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Functional Classification II

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Continuation of article published in Int. Classif. 11 (1984) No. 2, p. 69–76. Review of the problems and possibilities of classing the 20 000 international bodies and treaties described in the *Yearbook of International Organisations* as well as their preoccupation in the form of “World Problems”, disciplines and occupations described in the *Yearbook of World Problems and Human Potential* (9 000 entries). Describes the design considerations for an alternative approach as compromise between the practicalities of directory production, facilitation of classification experiments, and an emphasis on incorporating richer patterns of relationship between activities to facilitate understanding of functional interjections.

The first approach was developed from *I. Dahlberg's* ICC Scheme modified in the light of insights from the periodic classification of chemical elements. The result is compared to a presentation of interrelationships of different levels of inquiry and modes of experience arising from a study by *Eric Jantsch*. The resulting experimental matrix of codes, discussed in the second part was used to class titles by computer which were published in Global Action Networks, classified directory by subject and region (Vol. 3 of the *Yearbook of International Organisations*).

(Author)

5. Implementation: Matrix (Current Edition)

As stressed above the classification is designed to be modified. For the 1983 and 1984 editions the design can best be described in terms of the classification matrix and specifically in terms of the definition of its “semantic cell” on the basis of the levels (rows) and columns in Figure 6. 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 (26), 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 (27, 28) in an attempt to reconcile the qualitative results, from different cultures, of exercises in classifying the same range of attributes into 1, 2, 3, . . . of N categories (see also ref. 68). The situation here is of course complicated by the apparently heterogeneous nature of the qualities to be balanced. Hence the experimental nature of this approach.

This article also appears in the publication to which it refers: Union of International Associations (Ed.) Global Action Networks; classified directory by subject and region (Vol. 4 of the *Yearbook of International Organisations*). München: K.G. Saur Verlag, 1984. 2nd ed. 1984/85. For reasons of space, two concluding sections are omitted in the version printed here.

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 have been selected as recognizable common terms indicative of some percentage of the significance to be associated with each such cell. At this stage no attempt has been 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.

5.1 General structure

Before discussing the structure in more detail it is appropriate to note a general structuring device which has been 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 domains (e.g. science, religion, commerce), whether as expressed in relations between international agencies, between university faculties or between their departments (28). 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 (29). 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 have therefore been organized in an alternating manner to reflect the extremes of these dichotomies. In levels 8–9 and column 9, areas are reserved for the “transcendence” of these dichotomies. Where the row and column dichotomies do however “interact”, cells of three distinct types are 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).

5.2 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 imple-

mented, rather than disguising them as the subject matter of psychology of 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 (30).

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.

5.3 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), adaption 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.

5.4 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 Figures 3 and 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.

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).

5.5 “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.

5.6 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 counterbalance that function. This is most clearly seen 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.

5.7 “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.

6. Implementation

6.1 Word coding (1983)

Using the original computer extracted word list of 11,000 items (mentioned above), a procedure was adopted for the 1983 edition whereby significant words were first given a 2-digit code according to Figure 6. 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 7500 words were used (see Subject Index), 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 which can be considered as "elements" and those which should be treated as "compounds" of such functional elements. Although only in the first stage of its elaboration, this is the intended distinction between Section W and Section X.

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 in Section X because of their multi-functional nature. Further attention will be given to this problem in future editions.

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 Section X. 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.

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 hoped that for a future edition the organization within the 2-digit cells can be made 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 experiences which are more concrete and those which are more transcendental.

6.2 Section generation

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 the three main sections of this volume (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 name/address entry was allocated to the relevant categories in the different sections of this volume.

Where the kinds of keywords in the name of an organization made the above procedure inadequate, it could be 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"). Only following this stage was it possible to obtain

an accurate count of the number of entries that would result by section, and hence to determine the number of pages which would result. On the basis of this information certain types of entry could then be filtered out to bring the total number of pages down to a figure acceptable to the publisher. Possible filtering strategies are the omission of Section X entries for certain categories of organization (e.g. those from Yearbook Sections E or F), omission of all entries (e.g. those from Section H), or inclusion of entries associated with selected cells only (e.g. those for "international relations" from Section G).

The final sorting of the individual entries into sections was then completed by computer up to and including the generation of photocomposition pages ready for print. Statistical tables were produced as a by-product. A summary is given at the end of the volume.

6.3 Revision (1984)

The results of the above exercise were reproduced in the first edition of *Global Action Networks* in 1983. As planned, those results were reviewed as part of the production of the revised 1984 edition.

The thesaurus was automatically extended from 11,000 to 13,604 words by incorporating words from names of new international organizations and world problems. Nearly 8,000 words have now received subject allocation codes placing them in the active part of the thesaurus. 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. This has now resulted in the allocation of organizations to more subjects, especially since selected keywords in the body of the organization descriptions were also used to determine subject allocations.

