I / COMPUTER-AIDED CONFERENCES

- Enhancing communication at a large conference festival 85

- Facilitating the networking processes of a trans-national university using computer conferencing 94

- Development beyond "science" to "wisdom"; facilitating the emergence of configurative understanding in "Councils of the Wise" through computer conferencing dialogues 104

The first paper discusses the use of computers to enhance communication at a conference. The second discusses ways in which computer conferencing could be used to facilitate and focus conceptual activity and integration amongst a geographically dispersed group. The third paper explores the current limitations of the computer conferencing technique in relation to the need for wisdom in addition to know-how, however specialized.

Enhancing communication at a large conference festival

Introduction

The purpose of this document is to outline some practical options for use of computer-conferencing techniques to facilitate a variety of interactions between participants at a large conference /festival /exhibition. The document has been prepared in response to the encouragement of the organizers of several large conference /festival events who are looking ot the possibility of using such techniques in the near future.

It cannot be stressed too strongly that the advocates of this approach consider it to be a **breakthrough in interpersonal communication** of as much significance as was the telephone. Many new forms of interaction become possible, particularly that of making contact (possibly anonymously) with people whose names one does not know but who have similar interests and projects. This type of communication environment can support a whole new style of people-organization. However, there is a real difficulty in explaining the nature of this breakthrough into an « altered state of communication ».

« Most of our intuitions about face-to-face interaction simply do not apply to this new and unusual form of communication. In computer conferencing, time and distance are dissolved... Each person's « memory » of what has been said is accurate and complete. And everyone may speak at once or listen at leisure. With such features, it is not surprising that computer conferencing might actually establish an altered state of communication in which the realities of face-to-face communication are distorted and entirely new patterns of interaction emerge » (Jacques Vallee).

This document will not give detailed background information on computer conferencing, since an explanatory survey convering a variety of viewpoints has been produced as a special issue of Transnational Associations (October 1977).

As opposed to the main use for which computer conferencing is advocated, namely linking people who are geographically dispersed, **this document focuses on its use for linking people attending a large conference or festival.** This does not exclude the possibility of linking in people at more distant locations.

It is vital to understand that a conference /festival is not dependent upon the use of this technique, if employed, but that it is a catalyst and support for new kinds of interaction. Participants can choose to use it or ignore it as they see fit.

Context

Experience with conferences of more than about 40 participants indicates that despite physical proximity people frequently do not « make contact » although they may have common concerns, interests, etc.

It is not uncommon for people to recognize their mutual interest at some closing event or even months or years after the occasion at which they were both present. Since a principal objective is to use the concentration of human resources for participants to further their shared concerns, missed contacts are a sign of sub-optimum organization.

A conference /festival which only encourages participants to maintain a role of « consumers » of exhibits, lectures, and displays does not make use of the « critical mass » of people present. Many participants would be pleased to benefit from the stimulating influence of the occasion to make other things happen, to explore shared interests with others who may be present, and to bring new projects into being. This introduces a special dimension of spontaneity and creativity which no other occasion can adequately provide. Although not essential, computer-conferencing techniques can do much to make this « multiplicative interaction » take wing and to nurture its development. It can certainly take a lot of the burden off the organizer.

It is also true that the more active or eminent participants tend to suffer from « contact overload » because of the time which each face-to-face contact demands on such occasions. Such key people therefore normally have to « manoeuver » to reduce the risk of new over-demanding contacts thus reducing their value to the occasion adn cutting themselves off from some new contact which they would find valuable. Computer-conferencing provides a means of « filtering » contacts without « loss-of-face » to either party. It helps to improve each persons use of his own time and energy.

The opportunity for anyone to send messages to anyone means that question /discussion periods at the end of lectures do not have to bear such a communication load and are not terminated at some arbitrary moment by time constraints. Those most involved can continue to interact via a computer conference. Participants can continue to ask questions of the speaker via computer without competing for question time at the end of the lecture. (similarly participants can leave messages for exhibitors to send them documentation if a stand is busy.) Such opportunities illustrate the significance of this new communication support as a new level of subtle organizational support for people interaction. Its full significance remains to be understood.

Goals

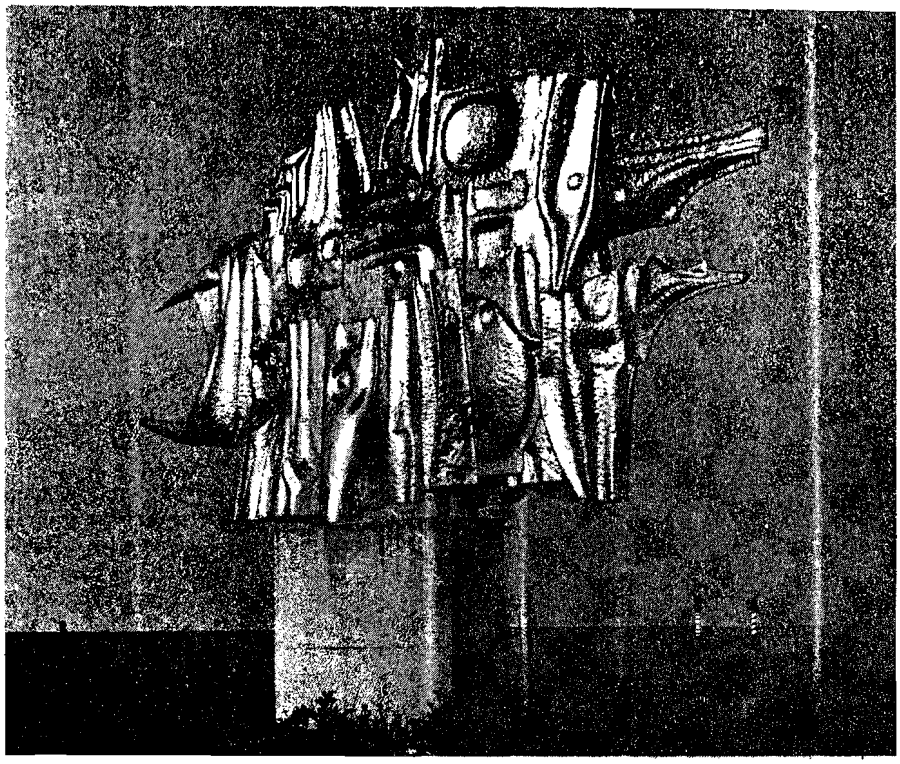
An ideal checklist of communication requirements during a conference has been developed (International Associations 1976, pp. 34-37). But this goes beyond some of the current possibilities. It is useful to note briefly the following realistic goals which a conference /festival should attempt to achieve :

— Each participant should leave with the belief that he or she has been provided with an environment which made possible the optimum number of useful contacts under the circumstances (including unexpected, serendipitous contacts) and that the limit to further contacts and sharing did not lie with communication obstacles in the conference /

festival process but with his or her ability or desire to handle more links.

— Each participant and group representative should leave with the belief that the communication process has facilitated (rather than hindered) the emergence of whatever new joint activities / projects were possible, between what ever possible coalitions of people and groups, with whatever degrees of coordination were possible.

— Each participant and group representative should leave with the belief that through their interaction during the conference / festival they have satisfactorily enrichened the communication data base which facilitated their interaction and which can be appropriately used without loss of momentum to develop followup contacts (mailings, publications, etc.) prior to the next occasion. (In effect the communication environment is made up of an evolving network, a new kind of decentralized organization with many focal points. Each succeeding conference / festival merely reinforces and re-energizes the whole process.)



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Description

The following description has been divided into two parts :

A Participant's perspective

B Organizer's perspective.

Clearly unless the first constitutes a credible and desirable environment, the second is irrelevant. However, providing a description from the participant's perspective necessarily precludes a logical step-by-step explanation. Some points are therefore repeated or could be much more succinctly expressed from the second perspective.

A : Participant's perspective

1. **Entry :** Participants would register or purchase tickets in the normal manner (possibly in advance to reduce queuing), since this process should not be disrupted.

2. **Communication environment :** Various means would be used to make participants aware that they are entering a « communication environment » (such means could include preliminary write-ups, hand-outs to those queuing, leaflets in preliminary mailings, etc.). Participants should be made aware that they can choose to increase or decrease their involvement in the communication process. Clearly the minimum level of communication is to simply purchase a ticket, examine the exhibits, then leave. Greater involvement is achieved by talking to exhibitors or trying out some of the exhibits, where appropriate. These are the conventional options on such occasions.

3. **What's on :** Should a participant desire to become slightly more involved in the communication environment, he may simply want to identify what spontaneous get-togethers are emerging as a result of the interaction between those more deeply involved. (Some of these get-togethers may be face-to-face meetings or lectures in rooms selected up to the last moment according to indicated attendance; others may be group discussions with stored messages via computer, particularly where face-to-face meetings are unnecessary or impossible because of the tight or incompatible schedules of those intrested, or the limited availability of appropriate rooms; the latter may lead to the former, and the former may be continued by the latter). To obtain this information, the participant would go to one of several information desks around the festival area. There he could be supplied, possibly for a minimum fee (e.g. $ 4,25), with a copy of the latest activity report relating to the general area of his interest. (Such reports could be generated every hour or so, edited with computer assistance, and then duplicated.) If he wanted more detailed or up-to-the-minute information, this could be obtained from the computer terminal at the information desk with the assistance of those stationed there (again, possibly for a minimum fee, say $ 0.50). With this information the participant can then choose whether to attend any of the « open » events or involve himself further in order to participate in some of the special interest event.

4. **Sending messages :** The participant may wish to limit his further involvement to sending a message to one or more identified participants, e.g.

— you left your coat in my car; I will be at Stand 42 from 10.30 til 10.45.

— I liked your lecture; do you know of J.R. Websters book on the topic. Title : Tomorrow and Again.

— I liked the questions you asked at Smith's talk. If you are free I will be at meeting point 15 at 2.30.

— Make sure you speak to Ken Jones on Stand 29.

Such messages do not require that the participant identify himself. To send them, the participant can go to any information desk and either dictate them to the assistant there or fill out a message form (rather as when sending a telegram). The participant would normally be charged some suitable fee for each message.

5. **Receiving messages :** In order for the participant to be more involved he needs to be able to receive messages. Such messages will be stored by the computer until he deletes them. But for the computer to store them it needs an « address » or identifier for him. The **simplest address** is the participant's name. This may be used for sending « general messages » when it is not known whether someone is more specifically identified. (It is not very satisfactory because John R. Smith may list himself as J. Smith, of which there

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could be several. And people sending messages to J.R. Smith would miss him. However, the organizers may arrange for someone to link such partial identifiers to precise identifiers where the messaged participant is in fact more involved.)

