a way of introducing a non-logical dimension if the sterility is to be avoided.

b) It is not sufficient to call upon the excellent arguments of theoretical physicists such as Bohm[89] concerning wholeness and the implications of uncertainty. This remains a left-hemisphere approach, resulting in an explanation with which the observer is faced and by which he is neutralized. The arguments are important however as a way of shifting the discussion out of an expectancy of linear extrapolations and predictability, even in the psycho-social domain.

c) Switching to the basically right-hemisphere approach, there is much material on the integration of the two modes, but only in a form considered academically acceptable to psychoanalysts influenced by Jung. This material forms part of the heritage of many cultures. Its value lies in the fact that it encodes the experiential process of personal development and transformation, which should make it highly relevant to the further exploration of human development. Its weakness is that it has nothing to say about social development. Furthermore its incredible richness makes it a fascinating trap in its own right. Its experiential nature makes it especially suspect in the light of any left-hemisphere perception.

d) These two seemingly blocked avenues of approach clarify the basic dilemma. It would seem that both have vital strengths and dangerous weaknesses. As pointed out earlier, the only way to move further forward is to be highly suspicious of both and to alternate between them, counter-balancing one by the other, since one or the other must necessarily be used.

e) Of great interest in the right-hemisphere material are the guarded attempts to define the essentially paradoxical nature of the outwardly incomprehensible possibility of creatively transcending the limitations of the two basic modes. This is typified by Zen literature and the associated practices.[90] These claim the merit of deliberately avoiding the traps of proliferating sets of symbols characteristic of other cultures. Such sets of symbols tend to create the impression that transcendence is possible through them rather than through identifying with the awareness from which they emanate as a set. The disadvantage of the Zen approach is that it is so individualistic and paradoxical as to be virtually inapplicable to social transformation.

f) Of great interest for the left-hemisphere approach is the implication of the current challenge of plasma physics in relation to fusion reactors for power generation. A plasma is an electrical conducting medium consisting of positive and negative charges forming a neutrally charged distribution of matter. A plasma is unique in the way it interacts with itself, with electric and magnetic fields, and with its environment.[91] Its properties depend on the collective behaviour of the constituent particles, as distinct from the individual. If plasmas could be confined under certain conditions for a long enough period of time in a fusion reactor, mankind's energy problems would be resolved. The difficulty is that plasmas are unique in their instability and in their tendency to revert to ordinary combinations of matter and energy.
The problems that have to be solved to achieve successful magnetic confinement are both scientific and technological in nature. The scientific problem is to find those particular configurations of magnetic fields, and values of plasma parameters which, when scaled up to fusion reactor size, would ensure a viable net power yield from the reactor.
Technologically, the problems are how to create the required high-intensity magnetic fields, how to heat the plasma towards fusion temperatures, at the same time protecting it from contamination by heavier atomic impurities (which would quench the reaction.[92]
If individual attention/consciousness or world opinion is considered as a "plasma", the problem of human and social development and integration are well-modelled by the fusion problem.

g) In the right-hemisphere approach, an interesting parallel to the fluid behaviour of plasma is to be found in the important taoist concept of "ch'i" (or ki), which as an essentially intangible form of "energy" defies all exercises in definition. It is by identification with ch'i that an individual develops a way of alternating appropriately between the two modes without the normal discontinuity of awareness. With a background in biochemistry and management, R G H Siu notes:[93]
"Energy is the essential stuff for structural integrity and mechanical and chemical processes, while ch'i is the essential stuff for pattern perpetuity and thinking and feeling. While energy-metabolism accounts for the vigour of health in the physical sense, ch'i-metabolism accounts for the well-being of the person in the psychic sense. A smoothly operating cross-feed exists between energy and ch'i in the normal and serene human being."[94]
In the East, many of the martial arts are explicitly concerned with practices for controlling the movement of "ki", as in aikido for example. This is also the case with the pattern of widely practised exercise movements called t'ai chi'i. Siu continues
"If one wishes he may carry the analogy further. He may postulate such laws as the conservation of ch'i, which would read: the totality of ch'i is a constant; it is neither created nor destroyed, it is only transformed. Comparable psychological formulations come readily to mind, such as: ch'i gradients, as a basis for explaining dominance, power, and

[89] Bohm, op cit.
[90] D T Suzuki. Manual of Zen Buddhism. New York, Grove Press, 1980.
[91] *If the states of matter are defined in terms of relationship to the environment, plasma is the fifth state. The others are: solid, liquid, gas, and reacting elements (e.g. in fire). 99% of the matter in the universe is in the plasma state.*
[92] McGraw-Hill Encyclopedia of Science and Technology. New York, McGraw-Hill, 1977, vol. 5.
[93] *It is interesting that this book should be published by the* Massachusetts Institute of Technology Press*, normally associated with left-hemisphere approaches.*
[94] R G H Siu. Ch'i, a neo-taoist approach to life. Cambridge, MIT Press, 1974, pp 261-262.