It was also decided that the percentage of acceptable mis-allocations in the 1983 edition was too high. Three techniques were used to reduce this percentage for the 1984 edition:

- (a) words generating an excessive number of mis-allocations were eliminated from the active part of the thesaurus. 85 words, namely 1.2% of the active thesaurus, were treated in this way.
- (b) The mis-allocation of specific subject codes to some selected organizations was inhibited. 390 such allocations, namely 2% of the organization allocations, were treated in this way.
- (c) Allocation of some subject codes to specific organizations was forced where it would not normally have occurred. 145 allocations, namely 0.7% of the organization allocations, were forced in this way. 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", "international relations", and "intergovernmental organizations").

The pattern of codes in the matrix was reviewed. But despite the specific facility for doing so, no major modifications were made. Aside from the changes noted above, of the 8000 words in the active thesaurus, code changes were made to 50 of them, namely 0.6%.

The major modifications planned to levels 8 and 9,

the most difficult area of the matrix, were postponed in the light of ongoing work on "human values" and "states of consciousness" for the 1985 edition of *World Problems and Human Potential* (70). The 2,600 "world problems" from the 1976 edition, which were incorporated into the 1983 edition of *Global Action Networks*, had been increased to 4,800, at the time of preparing the 1984 edition. These were duly included. (The 1985 editions of both publications are planned to complement each other). The above changes and the natural increase in the number of organizations, have significantly increased the size of the publication.

7. Pattern Interpretation Possibilities

Part of the original intention was to experiment with patterns which 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 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 how-

ever 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 has been 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 millions 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 signaling 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 (31). 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 (32). It is for this reason that a section on metaphors appears in the 1985 edition 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 of 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 (12, 13, 33) including the Rector of the United Nations University (34). 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* (35). 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 8 levels and 8 columns of Figure 6. 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 (26). A related approach is being used to classify "human values" in the 1985 edition of *World Problems and Human Potential*.

8. Envisaged Developments: Future Editions

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 supplement-

ed, 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 Section E, organizations. It is also possible that some attempt will be made to relate this volume to the International Congress Calendar (36). 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, it is hoped at some stage to include in this volume computer-generated maps of the networks of relationships between organizations and world problems. The set of these maps would then constitute a rather unique form of "atlas" from which valuable overviews could be obtained.

9. Comments

9.1 Classification as a political act

1. 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 encyclopaedia which omits any entry on "torture" (37). 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 (5).

2. Classification schemes tends to denature and neutralize the functional significance of categories, by excising their nonconceptual 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.

3. 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 worldview. As such they can only do violence to non-western cultures in their present form.

4. 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 (38). Many existing systems are allowed to "bulge" in favour of hyperactive functional development (technology, industry, etc) at the expense of functions

which are politically insignificant (religion, ethics, art, etc) at the present time.

5. 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.

6. 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 included. A means is required to reactivate the information and the users by changing their relationship to the scheme.

7. Designers of a classification scheme necessarily engage in a process which 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.

8. 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.

9. 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 unuseable in the political arena, except in relation to the Third World.

10. The above considerations suggest the need for a politically "aggressive" approach to classification which does not simply accept the result of discipline political activity, empirebuilding, or blinkered manipulation of other functional domains. A political stance is required with regard to the need to "see things whole".

9.2 Flexible open-ended approach

1. This initiative is funded largely because of the value of the resulting check-lists by functions or "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 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.

2. 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.

3. 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 (39).

4. This approach responds to the requirement that inte-

gration itself should not be closed and final – or else the integration scheme is itself an obstacle to change rather than flowing with it.

5. 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.

9.3 Distinguishing functions

1. Given that much effort has been devoted in the past (14) 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 cluster 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.

2. 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 (28, 27) were used as possible guidelines, as was the structure of the periodic table itself.

3. 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 (28). 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 (40, 22).

4. 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 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.

5. 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 (13).

6. 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.

7. 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.

8. 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.

9. 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 man. Fish are not only to be understood as “fish-able” for man. 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 problem for man. In addition, such narrowness closes off any possibility of inter-species understanding, ignoring such questions as animal education and the intelligence of dolphins and whales, with all that that could imply for their rights with man on the planet in a more enlightened culture.

9.4 Function pattern

1. “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.

2. As suggested by Bohm (11) and Thom (41), a more realistic approach is to use verb “descriptors”, thus emphasizing the essentially dynamic processes of development (see also ref. 59).

3. 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.

4. An integrated pattern of categories is essential if functional integration is to become in any way a reality. In many classification schemes categories are grouped arbitrarily with little, if any, concern for the relationship between functions.

5. Classification schemes tend to conceal the absence of categories which do not relate to the functional preoccupations of those elaborating the scheme. Such categories are signalled naturally in an integrated pattern.

6. An integrated pattern should lend itself to percep-

tion through different "cuts", according to depth of interest and level of complexity tolerated.