6. **Acquiring a conference / festival identity :** The next level of involvement is that at which the participant effectively fills out a « communication form », if he so desires. The form could also be sent out (and returned) in advance by mail or be included in the periodical produced by the organizers. It could be handed to people whilst queuing and would be available at information desks. Or the contents could be dictated at an information desk. The main purpose of the form is to allocate a unique indentifier to the participant (this could be the entrance ticket number, registration number, an alphabetic code, or some other number).
The participant can fill out as much or as little of the form as corresponds to his intentions and interests. The contents can be revised whenever necessary during the conference / festival. Such a form might include items such as :

— *unique identifier*
(possible prestamped on the form)
— *pseudonym*
(if the participant does not wish his real name to appear in the participant directory and wishes to exchange messages anonymously or with known contacts)
— *name ← address*
(the address may be omitted entirely, only supplied in order to receive mailings, or also supplied for listing in the participant director)
— *organization(s) represented*
— *topics of interest*
(topics in a standard checklist could be selected; non-standard or new topics could also be listed by the participant).

Other details could be included concerning : what he or she wants to contribute to or get out of a sharing process on a particular topic; the maximum size of group in which he is prepared to participate; preference for lecture, discussion, action, etc. Again a fee could be charged to cover the cost of inserting this information into the computer

7. **Exchanging messages :** Once the participant is identified in the communication environment, his name or pseudonym is listed in a conference / festival directory which is maintained on computer. (It may be « consulted » via any terminal or information desk, parts of it may be listed on request and for a fee for participants interested in a particular topic, but is is unlikely that the whole directory will be listed out and distributed.)
The participant will now start to receive messages of various kinds. They will be stored in the computer either for visual inspection at any terminal or else he may request that they be listed out on paper every hour for collection at a « pigeon-hole ». The nature of the messages will be determined by the information and « filters » supplied in the « communication form ». Messages may include any of the following :

— invitations **automatically** addressed to anyone interested in a standard topic (or combination of topics)
  - reminders to visit certain Stands
  - reminders to attend certain lectures, panel sessions, etc. at the festival or in the future.
  - reminders to purchase certain products or services (e.g. books, periodicals, etc.).
  - calls to subscribe to a declaration on some current issue
  - calls for collaborators on a joint project.
  - calls for papers for a future conference.

— invitations **specifically** addressed to the participant in the light of something he or she is known to have said or done at the festival / conference or previously
  - suggestions that he meet up with a group of people for an informal discussion
  - suggestion that he speak to a group on a topic (possibly of his choice), either during the conference / festival or at some later date
  - suggestion that he participate in one or more computer miniconferences (see below).

— a variety of messages from people who want to make contact with him, give him information, or pass on messages from friends (e.g. « Don't forget that Jane wants us to meet at 5.00 pm to go with the others to Bill's. Don't forget the leaflets. Anne »). The possibility of exchanging such apparently trivial messages increases the fluidity of any occasion as much as the telephone increased the fluidity of normal social life in comparison with the messenger era of the past.

He may also send questions to other identified participants to which they can respond if they so choose. Some of these exchanges between two or more people via computer may be continued sporadically throughout the duration of the conference, particularly if the people concerned have commitments which prevent them from getting together in one place.

8. **Joining a computer-conference :** The next possible level of involvement for a participant is to link together with up to 50 or more people in a « computer mini-conference » on a special topic on which they all have an active interest. Some computer mini-conferences may be deliberately prepared by the organizers prior to the occasion in collaboration with interested individuals or groups. Others emerge in the light of the meeting process, possibly stimulated by a particular lecture or other event, or possibly as a result of the networking activities of one individual or group. A participant can collaborate in as many of the computer mini-conferences as interest him — and in each he will be linking with a different network of people. From the participants point of view, one of these mini-conferences operates in the following way :

— he registers himself by a message to the focal person for the mini-conference who incorporates his name in the list of members of that conference.

— the new participant may now obtain any of the following (either directly on a terminal or listed onto paper) :
  - list of other participants and their interests
  - the current « agenda » of that mini-conference
  - the text of statements made by one of more participants on any agenda item

— as a participant he may now
  - send private messages to any of the other participants in relation to any agenda item
  - make general statements on any agenda item for examination by all participants
  - propose new agenda items (e.g. projects, discussion points, etc.)

— one of the conference participants may take on the role of « editor » in order to
  - select and structure the stored statements into a draft « report » or « news bulletin », if such is required
  - amend a draft report in the light of comments from the other participants, then list it for duplication and circulation.

— as a participant he may express a « feeling / vote » on any stored statement to help the group move toward some degree of consensus.

— as a participant he could use a private « work space » to draft out a major statement, sharing it with selected other participants of that mini-conference, before releasing for general consideration.

Clearly a particular mini-conference may range from a casual interchange (without any effort to reach conclusions or produce a collective statement) or else it may be a very intensive interchange using all the facilities available. It is up to the participant to choose his preferred mode in each case. If he is simultaneously a member of other computer mini-conferences, he may (within a space of minutes, or at his convenience) bring up to date his contributions to each of them.

9. **Conference / festival networking :** That last possible level of involvement for a participant is as an activator or network broker. Such key individuals may choose to make it their function to scan the conference / festival directory (possible in the light of messages exchanged with other key people) in order to propose to specific people that they meet together or that they link together in a computer mini-conference on topics they apparently have in common.
They may also chide some of their participant-friends for inappropriately defining themselves on the communication form, and thus disguising their full importance to the occasion and to others present.
Others may selectively survey participants to determine what mental models they are using which may influence the kinds of topics (and people) they believe to be mutually relevant. Such models can be distributed to participants or displayed on wall charts on a special Stand. This kind of activity help people to see « where they are at » in relation to other participants.

10. **Involving other towns and countries :** Not everyone can be physically present at a conference / festival some or all of the time, whether because of the cost of travel, or because of other commitments, or because they are only interested in a special aspect of it which does not justify their presence. On the other hand some may not wish to be physically present for personality, prestige or political reasons and would prefer to participate under a pseudonym from a distance. Such individuals and groups can however participate more or less directly by the following methods :

— by telephoning a conference / festival message desk (a) to see whether there are any computer-stored messages for them, and (b) to dictate messages to be stored for other participants (possibly as members of mini-conferences)

— by a computer terminal linked by telephone line to the network of terminals at the conference /festival (e.g. a terminal already installed for other purposes at a university or some other institution)
— by telephoning to a message desk at the location of the neares terminal (a) to see whether there are any computer-stored messagers for them, and (b) to dictate messages to be stored for other participants.

It would appear that **there are many unexplored possibilities for using « Intermediate » techniques** (including han distributed message lists, telephoning messages to free terminal locations and using the telex network) to link people and groups at distant locations into the conference /festival network.

11. **Computer games, art and distractions :** Aside from facilitating the sharing process between participants, at the conference /festival or elsewhere, the availability of computer terminals permits other (alternative) uses, either by particular exhibitors demonstrating on special stands or by participants in general.

Possibilities of interest ot participants include :
— various computer-based games (e.g. ecological games, decision games, educational games, etc.), computer simulations, etc.
— computer games for children who rapidly develop familiarity with terminals and the whole environment which they render possible.
— computer art (e.g. poetry, images, cartoons, etc.).

In each case participants can become actively and creatively involved in the use of these devices — whether for serious purposes or simply because they provide an amusing form of distraction.

In those cases where more than one terminal is used, there is no reason why some of the terminals should not be in other towns or countries. So, for example, a (ecology) game might involve participants at several US universities (e.g. the World Game group initiated by R. Buckminster — Fuller).

12. **Other possibilities :** The exciting thing about this new technique is that its special significance lies not in what the organizers expect 'participants to use it for, but rather in the other possible uses which will emerge as participants recognize its possibilities for helping them to do what they want to do better. And it is the young people who open up these possibilities most quickly.

B : Organizer's perspective

1. **General organization :** The presence of computer terminals and the use of computer conferencing techniques need not affect the general organization of a conference /festival. Such facilities are present to assist participants if they so wish, their presence does not make the communication dependent upon them. They may however assist the organizer.
2. **Number of terminals VS, number of participants :** The number of terminals which can usefully be installed needs to be explored in the light of the costs. Basically it is better to have more terminals rather than less. For, as with the telephone, the whole communication process is disrupted if participants have to wait an inordinate length of time before being able to check for any messages received and to send messages of any kind. It would be counter-productive if only one terminal could be installed, for example, since its status as a « demonstration technique » would only impress the « hardware nuts », alienate the « people people », whilst contributing nothing to the communication process. A crowd of people around one terminal can represent a communication failure rather than a success. The availability of an unoccupied terminal is in fact an encouragement to a participant to explore the opportunities of this new medium.
Terminals : Preliminary contacts indicate that 16 terminals is already a respectable number at one location for a specialized conference. Given that some (say 5) would have to be allocated to information desks, some to « networking stands » (say 3), some for games and art (say 2), some for the organizer (say 2), this does not leave many available for casual use at a large conference /festival. It would seem that in a large conference /festival of, say, **2,000-5,000 persons physically present,** a minimum of 32 terminals would be necessary on site to enable the computer conferencing process to take wing successfully. At any lower number, some useful computer-based interaction could be facilitated and supported, but always with the danger of making it a gimmick rather a genuine adjunct to the communication process.

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Participant /users : Of those physically present, probably only a small percentage of active participants (say 5-10 %) would want to use the computer-conferencing facility several times per day. Others (say 10-20 %) would use it to exchange occasional messages, and others not at all. These percentages would of course vary with the kind of meeting and the subject matter but they can be controlled by varying the basic charges (or even by increasing the cost to reduce the demand at peak periods during the conference day). This is obviously not particularly satisfactory since it constitutes an artificial constraint on communication. But until more is known about how to balance demand against terminal /computer availability, it is a realistic and effective approach.

3. **Obtaining terminals :** Since there are few precedents for the use of this technique at large conference / festivals, especially outside North America, there may well be difficulty at present in obtaining many terminals for a one week period — although this should not be the case in the near future. Some of the standard ways around this are :

— contact the major hardware manufacturers to see whether they have spare equipment and are interested in the occasion as a promotional exercise.
— contact the companies leasing computer hardware.

Alternatively, or in combination with the above :

— contact the « computer underground » of people in the computer world who locate and use computer « free-time » for fun and are happy to share their enthusiasm on an appropriate occasion
— contact large universities which have networks of terminals (and may well be using the conferencing process with students).

The problem is to blend together the various opportunities which these different kinds of contacts can offer in the lifht of their respective costs. It may, for example, be possible to get enough terminals at an acceptable (subsidized) rental cost, by working with three different contacts.

The technology is developing very rapidly and, with the introduction of mini-processors, an interesting form of computer conferencing is possible with a set of « multi mini-processors » involving up to 16 terminals. One approach might therefore be to use two independent sets with whatever constraints that implied.

4. **Obtaining computer time :** Obtaining appropriate terminals is directly linked to the question of obtaining computer time. Whilst it may seem highly desirable to be able to link the terminals to a computer (possibly belonging to the conference centre) of which one has sole use, this is only practicable at this time at a major university — and the degree of dependence on one computer may be undesirable.

Basically the same contacts noted above should be consulted with regard to obtaining computer time. In addition, however, computer time may be obtainable from sympathetic institutions:

— *corporations*
— *government agencies*
— *universities*

as well as from commercial time sharing services (which may be prepared to subsidize the exercise for promotional reasons).