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influence, which would be analogous to thermodynamic gradients; matching ch'i impedance, as a basis for explaining harmonious social operations, which would be analogous to electrical requirements in circuit design..."[95]
But although Siu has written a subsequent book on management, there is apparently little attention in the East to the significance of ch'i at the societal level.

h) Returning to the left-hemisphere approach and the point of departure, the problem is how to design a suitable "container" for development using the pattern of functions. Using the plasma model as a guide, the problem can then be defined as using the configuration of functions to contain individual or collective attention. From the plasma case it is clear that the functions should serve a variety of purposes in enhancing attention (the will-to-change?), in focusing it, but especially in counter-acting ever-present instabilities. These lead to "degeneration" of the attention if it is not effectively insulated from the surfaces of the "container". The model suggests that these surfaces are intimately related to the functions themselves. This confirms the difficulty of the problem. It is already well-recognized that no one function provides the desirable solution and each of them is dangerous to society or the individual if unchecked. But the current work on plasma confinement suggests that advances can be made by "bouncing" the plasma around within the configuration of a magnetic cavity. This would indicate that the problem is really one of allowing the attention to be constrained by all the functions simultaneously but without allowing attachment to any one of them. It is thus not just a simple problem of oscillation between two functional modes but between enough modes to constitute a container (at least in a three-dimensional configuration).
i) Switching to the right-hemisphere approach, in discussing ch'i Siu notes that: *"The conventional theories of physics and chemistry have not been successful in clarifying the intrinsicalness of life and the specificity of biological responses."* [96] The same may be said of sociology and psychology and in relation to the specificity of response to significance. Architect Christopher Alexander attempts to clarify the nature of this here-and-now livingness as follows:
"There is a central quality which is the root criterion of life and spirit in a man, a town, a building or a wilderness. This quality is objective and precise, but it cannot be named. The search which we make for this quality, in our own lives, is the central search of any person, and the crux of any individual person's story. It is the search for those moments and situations when we are most alive... The more living patterns there are in a place - a room, a building, or a town - the more it comes to life as an entirety, the more it glows, the more it has that self-maintaining fire which is this quality without a name... This quality in buildings and in towns cannot be made, but only generated, indirectly by the ordinary actions of the people, just as a flower cannot be made, but only generated from the seed."[97]
The question he confronts most admirably is how to enable individuals and groups to work with a "pattern language"[98] to build an effective container for the "quality without a name". (The patterns would seem to reflect life in the same way as magnetic mirrors reflect plasma.) It is regrettable that he is primarily concerned with social patterns related to buildings and not also with the less tangible psycho-social patterns in their own right.
j) In both the plasma example and Alexander's "quality without a name", it is significant that the configuration of definable patterns engenders a central space with special characteristics. Siu cites Lao Tzu with regard to this "empty" space: *"Thirty spokes unite in one nave and on that which is nonexistent (the hole in the nave) depends the wheel's utility... Therefore, existence renders actual but nonexistence renders useful."*[99]
But the wheel only works effectively when the compression in a particular spoke is appropriately distributed around the pattern of spokes as a whole. This is also true in both the plasma case and in Alexander's living environment. It is relating this empty central space to human and social development that is the current challenge. It is for this reason that R Aitkin's work on "q-holes" in organizations is of special interest.[100] [101]
k) The essential weakness of attempting to describe the needed container is that it places an illusory emphasis of a static configuration, when in fact any static characteristics it may have are probably only a significant as in the case of "standing wave" phenomena. It is the dynamics of how the container works that needs to be better understood. This is also the problem in the plasma case, Alexander's concern, and in Aitkin's q-holes.