7. To contain the complexity and range of differences, the pattern of integration should highlight differences as well as similarities.

9.5 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 subject 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:

1. Occupations or professions which together reflect the pattern of human resources in an integrated society.
2. Institutions, organizations and groups. Of special interest is the correspondence with government ministries and agencies, especially as the country develops.
3. Types of building (or parts of a town), as well as rooms (or parts) of a home.
4. Organizational or community roles.
5. Information systems or styles of information processing.
6. Characteristic human needs and satisfiers associated with many of the functions. Together these should reflect an integrated pattern of human needs.
7. Characteristic values and possibly characteristic mind-sets, ways of being or weltanschauungen.
8. Characteristic events, objects, and processes and their associated characteristic concepts of change.
9. Characteristic methods, tools, distinctions and problems.
10. Characteristic human activities. These should correspond to the elements in a time budget analysis.
11. 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.
12. Characteristic images of man.
13. Characteristic educational processes. Together these would make up an integrated educational programme, corresponding to the organization of curricula and sets of university faculties.
14. Characteristic decision criteria, constraints, blind-spots, biases, strengths and weaknesses. In many cases there would also be things which are considered self-evident or inconceivable.
15. Characteristic social and other indicators.
16. Characteristic constituents of a system.
17. Characteristic metaphors.
18. Characteristic associated verbs, possibly based on such action-oriented suffixes as: "-ization", "-izing", "-icizing". (cf. Thom 41, Burger 59).

9.6 Dynamic relationship between functions

I. As has been repeatedly stressed here, for integrative purposes the functions should not be considered in isolation one from the others. Some functions clearly sub-

stitute for one another under some conditions, others compete with each other. It is important to arrive at some understanding of this dynamic pattern.

2. Several analogies may provide useful guidelines to explore these relationships:

- input/output matrix: as in the standard analysis of economic sectors, there is value in exploring the pattern of exchanges between the functions
- periodic table: as with chemical elements, the pattern of possible interactions, the degree of reactivity, and the resulting composites are worth exploring
- 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
- 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 (35) (69)
- time budget: the pattern of interactions can also be explored in the light of time budget analysis.

3. The computer programme is designed in such a way that copresent 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.

9.7 Non-linear and oscillatory functional relationships

1. The point was made earlier that to be meaningful the pattern must provide for the presence of 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.

2. In order to be hospitable to discontinuity the scheme must somehow encompass the non-rational character of disagreement (28). This implies at least a distinctly non-linear relationship between such functions.

3. The most accessible indication of the possible nature of this relationships is that between right- and left-hemisphere modes (29), and the essential difficulty of integrating them. The functional consequence is an oscillation between the two modes according to the task to be performed.

4. 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.

9.8 Implication for modes of comprehension

1. 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 (42), 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 which 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.

2. It could therefore be very fruitful to explore how psychological types are reflected in the classification scheme. The work of CG 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 of 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 that would imply for the dynamics of their relationships and the problems of the development and maturation of such collectivities.

3. 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.

4. 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.

5. 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

(32) — whence the value there 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 (27). 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 an earlier paper (27).

6. 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:

- (a) player positions and attack patterns in a football game
- (b) pieces and attack/defence patterns in a game of chess
- (c) katas and attack/defence patterns in interpersonal combat
- (d) recognized tactical and strategic ploys in military combat and business competition
- (e) diagnosis of a particular disease
- (f) recognition of a plant or animal species in the wild
- (g) 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.

9.9 Need for a development "container"

1. 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 "home-base" or goal. As such it is a fundamentally anti-developmental form of representation, despite its obvious convenience and efficiency.

2. 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.

3. 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 for each UN "year"), or a person (e.g. Mère Therèse). 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.

4. Once again there is a dilemma, namely the choice between the limitations of "flatland" (43) 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?

5. 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 "cemetries", whatever their limited merits. It is possible to alleviate this imprisoning effect by seeking some form of synthesis between the two modes.

6. 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 (31, 44). 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 (11, 45, 46, 47) and the related essential problem of the inadequacy of particular conceptual languages (48) to "contain" the complexity of experience.

7. 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 (27). 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.

8. 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 (49, 50). This in fact over-emphasizes 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 development, whatever their merits for some people in the short-term.

10. 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 (51, 52) and the efforts to avoid consideration of non-material human needs (30). As the first stages of what is hoped to be an ongoing experiment, it is natural that much may be modified for the next edition. But whilst this experiment is definitely not value-free, it is hoped that it 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 impotence they experience in the face of the problems on which they are mandated to act (53). 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 (25).

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 learning in order to coun-

ter the marked erosion of collective memory (55). A recent Club of Rome report (56) 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 as to the nature of social dynamics, about limited data for testing theory, and hence about our limited ability to control our situation well enough to expect to be successful more often than not" (39).

The weaknesses of the 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 the first two 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 subject 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.

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