A special difficulty is that, for the computer-conferencing process to be completely successful, access to the main computer is required through (and ideally before and after) the hours at which the conference / festival is open. Compromises are always possible, but this is an important constraint. It should not be forgotten that it may even be easier to support the whole conference process from a major computer on another continent. In fact it may be easier to subsidize such an innovation in Europe by doing much of the computer processing at an appropriate institution in North America — where such innovations are more acceptable and where there might be interest in « tracking » the conferencing process for research purposes. Under such circimstances, an important cost would then be the data link between continents for which there are special rates (although various « piggyback » options may be available through sympathetic institutions.

5. **Computer failure and delays :** Despite enthusiasm for the computer-conferencing process, it should not be forgotten that computer systems fail. Under some circumstances back-up systems are always available, but in other cases everything is frozen. Failures of this kind can constitute a most unpleasant experience for all concerned. For this reason it is important not to make a « big prestige thing » out of the presence of computer terminal facilities. They should be treated in a low-key manner, whether or not all goed well. Promotional splurges should be made after they have been successfully used and not in anticipation there of — else the dramatic intercontinental opening link may be a complete flop.

Less serious, but nevertheless disruptive of the communication process, is the tendency for the central computer to be overloaded at certain peak periods. This leads to delays at each terminal before a message is accepted and before the terminal responds. The likely extent of such delays should be determined when negotiating for computer time.

6. **Distribution and status of terminals :** Menton has been made earlier of reserving some terminals for special use. Aside from terminals reserved for the organizers and those using them for special purposes (demonstration games, art, etc), a decision must be made about how to facilitate participant access to them.

Clearly it is important to have enough terminals at enough **information / message desks** to avoid crowding, queuing, etc. This use of terminals is always *either — verbally via the assistant at the desk or — in writing on a message form handed in (like a telegram).*

A distinction may usefully be made between this kind of general use and assistance and a form of more specialized (« personalized ») use and assistance. A **second category of terminals** could be scattered around the conference / festival area to which participants could go to engage in « assisted computer-conferencing ». At such points they would find someone who would send or retrieve any messages for them for whichever conferences they were currently active participants. As the participant acquired familiarity with the procedure he could perform the operations himself (with occasional questions to the assistant). Finally, he could switch whenever he felt confident to a **third category of terminals** which could be located in groups of 3 to 5 (say) with only one assistant per group. Note that the computer conferencing systems are designed to help and prompt the participant whenever he is in doubt so assistants are only really necessary to overcome the initial (but very important) psychological barrier.

7. **Distributing messages on paper (« hard copy ») :** In conventional computer conferencing, effort is usually made to avoid listing out messages on paper. In many cases the messages are flashed onto a screen for visual inspection and can always be retrieved from computer memory. However it is not practical to encourage this message browsing process when there is a constraint on terminal availability — and when, in contrast to conventional computer conferencing, each participant does not have his own terminal.

In a particular case, if he needs browsing time, an economic alternative is for the participant simply to indicate at the terminal which messages he wants to examine in detail. He then requests via the terminal (or via an information / message desk) that they be listed on a special (high-speed line) printer of which one or more could be installed at the conference / festival.

The collection of messages listed onto paper for each participant can easily be separated, folded and pigeon-holed by participant number until he comes by to pick it up from a special message distribution desk. Note that this is an option available in conventional computer conferencing systems but is less favored, because the terminal is usually a considerable distance from the (high-speed) printer — which is not the case in a conference / festival. (There could even be several such message distribution desks at different locations, each with its own printer, and the participant could specify to which he wished his message sent at any one time).

When there are many communications stored, participants should be warned in advance as to how much text they will receive in response to any request for such messages to be listed. In this way a participant can refine his request

rather than run the risk of receiving a kilo of paper, appropriately charged.

8. **Charging and subsidizing costs**
(a) **Equipment and general costs and subsidies :** As discussed above, it may well be possible to obtain considerable assistance from different kinds of contact. In addition to those mentioned, there is always the possibility of getting foundation support to reduce the effective costs. It is however usually difficult to obtain general support of this kind and it may be easier to obtain support for specific kinds of communication as discussed below.
(b) **Charging and subsidizing participants for enhanced communication :** One advantage of computer-assisted communications is that by its very nature the computer is capable of providing a precise count of all the elements which make up the cost of linking two or more identified people.

In conventional computer conferencing each person is usually given a budget (if the particular mini-conference is subsidized) via the organizer of that mini-conference. Or else each participant pays in advance for a fixed amount of computer use. In both cases the computer then deducts from the person's account every time he makes use of the facility. Charges are automatically made, for example, for :
— *time at the switched-on terminal*
— *number of characters of message sent, stored, and received*
— *number of lines printed onto paper.*

The participant can then recover unused funds, if appropriate.
At a conference /festival there are a number of possible approaches to covering the costs of computer use. A combination may be offered so that the participant can choose between them according to his needs.
Those below are listed in approximate order of the sums involved :

(i) **Cash payment for minor services :** When a participant only wants to make casual use of the communication enhancement, cash payments may be made to the person at the information / message desk :
— *to whom he gives a message to be sent*
— *from whom he receives information obtained from a terminal by an assistant*
— *from whom he receives messages on paper (via the high-speed printer)*

(ii) **Establishment of a participant account :** When the participant plans to make more frequent use of the facilities offered, and especially when he plans to use a terminal himself or participate in a mini-conference, then it is better to open an account. This may be done preferably with a fixed prepayment but possibly by invoicing the person after the conference /festival.
A normal procedure when opening an account is to link it to the participant's identify number (described earlier). In addition, however, it is usual for the participant to specify a password for himself which the computer will recognize via a terminal so that only he can use that account.
A similar procedure is adopted by anyone using a terminal, including an organizer, to ensure appropriate accounting.

(iii) **Terminal rental :** Some exhibitors or groups of participants may wish to rent one or more terminals for their sole use for a period of an hour, a day, or for the whole conference /festival. A special charge would have to be made for such exclusive **equipment** use, but it does not affect the need to charge for actual use of **computing time** as described above.

(iv) **Subsidized usage :** Some organizations or individuals may wish to encourage the communication enhancement by partial or complete subsidy. This might be negotiated in advance of the conference /festival or because of a chance proposal made in response to circumstances during the event. Subsidies might be made for :
— any computer use, in order to reduce the effective unit rates of computer use to **any participants**
— computer use by **specific individuals** or groups; this would normally be achieved by opening an account for those concerned with whatever funds were available (or paying the amount into an already opened account). This procedure might be adopted by the organizer or other groups to encourage computer use by key individuals because of the kind of communications they will initiate.
— computer use by any individuals concerned with a **specific topic** or groups of topics. This procedure might be adopted by groups or exhibitors to further communication around the main topics of interest to them. (This option may be more difficult to incorporate into available software, unless it is treated as a subsidized mini-conference).
— computer use by any individual communicating with a **specific**

group. This procedure might be adopted by groups or exhibitors wishing to encourage participant interaction with them. It is similar to the « reverse charge » telephone call. For example, an exhibitor might in this way encourage participants to give their name / address and specific questions which could be answered via computer or by mail at a later date. (This option may be more difficult to incorporate into available software, unless it is defined as a mini-conference in which communication is only possible with its sponsor).

— if the number of messages each participant receives in such an environment becomes excessive, it is possible to envisage that a participant's account would be credited if he agreed to receive a certain message. This would be one way for a participant to filter commercial publicity releases to his own benefit. (This option may be more difficult to incorporate into available software.)

9. **Event organization :** An advantage from the organizer's point of view is that this approach enhances the self-organizing capacity of the conference / festival. It facilitates the emergence of any participant initiative and it facilitates the process whereby participants group together for some spontaneous activities (discussion, lecture, display, etc.) in preference to others felt to be less valuable. The organizer can use the facility to blend spontaneously emergent activity with pre-planned activities.
Eventually, such facilities should make it possible for organizers to be able to re-schedule during the course of the conference / festival on the basis of information received at that time :

— the allocation of pre-planned sessions to particular rooms, according to the number of persons who indite they will attend. (This might include the cancellation of some sessions to give place to others).
— the allocation of rooms to sessions proposed at the last minute on the basis of interests that have emerged during the course of a particular session.
— the allocation of audio-visual equipment and simultaneous interpretation facilities to meeting rooms according to revised requirements.

Attention will at some stage have to be given to the need for organizers to be able to exert the optimum degree of control over the flow of communications in order to maximize inter-participant contact and formulation of new activity **without** completely disrupting the conference or exceeding the possibilities of the available facilities.

For example, the balance of communication patterns may have to be shifted between :

— *an essentially hierarchical mode*
— *a small group sessions mode*
— *an amorphous meeting mode.*

In order to achieve the advantages of the network mode wherever possible.

Marc Maeken « Le Passeur d'Eau » inspired by a poem by Emile Verhaeren.

Clearly whenever the conference / festival is moving towards sterility, increased participant inter-action should be facilitated, but whenever this increases beyond the ability of the occasion to contain it, then the hierarchical mode should be used to a greater extent.
The advantage is that the organizers can invoice participants according to their precise use of the conference dynamic facilities (e.g. on a cost per communication or per contact basis), and can identify which forms of such communications should be subsidized to facilitate certain types of communication essential to the healthy dynamics of the conference (e.g. on a low or zero cost per communication basis).

Clearly **organizers are faced with the problem of handling flexible evolving conference / festival programs rather than the traditional pre-determined conference / festival program.** This can be perceived as an exciting challenge.

10. **Maintaining contact with participants :** A great advantage is that the organizer (like any other participant) is always able to maintain contact with specific participants or groups of participants identified only by a common interest. Participants, if they involve themselves at all, identify themselves

in the conference / festival directory maintained on computer

Whether or not such a directory is actually printed (in whole or in part, during or after the event, and with or without topic indexes), the information on computer constitutes a very valuable mailing list. It may be used as such by the organizer (in preparation for the next such event) and selectively by exhibitors or other groups (e.g. publishers, etc.).

11. **Possible abuses :** It should not be forgotten that any new development runs the risk of abuse, some of it quite imaginatively destructive. Aside from casual abuse, there is a special kind of computer genius that can by-pass protective devices on computer systems, usually in order to drain other peoples funds into his onw account.

More serious is the possibility of someone wishing simply to be destructive by destroying information stored in the computer or making the system unuseable in some unforeseen way — if only by blocking the telephone lines.

12. **Concluding overview :** There is no doubt that the use of such communication enhancement facilities offers the possibility of a really new and exciting kind of event. When the special characteristics of such an environment become better known, it is likely that participants will be prepared to pay the cost penalty to benefit from what it makes possible in terms of furthering and developing their interests.
One of the pioneers in this area sees it as follows. As a participant using a terminal one in effect has an :

> *« electronic vehicle with which one could drive around with extraordinary freedom through the information domain. Imagine driving a car through a landscape which, instead of buildings, roads, and trees, had groves of facts, structures of ideas, and so on, relevant to your professional interests ? But this information landscape is a remarkably organized one not only can you drive around a grove of certain arranged facts, and look at it from many aspects, you have the capability of totally reorganizing that grove almost instantaneously. You could put a road right through the center of it, under it, or over it, giving you, say, a bird's eye view of how its components might be arranged for your greater usefulness and ease of comprehension. This vehicle gives you a flexible method for separating, as it were, the wood from the trees » (Douglas Englebart).*

Although this is not quite possible yet much is already practical and available.