11. Individual and social development as mutual models

a) The previous section has pursued a line of argument to a point at which, whatever its merit as explanation, the significance is in danger of being lost to many. As pointed out by Feyerabend,[102] arguments need to be made accessible by avoiding abstractions and approaching the individual human scale to the extent possible. Centering the argument in this way is possible, but only by using the human-centred imagery which is the material of psycho-analysis.
b) The last section attempted to maintain the relevance to social development. The argument can be taken further by accepting a bias in favour of human development. The whole problem of containing plasma and relating to ch'i is encompassed by the concern in the Chinese cultural tradition with the "circulation of the light" as reviewed by Jung.[103] Thus a traditional text on meditation reads:

[95] idem, pp 270-277.
[96] idem, p259.
[97] Christopher Alexander. The Timeless Way of Building. New York, Oxford University Press, 1979, pp ix-x.
[98] Christopher Alexander. A Pattern Language. New York, Oxford University Press, 1977.
[99] Siu, op cit. p266.
[100] R H Atkin. Combinational Connectivities in Social Sciences; an application of simplicial complex structures to the study of large organizations. Basel, Birkhuser, 1977.
[101] R H Atkin, Muldimensional Man; can man live in 3-dimensional space? London, Penguin, 1981.
[102] P K Feyerabend. Realism, Rationalism and Scientific Method. Cambridge University Press, 1981 (Philosophical Papers, vol. 1).
[103] Richard Wilhelm (tr). The Secret of the Golden Flower; a Chinese book of life. New York, Harcourt Brace, 1962 (with commentary by C G Jung).

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"When the light is made to move in a circle, all the energies of heaven and earth, of light and the dark, are crystallized. That is what is termed seed-like thinking, of purification of the energy, of purification of the idea. When one begins to apply this magic it is as if, in the middle of being, there were non-being. When in the course of time the work is completed, and beyond the body there is a body, it is as if, in the middle of non-being, there were being."[104]

In this and related texts the parallel to the plasma is quite striking. Such a link between physical reality and meditative awareness has been noted by F. Capra.[105]

c) The problem frustrating human development is the inadequacy of the response to opposing tendencies or contradictions some of which were reviewed in an earlier section. Methods similar to the "circulation of the light" in different cultures respond to this problem. The explanation of the response is necessarily unsatisfactory because the "intrinsicalness" of life, as mentioned by Siu, is essentially experiential. "Light" in this context is very closely related to chi's, life and time. Siu illustrates this by examples from music and photosynthesis:

"Man is the most versatile in terms of the diversification and depth of temporal ramifications... In the case of man, however, something new is created upon the rendition of certain combinations and sequences of sound... Man has transformed something related to time into a heretofore nonexistent entity - a poem, a song, a symphony. We identify this time-related X as ch'i. We suggest that living systems possess some unique capability of marshalling ch'i, light would be looked upon as containing both energy and a time substance.

A given quantity of light would consist of certain units of energy and stretches of time-substance. The energy-component would be fixed in the dextrose molecule in photosynthesis, the time substance in a temporal matrix... Just as the dextrose molecule can be assimilated so that energy fixed therein can be processed in varying bits and pieces to be utilized for inanimate work, so can the temporal matrix be assimilated so that ch'i fixed therein can be transformed in varying stretches and compositions to be utilized for animate purpose"[106]

d) This harmonious relation to opposites can be effectively represented in dance and movement as in the case of t'ai ch'i reported by psycho-analyst June Singer:

"When Chung-liang dances, the circular process of life is made manifest... Change is the only constant, from one movement to another, from initiation to completion, to rest, to initiation again. The energy never stops, never pauses, never appears to be blocked. The circulation of the light, a goal sought in Chinese philosophy, takes place before my eyes. It takes place in the body of this man... Although in continuous movement, the body is always in balance; the balance is always asymmetrical, so that at any moment the design formed by the body is in the process of turning into is opposite."[107]

It is noteworthy that the interaction between this dancer and theoretical physicists resulted in a most remarkable description of the current frontiers of understanding of reality and how they are to be approached.[108] But the weakness of dance as a mode is that, once again, it is essentially right-hemisphere and as such a trap, preventing further advance.