Univac / Uniscope visual display

Conclusion

Although considerable investments are being made in the development of computer conferencing systems at this time, these are primarily directed towards servicing geographically dispersed terminals, whether across a city, a country, or between continents.

Distributing terminals around a large conference / festival site has not been considered of special interest or significance. Although the computer software requires little modification for this difference in usage, the special problems of enhancing communication at a conference have not received attention. The only exceptions to this appear to be the experience with the PLANET system, and the experimental use of the CONFER system at the 1976 Congress of the International Society for Technology Assessment (see Transnational Associations, 1977, 10, pp. 412-417). Either CONFER or PLANET could be used to acquire more experience with this approach. And it should not be forgotten that such use of the facility permits absent participants to be linked into the communication process of those physically present. In fact it is not of great importance what proportion of the participants is physically together at a given meeting site. It may be of far less significance than the ongoing communication via the same facility between participants who are geographically dispersed.

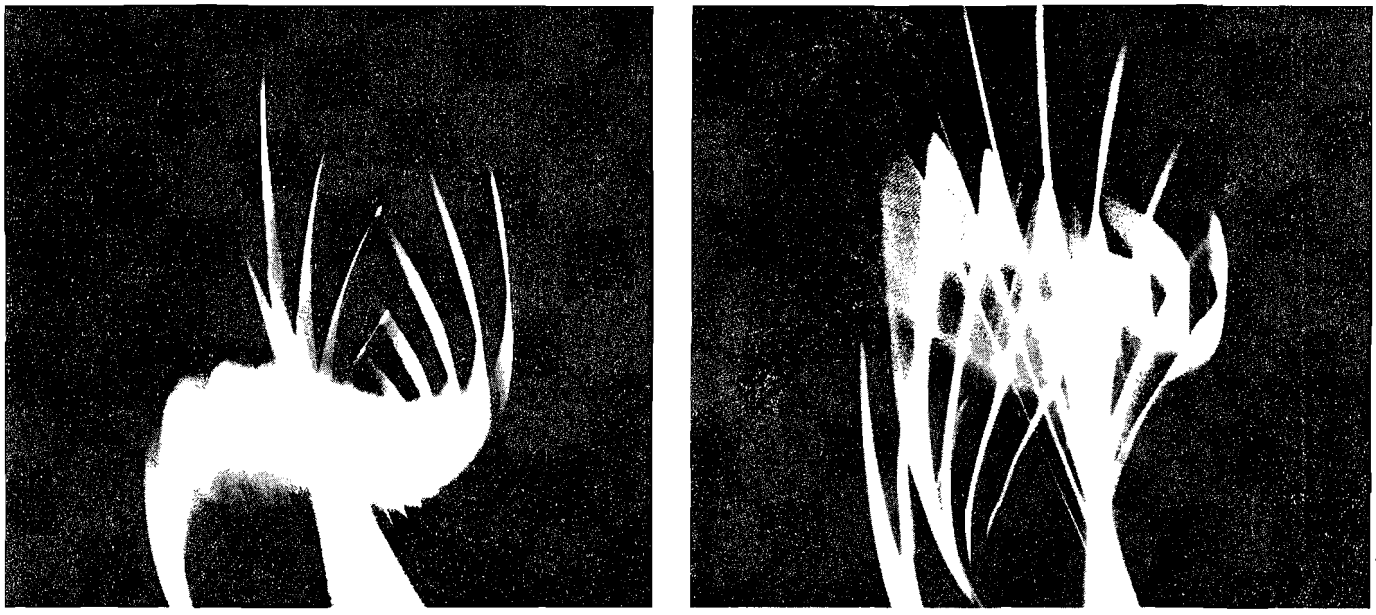
It is of the utmost importance that any such on-site use of computer terminals should be made as a casual adjunct to the existing communication process and the organizers should not get carried away with enthusiasm to the point that the equipment and its fanatics detract from the communication process which should be enhanced. The acceptability of such an innovation may depend a great deal on « superficial », « packaging » and « psychological » factors such as the setting given to the terminals and the message handling desks, the « style » of the assistants, and the presentation of any descriptive material and identity cards. These may either be encouraging or discouraging. If the latter, then no matter how sophisticated the facility, it will not be given a chance to demonstrate its potential and the whole environment will be perceived as mere « gadgetry ».

Despite such risks, computer conferencing represents one of the few (if not the only) available methods whereby a large group of people can consciously meld together into an organic self-organizing whole in which each individual and group perspective is distinctively expressed and blended with others to the extent possible at the time. ■

A.J.

Facilitating the networking processes of a transnational university using computer conferencing

This is a working paper prepared by A.J.N. Judge for the second Planning Meeting (Geneva, January 1978) of the Goals, Processes and Indicators of Development Project of the Human and Social Development Programme of the United Nations University (Tokyo), coordinated from the Institut universitaire d'études du développement (Geneva).



Thomas Wilfred : Kinetic sculpture, Photo IPS

Introduction

The purpose of this report is to attempt to identify how the technique known as computer conferencing (*) could prove of considerable significance to the operations of a transnational, transdisciplinary university network. There are several examples of such networks. The clearest is the United Nations University which is being deliberately based on a world-wide **network** of national and regional institutes. A very different example is the network of institutes which make up the International Federation of Institutes of Advanced Studies. And another extreme is represented by the proposed Free International University for Creativity and Interdisciplinary Research. The above examples are network-based and are therefore quite different from the many « international » universities, including the European University Institute (Florence) and the College of Europe (Bruges). The Inter-University Centre of Postgraduate Studies (Dubrovnik) is however an intermediate case in that it is geographically centred but dependent on an international network of university institutes (**).

This report is therefore primarily concerned with the genuinely transnational and transdisciplinary networks and not with geographically centred institutes, nor with national university networks such as Educom in the USA, nor with interesting national experiments such as the Open University in the UK. Of special interest are those networks which attempt the difficult task of balancing, in both their conceptual and operational concerns, the constraints and challenges of the North-South and East-West influences encountered in facing up to the problems of the world.

Problems of transnational, transdisciplinary operations

The special problems of such operations may be grouped as follows (without attempting to establish their relative importance) :

1. Problems of geographical distance

a. **Physical distance :** The inter-continental dispersion of participating bodies and individuals has a major impact on the operation of the network by inhibiting the movement of people, resources and concepts. Although this may in part be disguised by gathering people together at national or regional centres (or for periodic meetings) this may only represent a change in kind of the problem — for intra-national and intra-regional distances may be very great (and not necessarily less costly in air travel terms, because of peculiarities in ticket pricing).

b. **Time delays :** Even when it is only a question of movement of documents or audio-visual materials, the postal delays of up to several months may severely inhibit maintenance of adequate contact within the network.

(*) See Transnational Associations, 1977, 10, special issue, 1977, 12, pp. 401-448.

(**) Another intermediate case of historical interest is the first, although short-lived, International University established in Brussels in 1920 on the initiative of the Union of International Associations. Its peak membership comprised 15 universities with 346 university professors from 23 countries, **supported by 13 international associations and the League of Nations which each had special Chairs.** Courses were given for three sessions (1920-1922) to permit students « to complete their training through initiation into the international comparative aspects of all great problems ».

c. **Finance :** Both the preceding problems may be solved by increased funding for air travel and airmail postage. However in practice the cost is prohibitive and can only be justified in the case of certain key individuals and documents (and even then it is questionable whether their movement around the network does more than increase awareness of the conceptual constraints imposed upon those who do not have such privileges).

d. **Time zones :** But-even when there is no financial constraint on telephone or tele-satellite contact, the mismatch in time zones may make regular use of such real-time solutions impratical.

2. **Problems of cultural differences**

a. **Language :** The assumption that the use of English resolves the language problem in only credible to those whose mother tongue is English and who are thus insensitive to linguistic imperialism, the conceptual pitfalls of monol ingualism, and the problems of concept transfer to **and from** other languages. These difficulties must be faced in a transnational network, part of whose function is to make use of such diversity.

b. **Shifts in values and priorities :** Subtle differences in perspective of this kind around the network may undermine efforts at establishing consensus, at maintaining collaboration, or even at developing communication. Furthermore, it is only too easy to encrust a different conceptual stance with stereotyped perceptions and prejudices concerning people of the culture in question. This inhibits healthy development of the network. Such difficultues are aggravated by the above-mentioned constraints in communication.

c. **Behavioural modes and preferences :** The Western academico-administrative style adopted by the international community is associated with certain working habits, meeting processes, attitudes towards the use of time and space (*), and preferred methods of presenting information. There are differences in other cultures whose significance for the operation of a transnational network it can be unwise to neglect.

3. **Development-related inequalities**

a. **Equipment :** The style of academic work possible in industrialized countries, because of ready access to telephones, document reproduction equipment and computers, is not necessarily matched in developing countries or in poorly funded institutes in the network.

b. **Education :** It is a function of a transnational university network to be comprised of institutes of differing educational levels and standards. Any assumption concerning the desirability of some uniform standard of excellence raises issues which it is the purpose of the network to resolve.

c. **Funding :** the difficulties created by financial constraints, and the differences around the network in the relative budgetary importance of the same items or services, require no comment.

d. **Status :** Since the image and status of an institute is quickly linked to its equipment, educational level, and funding, special difficulties of communication arise between institutes where there is an awareness of such differences in status.

4. **Institutional barriers**

a. **Administrative difficulties :** The administrative structure and procedures which a particular institute has acquired or inherited may render communication between institutes on substantive and conceptual matters secondary to fulfillment of procedural requirements or other behavioural norms. (It is not unknown for some communications between UN agencies to require approval from 3 or more levels of the bureaucracy — even for long-distance phone calls).

b. **Government monitoring :** Government agencies of many countries, in which it is desirable that the network should have an associated institute, expect to have the right to monitor communications (whether directly or indirectly) to and from such an institute. Any attempt to avoid this may result in an increase in the administrative barriers discussed above.

c. **Customs, tax and exchange control :** Although apparently trivial, such difficulties can severely inhibit the movement of documents and resource persons.

d. **Professional difficulties :** The movement of persons between institutes in the network can be indirectly but severely inhibited by the attitude adopted towards such activity by the professional or faculty group either in the home-country or in the receiving country.

5. **Multiplication of interlocking perspectives**

The operation of the network is considerably complicated by the need to maintain its relevance to those oriented towards :

— pure (« value-free ») research
— applied research
— undergraduate education
— postgraduate education
— training /briefing officials
— political relevance as an instrument which through its operations diminishes North-South and East-West inequalities.
— policy significance for action programmes by the international community.

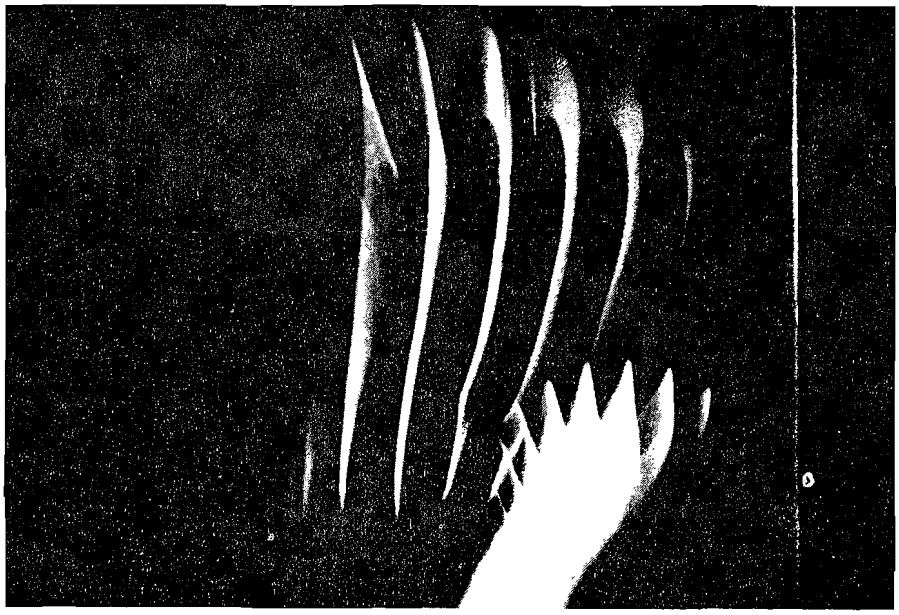
6. **Personal idiosyncracies**

It is appropriate to note the difficulties in communication which may arise because of a person's relative slowness of thought, verbal habits, physical handicaps, or any other characteristics which may trigger unconscious prejudices.

7. **Problems of interdisciplinarity**

Today most scientists are acknowledged as specialists, for whom it is legitimate to know progressively more and

Thomas Wilfred : Kinetic sculpture **Photo IPS**



(*) E.J. Hall. The Hidden Dimension. New York, Doubledon. 1966

(**) Extracts from the introduction to « integrative, unitary and transdisciplinary concepts « In : Yearbook of World Problems and Human Potential ». Brussels, UIA / Mankind 2000, 1976

more about less and less. As Harold Linstone note (**) : « When a group of prestigious future-oriented interdisciplinary scientists meets, the result usually fits the words of novelist Arthur Koestler :

The moment you put them together in a conference room, they behave like schoolboys performing a solemn play... each of them possesses a small fragment of the Truth which he believes to be the Whole Truth, which he carries around in his pocket like a tarnished bubble gum, and blows up on solemn occasions to prove that it contains the ultimate mystery of the universe. Discussion ? Interdisciplinary dialogue ? There is no such thing, except on the printed program. When the dialogue is supposed to start each gets his own bubble gum out and blows it into the other's faces. Then they repair, satisfied, to the cocktail room ». (The Call Girls. New York, Random House, 1973).

Georges Gusdorf, in an exceptional survey of interdisciplinarity for the French-language **Encyclopaedia Universalis** comments on the obstacles to interdisciplinary knowledge :

— an epistemological obstacle, arising from the inexorable process of discipline subdivision and divergence;
— an institutional obstacle, in that teaching and research institutions reinforce the above separation through administrative procedures which tend to eliminate communications with institutions associated with other disciplines;
— a psycho-sociological obstacle, the division of intellectual space into ever smaller compartments and the multiplication of institutions assuming the management of each such territory results in the formation of a feudal system (he also uses the term epistemological capitalism) which governs the majority of scientific teaching and research enterprises;
— a cultural obstacle, whereby the separation between disciplines is aggravated by the separation between cultures, languages, traditions and their associated mentalities — to the point that science itself is a typically western phenomenon.

Gusdorf also notes the existence of various kinds of false interdisciplinarity.

Computer conferencing

It is not possible to give a comprehensive description of computer conferencing in this report. This has been done in a collection of papers (*) which should be read in conjunction with this outline of its relevance to the operation of a transnational university. A brief description given therein by Murray Turoff is as follows :

At its simplest level, computer conferencing is a written form of a conference telephone call. Using a computer terminal, a person can talk to a group of people by typing messages and reading, on a display screen or a printout, what the other people are saying. The computer automatically informs the group when someone joins or leaves the discussion. When a person signs off, the computer marks his location in the discussion and picks up at that point when he rejoins the conference. Computer conferencing dif fers from verbal communication in some very important ways. People engaged in computer conferencing can be both geographically and chronologically dispersed. In computer conferencing, everyone may « talk » or « listen » at the same time. A person can make his contribution to the discussion at his own convenience, rather than having to wait until other speakers have finished. He can work at his own pace taking as much or as little time as he needs to read, contemplate, or reply. He can « leave » the conference at any time, knowing that the computer will store all of the messages that he has missed and show them to him whenever he is ready. Each message is assigned a number and labeled with author, date, and time for easy identification and retrieval. Computer conferencing is a truly self-activating form of communication.

The fact that input can be anonymous leads to more open and uninhibited discussions, particularly in the case of someone who would otherwise be hesitant to disagree with a superior. The results of votes are presented only as distributions and there is no way to determine who voted which way on any particular issue; in addition, a conferee can change his vote at any time. During the computer conference, individuals may « whisper » to one another by exchanging private messages which are not part of the permanent record of the conference; the other conferees are not even aware that these exchanges are taking place. This whispering capability, by making possible timely subgroup negotiations and discussions, can lead to more rapid resolution of important issues. The printout capability provides a permanent record of the proceedings and insures against someone being misquoted. It is possible to retrieve information without going through the entire text; you might want to see all messages containing key words or the input of a particular person.

Thomas Wilfred : Kinetic sculpture. Photo IPS

(**) Harold Linstone. Communications; the planner's predicament. (Paper to Rome Special Futures Research Conferences, 1973).

(*) Transnational Associations, 1977, 10, special issue.

Computer conferencing puts unique psychological pressure on a person whose messages tend to be verbose, irrelevant, or filled with bureaucratic jargon he will soon notice that no one is paying any attention to his messages. In a face-to-face conference, people have to give an appearance of listening to the speaker, but there is no way you can force a person to read your messages on his computer terminal. One other important point I should make is that computer conferencing is the most efficient way to handle large group discussions involving 25 or more people and should be considered any time more than five people are discussing a subject. A conference telephone call begins to get difficult with more than five people, and face-to-face meetings encounter problems when more than 15 people are involved.

Feasibility

The feasibility of using computer conferencing may be usefully examined under the headings of hardware, software, data networks, data bases, facilitative systems, cost and demand.

Hardware : Computer terminals are now increasingly common and it is expected that they will soon become standard office equipment at about the cost of a colour TV set. (Note the sudden rise in the availability of hand computers and the drop in their cost).

Software : A number of software systems have been developed and are in regular use. Examples are : PLANET / FORUM, CONFER, EIES. A new generation of software is being tested by user groups under a grant from the U.S. National Science Foundation.

Data networks : Intra-continental and inter-continental data networks (required to link terminals) are now multiplying. Examples of government sponsored networks are : EURONET, SCANNET, ESANET. Examples of commercial networks are : TYMNET, TELENET. Many networks are in operation world-wide for specialized services : finance, meteorological data, technological know-how, etc.

Data bases : By mid-1978, it has been estimated that around 100 data bases will be available on line through EURONET. The Lockheed data base service currently provides several thousand customers world-wide with instant access to 15 million abstracts of reports and journal articles in science, technology, social science and business. A number of UN Specialized Agencies have developed, singly or jointly data bases : INIS, AGRIS, DEVSIS, SPINES, ASFIS. Access to such data bases is important to the operations of a transnational university. Over 400 already exist in Europe. (see Table p. 209).

Facilitative systems : The UNESCO-based World Science Information System (UNISIST) has been created to facilitate access to information, especially via computer-based systems.

Cost : There are a number of distinct cost elements to be considered (*). A recent overall estimate gave the cost of operating a multi-conference computer system on a nation-wide data network in the USA as :

— $ 8.00 per hour per person (with 300 participants)
— $ 5.00 per hour per person (with 1000 participants).

Some of the cost elements are expected to decrease. Others can be avoided under certain circumstances (*).

Demand : Examples of the use of computer conferencing by international organizations have been given (*). Taking the demand for on-line access to data bases as an indication of an orientation towards computer conferencing, the rate of on-line queries increased by a factor of 10 in the USA in a recent 3-year period to 1 million per year. It is estimated that by 1980 there would be a user demand in the European Community for 2 million queries per year, doubling to 4 million by 1985.

The above points suggest that the necessary information infrastructure for a transnational university exists. The only difficulty arises with the need to ensure appropriate interfaces for those without the more technologically sophisticated forms of access.

Intermediate communication interface

Whilst there is little doubt that computer conferencing hardware and software will be available in many locations over the next few years, it is important to face the fact that they will not be available in many developing country locations. Nor, for that matter, will they be available in some desirable locations in industrialized countries. And, even when they are available to a particular institute, the administrative procedures and physical location of a terminal may be such as to reduce the desirable feeling of « hands-on » accessiblity to those in the institute.

Compromises can however be made to overcome some of these difficulties. The compromises are quite unsatisfactory to purists — and a number of advantages are indeed lost — but they do represent a considerable improvement on the current situation.

View of New York : Photo US.I.S. (Brussels)

(*) See : Transnational Associations, 1977, 10, pp 446 and 447

Table 1 Categorization of international information systems and programmes

AGRIS	*International Information System for Agricultural Sciences and Technology (FAO)*
ASFIS	*Aquatic Science and Fisheries Information System (FAO)*
INIS	*International Nuclear Information System (IAEA)*
ISONET	*International Organization for Standardization Information Network (ISO)*
ARKISYST	*International Information System for Architecture (UNESCO)*
CARIS	*Current Agricultural Research Information System (FAO)*
INDIS	*Industrial Abstract Information Service (UNIDO)*
ISIS	*Integrated Scientific Information System (ILO)*
AOE	*Information Service on Industrial Equipment and connected Technologies (UNIDO)*
INPADOC	*International Patent Documentation Centre (WIPO)*
SDI	*Selective Dissemination of Information Service (UNIDO)*
WHIS	*World Health Information System (WHO)*
WWW	*World Weather Watch (WMO)*
CIS	*International Occupational Safety and Health Information Center (ILO)*
IIS	*Industrial Inquiry Service (UNIDO)*
DEVSIS	*International Information System for the Development Sciences (IDRC)*
IRS	*International Referral Service (UNEP)*
DARE	*Data Retrieval System for Documentation in the Social and Human Sciences (UNESCO)*
GEMS	*Global Environmental Monitoring System (UNEP)*
MEDI	*Marine Environmental Data and Information Referral Service (UNESCO / UNEP)*
POPINS	*Population Information System (Population Division of the U.N. Secretariat)*
SPINES	*Science and Technology Policies Information Exchange System (UNESCO)*
DRS	*Development Referral Service (SID-OECD)*
CLADES	*Latin American Center for Economic and Social Documentation (ECLA)*
IDCHEC	*Intergovernmental Documentation Centre on Housing and Environment for the countries of ECE*
ISDS	*International Serial Data System (UNESCO-UNISIST)*
CORE	*Common Register of Development Activities (IOB)*
WDRS	*World Data Referral Service (UNISIST)*
ISIS	*Integrated Statistical Information System (CES)*
WISI	*World Information System on Informatics (UNESCO / IBI)*
UNISIST	*World Science Information System (UNESCO).*

SCOPE / FUNCTIONS	- SECTORAL SYSTEMS	- MULTIDISCIPLINARY SYSTEMS	- MANAGEMENT CO-ORDINATION SYSTEMS
- STORAGE	AGRIS ASFIS ✱ INIS ISONET	DEVSIS ✱ (I) IRS DARE	ISDS ✱
- RETRIEVAL	ARKISYST ✱ CARIS ✱ (I) INDIS ISIS (ILO)	DEVSIS ✱ (II) GEMS ✱ MEDI ✱ POPINS ✱	CORE WDRS ✱
- ANALYSIS AND SELECTIVE DISSEMINATION	AOE CARIS (II) INPADOC SDI WHIS WWW	SPINES ✱ DRS	ISIS ✱ (CES) WISI ✱
- CONCEPTUAL FUNCTIONS	CIS IIS	CLADES IDCHEC	UNISIST

✱ Systems being planned or under development.