e) Some of the dimensions of the trap constituted by right-hemisphere, person-centred expression are avoided by the philosophy underlying the performance of the traditional Rig Veda hymns in India. The performance seeks ways to avoid being locked into any particular mode of expression, although the performance necessarily involves the spontaneous selection of one mode amongst several. Adopting that mode for a period of time is seen as a necessary sacrifice or limitation of options in order to make use of a particular comprehensible language which will be abandoned as soon as the task is completed. This affirms the essential inadequacy of any given mode. The performer then effectively withdraws to an empty centre from which another mode will be chosen through which to continue the performance. This process is seen as a model of an appropriate response to daily life, as well as of a succession of incarnations.[109] [110]

f) The previous points suggest a way to communicate possibilities of human development, especially in a semi-literate society. In both cases left-hemisphere structural significance is effectively encoded on to right-hemisphere expression. Considered in these terms, much of the cultural material of psycho-analysis takes on a new significance for development. The problem with this approach is the continuing danger of responding to the material solely as a code (a left-hemisphere trap) or solely as an aesthetic experience (a right-hemisphere trap). There is a further danger, as illustrated by June Singer's work on androgyny as a goal of development,[111] which provides a valuable overview of such material from many cultures. Care must be taken in giving content to the synthesis of these two modes for, once again, this synthesis is primarily significant in terms of its dynamics and not in terms of any mechanical juxtaposition of attributes (especially as in hermaphroditism of bisexuality). The synthesis of opposites as encoded by the androgyne is not sexless, and therefore sterile, but rather the essence of fecundity and creativity. Even if is primarily intra-psychic, it is very doubtful whether the androgynous condition is as accessible as June Singer claims, although the future may be able to distinguish usefully the degrees of androgyneity.

g) An essential characteristic of the androgynous synthesis is that it can only be expressed, discussed and comprehended through the ongoing interaction of opposites, as effectively encoded by the relationships between the two sexes. Expressing the dilemma of the opposites in terms of the male/female relationship certainly has the advantage of making its complexity "accessible". It also draws attention to how little has been accomplished in moving creatively beyond this polarity. Given present inadequacy in handling male/female relationships (as indicated by divorce rates, discrimination, etc), it is highly probable that

[104] idem, p31.
[105] Capra, op cit.
[106] Siu, op cit. pp 261-262.
[107] June Singer. Andrology; toward a new theory of sexuality. New York, Doubleday, 1976. (pp 212-213)
[108] G Zukav. The Dancing Wu-Li Masters. New York, William Morrow, 1979.
[109] de Nicholas, op cit.
[110] E G McClain. the Myth of Invariance. Boulder, Shambhala, 1978.
[111] Singer, op cit.

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this inadequacy reinforces the pattern of suboptimum responses in other domains, in which polarities must be handled. It is also significant that the major product of this relationship as presently conceived, namely children, is what ensures the major pressure on planetary resources through the population explosion. It is also significant that this very relationship provides one of the major motivating forces for individuals on which much merchandising is directly based.

h) The relevance of the above argument is based on the assumption that the male/female relationship can be understood as encoding other polar relationships. This is a source of major difficulty because the dynamics of the male/female relationship are so "fascinating" to the participants that they do not encourage reflection or generalization. This suggests that they tend to be perceived through the right-hemisphere thus making the argument into a circular one precluding any transcendent synthesis. Nevertheless much cultural material of psycho-analytical significance is encoded onto the male/female relationship and its products, suggesting the possibility of such a development under certain conditions presumably triggered by traumas.

i) It would seem that there is a vital link to be established between the understanding of human and social development and the understanding of male/female relationships as exemplified by sexuality. The link between sexuality, population increase and war are fairly evident as a "negative" self-correcting cycle. It is the corresponding "positive" development cycle which is unclear and it is interesting how easily the validity of this area of concern is rejected as irrelevant. It is politically highly sensitive. In fact it is appropriate to note that any psycho-cultural phenomena involving alternation of oscillation is rejected, "frozen" into one of its modes, or characterized by traumatic discontinuity (as in the switch in power between political fractions following elections of revolution). A significant exception is the "good-guy/bad-guy" technique employed by teams of interrogators.

j) The same inflexible attitude is characteristic of certain traditional religious practices in support of human development. In many religions the relationship between polarities by-passes the male/female relationship and is encoded into the individual, especially into a highly disciplined approach to the breathing cycle of inspiration/expiration. Within such a framework, obstacles to individual development are seen as encoded into irregularities in the breathing cycle. This approach is claimed as of great value to human development (e.g. in yoga). The price of success is however the obligation to freeze the dynamics of the individual's male/female relationships in society. In this sense the monastic tradition, for example, is unable to encode any creative understanding of male/female relationships in society.

k) The previous point indicates that there is a high price to pay if polarities are to be usefully encoded onto the individual. Since few are tempted to pay that price, it is appropriate to look for ways of encoding polarities into a left-hemisphere presentation of the range of functions operating in society. Hence the interest in classification schemes. In parallel there is value in using the environment, as perceived in the right-hemisphere mode, as a way of encoding the polarities of human and social relationships.[112]

I. CONCLUSION

It is too soon to assess the merit of this approach in terms of its more experimental aims. Hopefully their implications have however been related to the organization of the categories in such a way as not to affect its value as a practical tool. As such the result is an interesting compromise between theory and practice with the merit of emphasizing the dimensions of innovative change and the value-related experiences in the name of which it is advocated.

The effort made to incorporate these less tangible dimensions in positions similar to those usually only accorded to the more concrete manifestations of human activity calls for a careful evaluation. It does attempt to reflect the concerns underlying recent major international projects, such as that of the United Nations University on Goals, Processes and Indicators of Development. This questioned the traditional "value-free" approach to serious scientific activity[113] [114] and the efforts to avoid consideration of non-material human needs.[115] As the first stages of what is hoped to be an ongoing experiment, it is natural that much may be modified for future editions. But whilst this experiment is definitively not value-free, it is hoped that is helps to clarify ways in which a variety of seemingly incompatible value biases can be usefully balanced.

The prevailing assumption that classification is an objective, neutral activity may be what in effect severely reduces the value of its products as a support by which international organizations can be empowered to act more effectively. It may thus reinforce the importance they experience in the face of the problems on which they are mandated to act.[116] As pointed out above, the classification of each item of concern to the international community can usefully be seen as a political act. The treatment of "homelessness" as a sub-category of "sociology", a theoretical discipline, is indicative of the manner in which problems can be swept under convenient intellectual "carpets" in order to avoid acting upon them directly. Indeed each item classified in any international classification system needs to be assessed in the light of its implications for problem-solving. It can be argued, for example, that the choice of classes or subject fields reinforces and legitimizes their organizing influence in society such that each becomes a domain in which a different kind of significance is accumulated, usually at the expense of society as a whole.[117]

Classification schemes are the basis for user access to international information systems. As pointed out on the occasion of a recent conference on intergovernmental documentation, such systems are not yet adequately designed to facilitate societal

[112] Judge. The territory constructed as a map.
[113] Johan Galtung. Methodology and Ideology. Copenhagen, Christian Ejlers, 1977.
[114] Johan Galtung. The True Worlds; a transnational perspective. New York, Free Press, 1980.
[115] Lederer, op cit.
[116] Christian Delacampagne et al. Penser/Classer. Le Genre Humain. Paris, Fayard, No 2, 1982 (special issue).
[117] Judge. Development through Alternation.

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learning in order to counter the marked erosion of collective memory.[118] A Club of Rome report[119] specifically identified the need for innovative (shock) approaches to societal learning to counter the weaknesses associated with the adaptive (maintenance) approach built into the organization of current information systems. These tend to be totally unprepared for future crises and developments. It is for such reasons that it is appropriate to take the kinds of risk inherent in an experiment of this nature. Although errors are to be regretted, they are a useful indicator that risks are being taken in an endeavour to find a basis for a more appropriate mode of response. As pointed out by Donald Michael:
"More bluntly, future-responsive societal learning makes it necessary for individuals and organizations to embrace error. It is the only way to ensure a shared self-consciousness about limited theory, and hence about our limited ability to control our situation well enough to expect to be successful more often than not."[120]

The weaknesses of this volume as a practical tool are partly those of any computer-based retrieval system, namely the presence (or possibility) of a percentage of misplaced entries within any category. Weaknesses at this stage are also associated with the fact that, as an experimental procedure, problems can only be eliminated progressively in an iterative "semantic tuning" procedure. Hopefully however these first editions already indicate the possibility of organizing information on international organizations in a manner which highlights functional relationships relevant to the emergence of a new world order. To the extent that this has been achieved in some measure, it may be considered a first step beyond the current subjects and discipline-oriented approaches. These are only distantly related to the dynamics of relationships between functional domains and the problems of comprehending them and communicating the nature of such interdependency in support of problem-oriented action.

[118] A J N Judge. Societal learning and the erosion of collective memory. (Introductory report for 2nd World Symposium on International Documentation, Brussels, 1980). In: Th Dimitrov (Ed). International Documentation for the 80s. New York, Uniflo, 1982.
[119] James Botkin et al. No Limits to Learning; bridging the human gap. Oxford, Pergamon, 1979 ("A Report to the Club of Rome").
[120] Michael, op cit.

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