Table extracted from :
Data for Development Newsletter, Oct. 1977. (special issue : Information systems and international organizations).
Data and Development, 343, bd Romain Rolland, 13009 Marseille, France.

We have presented above a large number of international information systems, classified into types from the pure specialized type system (e.g. INIS) to the multi-disciplinary cross-sectoral type systems (e.g. SPINES) and the management co-ordination type systems such as CORE. However, it must have been apparent to the reader that the systems described are highly heterogeneous, both in respect of their mode of operation and in their level of development and their degree of achievement or success. Some systems are largely computerized or are planned to be for example CARIS and INDIS, while others are plain documentation services using traditional methods of storage and dissemination for example CLADES. Even the fact that systems are computerized does not tell much, because they might be using computing methods at different levels of sophistication. For instance INIS is accomplishing a quite straight forward storage, updating and editing of abstracts in the nuclear field, while the ISIS project of the CES is becoming a quite sophisticated system, incorporating data analysis and modelling functions. Thus, it seems important to try to differentiate systems in some way along a dimension going from a simple storage function to a sophisticated set of functions, including conceptual tasks, such as complex documentary search. Along these lines, we have attempted to break down the systems into four levels of systems sophistication.
We have also added a few other international systems, such as the ISIS system of the International Labour Office and the WHO Information System (WHIS), as illustrative and pertinent examples.

Essentially the compromises take the form of **successive limitations** on full intercontinental, round-the-clock, on-line access. There are many possible intermediate stages and combinations which could best be presented as a table, but they can be summarized here :

Intercontinental : Instead of an intercontinental link-up, a less costly intracontinental link-up is possible. Exchange of data between continents could be accomplished periodically, whether by highspeed temporary links or by physical transfer of tapes. If the intracontinental link-up is not feasible, a national (or even a sub-national) link-up could be used, with periodic international transfers of data.

Round-the-clock : Instead of maintaining the computer conferencing files on-line over the 24-hour period, this could be done for as many hours per day or per week, as was justified. (This procedure is already adopted for intercontinental access to certain data bases).

On-line : If on-line operations were not practical, batch operations could be instituted with an appropriate periodicity. To reduce the time (and thus the cost) of long-distance link-ups, greater use could be made of the option in computer conferencing software of switching large amounts of information onto a nearby high-speed line printer. Indeed, it might be better for a user to request via his terminal that distant files (or file updates) be transferred to a local computer with which he can then interact at lower cost (and at the end of his interaction, or more infrequently, any updates could be transferred back from the local computer into the intercontinental network). Analogous cost saving can be achieved with terminals which have some storage capacity.

Inter-active : It may not always be possible for a particular user to engage in inter-active dialogue via a terminal, particularly if some of the more restrictive compromises are selected. Nevertheless a user could still employ the computer conferencing system to search for information corresponding to his interests (like searching a data base). And if that were not feasible, he could automatically be sent (whether through computer terminal, telex, or by post) information corresponding to a permanent profile of his interests.

Personal access : Instead of a personal (desk-top) terminal, the terminal could be shared by a department or, failing that, by a whole institute. If that were not possible, an individual could go every day or week to a service bureau or institution in the same city from which he could link in to the network for the necessary period of time. If that were not feasible, messages to or from one or more persons at a particular institute (or in a particular country) could be processed at the nearest available computer — the final link with the person being made by mail.

Summary : Clearly there are many possible compromise combinations from which the most appropriate could be selected for a particular case. Indeed different options could be selected depending on the amount or urgency of work with which the user was faced at any particular time. It is also possible to envisage the use of focal points whose function it was to act as interface between the computer based network and those dependent on post, telex and telephone.

Computer conferencing network facilities

A whole range of interdependent facilities is available to those involved in the computer-supported transnational university.

Focal topics : An important concern at all levels of participation in the network is to determine what topics are currently a focus of attention, whether as a research project concern, or as content in an educational programme, or in an information collection programme, or as a problem requiring contributions from many disciplines, or as the special concern of a particular individual, or as the theme of any of a variety of computer-based conferences. Such information can be obtained either from a current list of topics or by a specially activated search.

Messaging : Any individual in the network can send a message to any other and it will be stored until he cares to examine it. This facility is the basis for effective formal and informal interaction. Messages may range from depersonalized comment on topics of mutual interest to jokes and greetings. They may be anonymous and or shared with selected people.

Personal notes : Messages to oneself may also be recorded as notes. Such a « notebook » is currently used to build up material, as a persons thinking on a topic develops, until it is appropriate to share some of the items with selected other people or to restructure them into an edited report for general access distribution throughout the network.

Collective notes : A self-defined but usually unstructured group of people in the network may contribute to and modify a common file of notes on a selected group of topics over a period of weeks or months. At some stage these notes may be restructured into an edited report for wider access and distribution. One or more such files may be used as a « bulletin » or « newsletter » to store messages of interest to a large number of participants. This might list new topics, new participants, new mini-conferences, calls for contributions or comment, etc.

Seminars I : Where there are time constraints and a degree of group structure, participants may be required to intervene and comment on the interventions of others in order to arrive at a consensus statement which can be structured into a report on the focal topic for wider distribution. The frequency and intensity of exchanges, in the case of a research seminar for example, is much greater than in the previous case.

Seminars II : As a variation on the previous case, and of particular interest in an educational mode, one participant (the « educator ») may, over a period of days or weeks, transfer successive « pages » of material from his personal file to the seminar file as course material on which the other participants (the « students ») are invited to comment. The educator may have privileged access to the personal note files of each student and may than send them individual messages on the basis of what he sees.

Assemblies : In the case of a complex topic (possibly involving hundreds of participants) which can be usefully broken down into sub-topics each subtopic may be made the focus of a seminar and/or a collective note file. There could then be many seminars **in parallel**, although a particular individual could participate (actively or passively) in as many as he wished (possibly depending on his qualifications). Rapporteurs can monitor the progress of each seminar and formulate inputs (questions, constraints, etc.) relevant to other seminars. The cross-linkages between seminar/sub-topics can be made as complex as is required by the structure of the macro-topic on which a consensus is required.

Encounters : The seminar-type environment can be modified to permit very intensive synchronous interaction over a period of hours. These conditions correspond to those already used in international relations simulation and gaming.

Questionnaires : A highly structured form of interaction between one individual (or group) and other participants in the network is the electronic questionnaire which can be used to facilitate surveys, complex votes and Delphi procedures, and subsequent data processing.

Voting/Flagging : Interventions or contributions of any individual are each numbered. Others can of course comment on previous interventions by number. Such comments can take the form of simple votes, usually anony-

mous. Interventions may also be ranked or flagged in terms of some criteria or as a basis for subsequent searches (e.g. by keyword).

Anonymity / Control : Participants may choose the degree of privacy of any intervention they make. This may range from « open to all in the network », through « open to all those in a specific seminar », and « open to named individuals », to completely private. Comments may be made anonymously or under pseudonyms. This may be very important where it is suspected that the interpretation given to interventions would be influenced by the culture, background, or other characteristics of participants. The convenor / organizer of a particular seminar may have formal control over who participates in the seminar (although particular cases might be put to a vote, for example). He may also have the right to scan the messages of those participating in the seminar, which may be very appropriate in the case of an educator / student relationship. Maintaining the distinction between a multitude of parallel seminars is not a problem, and links between some of them can be established when necessary (seminars can also be « nested » within one another).

Translation : Some participants may have a special function to provide translations for messages to or from particular languages. An individual can express his comment in his own language, transfer the comment to the translator who sends the translated version in return. (A record would be kept for budgetary purposes). This is then released to those using that language. Alternatively, selected untranslated interventions may be switched on request to a translator who then returns the translated version. Presumably some of this translation work could be done with machine assistance.

Explanation / Assistance : Some participants may have a special function either to assist those having problems in using the network or to provide explanations regarding substantive or procedural matters associated with a particular seminar. This can be done anonymously which may be of considerable advantage to those who would otherwise not feel free to ask such questions for fear of « loss of face ». In the case of standard questions, the participant might be given an entry point into a programmed instruction package within which he can maneuver according to the background knowledge he needs to acquire. (User guides are usually built into computer conferencing software and manuals are not necessary.)

Resource lists : Where it is justified, a collective note file may be opened to build up a bibliography of relevant articles, or a directory of relevant contacts, etc. This may at any time be edited into a report for hardcopy reproduction and distribution.

Data access, exchange and manipulation : A major use of computer terminals is to gain access to distant data bases, possibly outside the computer conferencing network. Data bases may be exchanged through the network. The data may also be manipulated and re-presented (e.g. as a graph) as an aid to the discussion in a particular seminar. The latest conferencing software also allows individuals to send data or retrieval messages to a « computer-simulated » participant which replies with the re-ordered data or the results of a search.

Report editing and production : As noted at various points above editing facilities are built into the software to enable the text of interventions to be restructured into a report, with appropriate bilbiographical and numerical data. Comments and modifications may be made to successive drafts of a report before it is « released » within the network or converted to hardcopy for offset reproduction. The same facilities can be employed by an individual in preparing a paper.

Use of time : A major advantage of computer conferencing is the ability of each participant to manage his own time according to his convenience. It is not necessary to waste time in gestures of politeness to speakers. It is not necessary to read items considered of little interest. Replies can be delayed. Comments can be made on early interventions and replies without being subject to arbitrary cut-offs by the president of a meeting anxious to adjourn for cocktails. This encourages considered reflexion and does not penalize slow thinkers or poor speakers, if their comments are of interest.

Flexible funding and resource management

Subsidized usage : Computer terminals may be rented and it is clearly possibly for this to be partially or completely covered by a subsidy in a particular case. Of greater interest, however, is the possibility that funding bodies are able to enhance communication in a variety of circumstances. Subsidies (**other** than for hardware rental) might be made for :

— any computer use, in order to reduce the effective unit rates of computer use to **any participants** in the network
— computer use by **specific individuals or groups**, possibly because of their qualifications, the topics with which they are normally associated, or the resource limitations of the institutes in which they are located (whether in developing or industrialized countries)
— computer use by any individuals or groups concerned with a **specific topic** or group of topics whose development requires encouragement. This might even be restricted to funding communication concerning the **relationship between specific topics.**
— computer use by any (or specified) individuals for **communication with a specified individual or group** whose contribution to the network needs to be encouraged.

In each case the detection of appropriate fund recipients and the accounting problems in managing the subsidies can be handled almost entirely by computer — possibly to the point that neither donor nor recipient would be known to each other, if this was so desired. In the case of much-solicited individuals faced with an overload of incoming messages it would even be possible to credit their accounts if they receive (or respond) to messages addressed to them (cf the « reply paid » telegram).

Non-financial resources : The last point illustrates one possibility of making flexible use of the most scarce resource, namely **the attention of key individuals** who are much in demand. Clearly the computer conferencing approach makes it possible for such an individual to relate effectively to far more people (as consultant, educator, research adviser, seminar leader, report editor, etc.). He can format texts addressed to specific groups, respond to specific questions from such groups or from individuals, scan comments made by (selected) individuals, in each case **choosing how much time (if any) to devote to a reply** — which could in some cases be a standard message or in others a referral to a more qualified person or to a programmed instruction routine. He thus avoids the time-consuming obligations of face-to-face contacts he would necessarily be unable to meet. Use of a translator as an intermediary (see above) also considerably increases the number of those with whom he can communicate. It must be stressed that such a key individual can contribute effectively to the university network whether from a fixed location (possibly in a non-network institute from which the major portion of his income is derived), or during travel to other countries (whether for the university or not), or on holiday (if he so wishes).

Other possibilities : As an illustration of the many other individually unimportant possibilities for cost reduction in a communication network, a book purchasing file could be opened to facilitate bulk purchase of key books at discount rates (possibly further reduced by subsidies as above).

Interrelating divergent perspectives

As noted above, a transnational university network can beneficially serve different functions for different categories of user. The challenge is to blend their respective requirements at whatever points they are shared and to separate them wherever they are considered to be distinct whilst at the same time providing a context for any evolution in the relationship between user concerns and minimizing the normal tendency to reist such flexibility. An indication of how this is achieved is given below under somewhat arbitrary sub-headings.

Education mode : Typically this arises when a number of individuals with access to the network indicate a wish to benefit from interaction with one or more resource persons also in the network. Emergence of course themes, if they are not imposed, may be facilited by prior interaction between the participants, potential resource persons, and possibly with the encouragement of funding bodies. The interaction between « educator » and « student », or between students, is not constrained by time, distance or language — except when rapid interaction is required (in the «encounter» mode). Course material can be transferred by release of selected files by the educator — possibly supported by audio-visual materials distributed in conventional form. The advantage of the approach clearly lies in permitting interaction between people who would not otherwise have contact, in facilitating the best use of the interaction time at the convenience of both parties, and in the possibility of obtaining complementary information or perspectives from others in the network possibly only incidentally concerned with education. This applies in the case of undergraduate and postgraduate seminar situations as well as the « staff college » mode appropriate to briefing delegates or officials.

Research mode : Here the concern of the participating individuals or institutes is to use the network to test out ideas on each other, obtain assistance or comments on difficulties they are experiencing, obtain bibliographical and quantitative data (using the search and computation power of possibly distant computers), and collaborate on comparative surveys and other projects. In addition any particular research activity is intimately linked to the project funding and project management processes which are vital to its commencement and continuation. The continuity of the network in fact provides a context which nurtures the conception of new research activity rather than subjecting the creative period to the vagaries of grantsmanship and a project-by-project orientation. The network also ensures appropirate continuity between the research mode and the education mode. Clearly wherever research data bases can be used in the education mode, either directly or via some « complexity filter », then this is a valuable means of ensuring that both modes focus on the same reality and that one is not out of phase with the other, as can often occur particularly in isolated institutes.

Project management mode : Research on complex topics, as well as application of existing research to them, requires organization and management. Nesting much of the communications within the network can considerably facilitate the management process — particularly where it is a question of linking many individuals or institutes concerned to a varying degree with many different sub-topics (themselves linked in a complex pattern of relationships). This matrix management process was first fully used by NASA on the Apollo Project. Such transdisciplinary, multi-modal projects depend for their effectiveness on communications not only to and from the project leader, but also between the collaborating bodies who need to respond to each others insights or needs and compensate for each others excesses and weaknesses.

Funding mode : As noted above the access of funding bodies to the network, and of participants to such bodies, facilitates the whole process whereby projects are proposed, peer-reviewed, monitored and finally evaluated. In addition, negotiating joint proposals and joint funding involving many bodies concerned with different phases or objectives of a project becomes much easier.

Administration mode : The whole process of resource allocation, accounting and review in a complex environment is carried out with considerable precision and without loss of flexibility. Computer conferencing could facilitate a transition from programme — budgets pre-defined in detail (a year or more prior to implementation) to flexible negotiation of funds in response to ongoing reconception of needs and opportunities.

Institutional mode : An associate institute acquires, through the network, access to counterparts (data and resources) around bhe world which can assist in the advancement of work in its priority areas. A greater operational reality is given to the sense of participation in the « knowledge community ». Whilst this is a stimulus to the institute itself, it also ensures that others are aware of its attitude to the relevance of their work to its priorities. Clearly there is less stimulus for an individual to move from one institute to another to reduce any personal feelings of intellectual isolation. As noted above, the process of funding individuals or projects based on one or a combination of institutes should be much facilitated, with valuable reinforcement of institutional identity.

Documentation mode : Access to the network, and consequently to the bibliographical and other data bases to which it can be linked, will considerably strengthen an institute's library or documentation function. (In fact, irrespective of whether a university network is established, library networks will continue to expand. Clearly it is desirable that appropirate cross-linkages should be explored to avoid unnecessary costs and duplication.)

Media-oriented mode : A network of institutes whose purpose is partly to improve response to world problems has a responsbility to be able to furnish the media (including government agency information offices) with appropriate data, background references and considered comment. Failing this the media are obliged to fabricate and disseminate an image of reality which is out of phase with current thinking on the same problems. Such lack of contact reduces the credibility of initiatives originated within the network and makes it more difficult to fund them. The computer conferencing process could be very helpful in ensuring appropriate communication to avoid such difficulties. (The media mode is in fact a stage of data decomplexification beyond that required for the education mode, but the importance of maintaining a correspondence between the data used in research, education and the media remains).

Policy mode : Clearly an effective transnational university network is of considerable potential value to the policy formulation process in response to world problems (as studied within the network). The pool of data-supported expertise constituted by the network in its research mode can also be tapped on a continuing basis in an advisory mode — even in emergency situations. (It should not be forgotten that the first computer conferencing system was developed for the U.S. Office of Emergency Preparedness). In fact the continuing use of the network to facilitate interaction between research and policy perspectives is of considerable advantage in tightening up a communication process often characterized as slow, if not of little relevance to both parties.

Other modes : It is highly probable that other users will emerge or link into the university network from other networks. Some may benefit simply by passively monitoring seminars, as would be the case with academic insti-

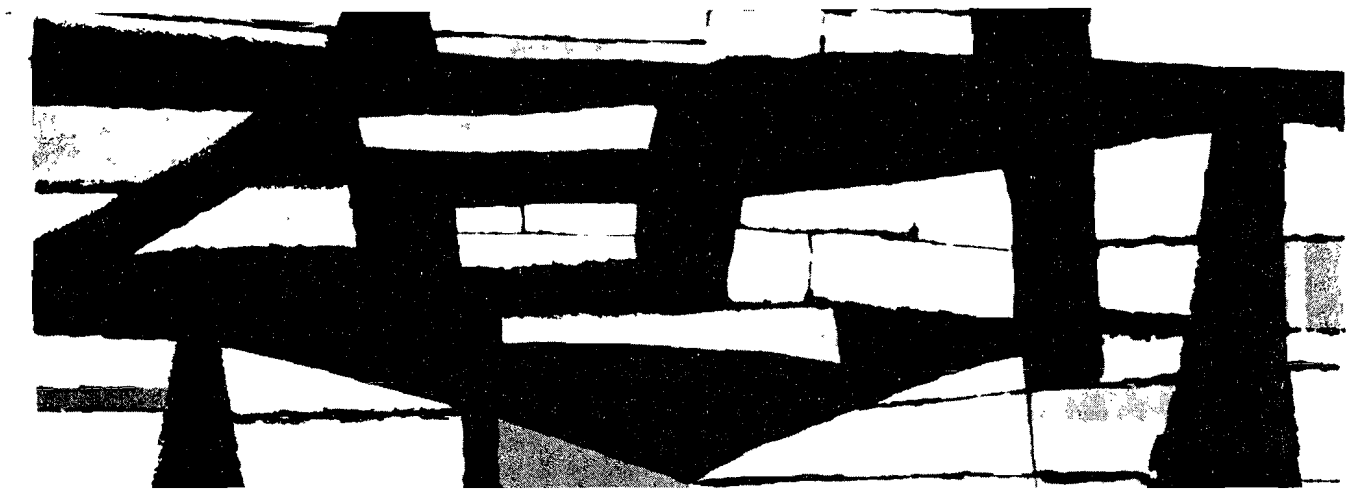


Photo U.S.I.S. (Brussels)

tutes not wishing to participate actively in the network. Some of these users may even be willing to contribute financially for the privilege of such access.

Facilitation of transdisciplinary processes

Use of computer conferencing to facilitative an individual's creative work and to nurture the processes by which he interacts with his colleagues has already been seen as sufficiently important to warrant extensive National Science Foundation funding in the USA. Considerable practical experience has already been gained over the past decade through work at the Center for Augmenting Human Intellect (Stanford Research Institute). It is clear that computer conferencing provides a very exciting intellectual environment in which individuals can maintain « thinking momentum ». Although implicit in the process, it would seem that no specific effort has been made to determine how it can be used to augment transdisciplinary and cross-category research and the formulation of more integrative concepts. Already, however, any participant may conduct searches for contributions into the network containing specific keywords. The keywords could themselves be linked in sequences or networks across conventional categories. Computer conferencing could have a major impact in this area when deliberate efforts are made to provide users with a range of classification schemes to guide such searches by grouping and inteslinking concepts in a variety of ways.

« ... it is highly probable that such environments will be developed for creative thinkers in key research disciplines and policy environments and for the conferences and institutions in which they interact. The key to the attractiveness for them of such (micro) environments is the manner in which the processes of thinking and communication are blended with those of storage, retrieval, classification and reclassification. In fact it is the intimate relationship between shared creative thinking and exploratory integrative reclassification in the light of new insights which is the chief feature of such environments. Of special interest is the manner in which the processes of analysis, conceptual innovation (and its verbal representation), explanatory comment, linkage to related initiatives, abstracting, classification, dissemination, and peer-group assessment effectively blur together into a new and more dynamic process whose nature remains to be explored and for which the current division of labour is inadequate » (**). Not only should this lead to improvements in interdisciplinary communication, it should also lead to the development of better ways to restructure a network of concepts to facilitate comprehension at a lower level of complexity whilst maintaining (educational) pathways between the lower and higher levels of complexity. Such an environment is also ideal for the processes required to explore and alleviate the serious problems of conceptual and terminological ambiguity characteristic of the social sciences which have been extensively documented by the Committee for Conceptual and Terminological Analysis (*). This Committee is currently collaborating with the Social Science Division of Unesco which has established the DARE system for information on current social science research. As part of DARE, an additional file, called INTERCONCEPT, is to be set up to handle conceptual and terminological information which will both improve retrieval capabilities of DARE and facilitate ongoing analytical work on concepts and terms (The project is also linked to a Unesco / International Social Science Council initiative on clarifying concepts in the social sciences). If the analytical work can be combined with experiments in classification, tools should emerge to facilitate transdisciplinary intellectual proceses — particularly in the computer-supported environment advocated here.

The contrast between this approach and the conventional one has been explored in separate papers (**).

Of special value is the ability of computer conferencing to provide an environment for the interactions between different schools of thought. This is important because the current procedure, in an effort to protect what is distinct in each approach, leads to behaviour which isolates and condemns groups which hold minority viewpoints. Computer conferencing ensures protective isolation but it encourages exchanges wherever they may prove fruitful. The most recent study of « interdisciplinarity » (***) does not however do more than indicate guidelines for thinking about the matter. The question of how to facilitate conceptual convergence on transdiciplinary conceptual focii by appropriate and specific software options remains to be explored.

Network overview

The term « network » is in incresing use as in some way holding the clue to a more desirable and more appropriate method of organization or modelling organization — whether in the case of individuals, of groups or organizational units, of information distribution, or of concepts (1). Despite

(*) G. Sartori, F.W. Rigge, H. Teune. Tower of Babel; on the definition and analysis of concepts in the social sciences. Pittsburgh, International Studies Association, 1976.

G. Sartori, Interconnected information and knowledge representation in the social sciences. Pittsburg, International Studies Association, 1974 (COCTA WP. 24).

(**) A.J.N. Judge Knowledge-representation in a computer-supported environment. International Classification, 4, 1977, n° 2

A.J.N. Judge. Relationship between elements of knowledge. Pittsburgh, International Studies Associations, 1972 (COCTA WP 3) subsequently abridged as COCTA WP 9.

(***) Centre for Educational Research and Innovation. Interdisciplinarity; problems of teaching and research in universities. Paris, OECD, 1972, 321 p

this acceptability, it is not yet clear just what makes up a network, how it should « function », or how it is in fact different from a « system » (1). Some very interesting work remains to be done. There is a danger, however, in becoming trapped by the suggestive power of the metaphor and in failing to explore the possible operational realities which it suggests.

The description of computer conferencing indicates the nature of an environment which encourages « networking ». This process seemingly involves individuals who tend to exchange information and ideas, who form groups, who are (individually or via such groups) linked to other groups or institutions. Such bodies themselves exchange information, funds, etc. The topics or concepts about which information is exchanged are themselves interlinked in complex networks. None of these interwoven networks is static. They grow in terms of a variety of established patterns. Conceptual networks are paralleled by interpersonal and intergroup networks. The established patterns are continually replaced by new forms of varying duration. Such changes may be catalyzed by events such as meetings (perhaps via computer) which provide focal points through which new links are momentarily made and then possibly given permanence through the establishment of working relationships or even formal organizations — whether of concepts or of social groupings. Clearly new concepts (or concept relationships), values or problems give rise to new meetings, new projects, new organizations, new information systems and new regulations. These is turn catalyze the emergence of further concepts, values or perceived problems. There are many shifts and waves in the changing pattern of relationships — many are short-lived and do not provide a basis for organization of any permanence. « Sympathetic » changes may occur out of phase with one another and provoke « degeneration » to a more « primitive » level of organization. The structure of any of these networks is not only a matter of detached observation. Much energy in devoted by individuals and organizations associated with these networks to re-ordering them. Domains of influence and hierarchies are established around focal points; specific problems, values and concepts are given territorial characteristics and stimulate appropriate behaviour (*).

Clearly participants must adopt strategies to further projects corresponding to their viewpoints and values. Such projects give rise to a degree of coordination encompassing certain domains — although the networking process provides continuity over time and a context to « nest » or link various levels or stages of coordination / centralization — autonomy / decentralization. The possible complexity is great, and were it not for the ability to facilitate, track and display this process by computer, its dynamism and flexibility could not be incorporated in an option which would be viable operationally or administratively.

Although the expertise, software and hardware are all available, they have not yet been applied to the task of facilitating operation of such networks and actualizing their potential. How can a complex of concepts, values, individuals and constitutions catalyze itself into a pattern of convergence from which will emerge the appropriate insights and breakthroughs — before it reorients itself in response to new circumstances, in a new configuration, and with a different set of elements ? What can be done to facilitate coalition formation and reformation in such a context ?

Clues to the directions which merit exploration include : the new principles of « structured design » for computer software, the principles of structural analysis and synthesis embodied in operational information systems for chemical structures (**), the possibilities of designing new conceptual and organizational structures which follow from a generalization of tensegrity principles (***), and the ability to handle such complexity in comprehensible form on computer display screens and computer generated network maps (****).

The need for such new models and operational « scaffolding » at this time is obvious from the terms in which Johan Galtung in obliged to couch his understanding of how the UN University project on Goals, Processes and Indicators of Development needs to evolve : « What is needed is an organic compromise between the two extremes (laissez-faire versus directed approach), using the fact that a network of research institutions is being created, neither an unrelated set, nor a vertically integrated research organizaton. Characteristic of a network is great flexibility and dynamism. Some central coordination does not preclude sub-sets from forming their own sub-centres, developing their own lines of research geared to their particular condition... Where the balance point will be remains, to some extent, to be seen, as part of the process ». He concludes with the suggestion to « let the matrix play », encouraging a maximum of activity (a) by each institution on its preferred topics, (b) between institutions and (c) between topics. Computer conferencing has a role to play in providing an environment in which this flexibility is protected and taken for granted, rather than being an operating condition which can only be maintained with continuous effort.

Conclusion

Computer conferencing provides a very powerful environment through which to overcome many of the obstacles to : **trans**-nationality, **trans**-disciplinarity, **trans**-culturel contact, and **trans**-organizational collaboration. One can but speculate on the synergy resulting from a manyfold increase in networking possibilities. It is appropriate to note that it is genuinely non-territorial in organization and operation and as such is an appropriate vehicle for a transnational university network. It should also be remarked that conventional notions of « organization », « meeting », « project », and « information system » are blended together within a new operational reality which encompasses them all, and more besides.

To the extent that the accepted structural principles governing the organization of concepts and models are influenced by the principles governing the structures of the organizations within which they are conceived, then the concepts emerging from the advocated network environment are likely to be much more flexibly responsive to the complex society in which we live. In this sense the operation of the network provides more appropriate clues to understanding the society which it is the purpose of the network to reflect upon. And in the case of the UN University project on Goals, Processes and Indicators of Development, the networking process in many ways models developmental processes occurring in society which the project hopes to elucidate and track with appropriate indicators.

Finally, even if computer conferencing cannot be used to support transnational university operations, consideration (or simulation) of how it might work, and affect concept formation and associated interpersonal and inter-group behaviour, is an instructive exercise in its own right.

A.J. ■

(1) Transnational Associations 1977, 9 (articles reporting on these issues).
— Organizational systems vs. network organization.
— System / network complementarity.
— The network alternative.

(*) Paragraphs adapted from : A.J.N. Judge. International organization networks; a complementary perspective. In : P. Taylor and AJR Groom. International Organization. London, 1978, pp. 392-3.

(**) R.E. Carhart et al. Applications of artificial intelligence for chemical inference; an approach to computer-assisted elucidation of molecular structure. J. Amer. Chem. Soc. 97 (1975) pp. 5755-5762.

(***) R. Buckminster Fuller. Synergetics; explorations in the geometry of thinking. New-York, Macmillan, 1975, 876 p.

(****) Yearbook of World Problems and Human Potential. Brussels, Union of International Associations / Mankind 2000, 1976 (annexes).

DEVELOPMENT: BEYOND « SCIENCE » TO « WISDOM »

Facilitating the emergence of configurative understanding in « Councils of the Wise » through computer conferencing dialogues (*).

CURRENT PROBLEMS

Irrespective of the many well-publicized « world problems », there are others which are less well recognized (1). These handicap our society in its ability to respond to those which appear more urgent. They are seldom discussed or researched because they call into question the methods used and the institutions or disciplines using them. They may even only be described in a humoristic vein (2). It is not the purpose of this paper to document such problemps in detail, even if it were possible (3). It is usually the case that, to those familiar with them, supporting evidence is superfluous, but, to those who are not, no amount of evidence is convincing.

The argument of this paper is not based on any consensus concerning the « existence » of all such problems, but rather on an increasing awareness that there are problems of this type, irrespective of how many a particular individual or group is prepared to recognize.

A list of such problems, described elsewhere (3), is included here as Annex 1. A humorous list (derived from 2) is given as Annex 2.

The concern of this paper is with the process that is used to reflect upon and discuss problems and action to be taken upon them, using intellectual, organizational and other human resources, in the light of present and emerging values, and with some objective of « human development ». The « hidden » problems now make a mockery of the processes that are used (a). One unique but unsatisfactory attempt at recording this is by Arthur Koestler (4) reporting from bitter experience of interdisciplinary meetings of international experts.

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* Prepared in connection with the sub-projects on networks, dialogues, and concepts of development of the Goals, Processes and Indicators of Development project of the United Nations University.
Presented at the World Future Studies Conference on Science, Technology and the Future (Berlin, 8-10 May 1979) – a conference in preparation for the United Nations Conference on Science and Technology for Development (Vienna, 20-31 August 1979), Agenda Item 4 : Science, technology and the future.

(a) There are few little boys to note that the Emperor, as in Hans Andersen's famous tale, is lacking any clothes.

It is unofficially accepted that at least 90 % of published papers are virtually worthless other than to the author and his or her career advancement. Research has even shown that the « average » journal article is « read » by one person amongst the total subscribership. The production of such papers is carefully designed to avoid confronting this issue – and indeed in whose interest would it be to confront it ? And yet the collective ability to respond effectively and creatively to problems seems to decrease rather than increase.

The difficulty is not only evident in use of the written word. The dynamics of meetings are such that the majority of spoken insights goes unrecorded, and even if recorded goes unread, as pointed out above. But what is most unfortunate is that the insights produced, as a linear sequence of statements (possibly in parallel sessions), can seldom be effectively interrelated into new patterns. The decisions which emerge are more often characterized by the insights which they ignore than by those which they are able to incorporate. In the field of ideas, as it has been between nations, « might is right »... although such a simplistic standpoint cannot counter a famine or an ecological disaster.

But this would not be so bad if those advancing insights were is some way interested in weaving their perception into a larger pattern. In fact this is not the case, somehow we (and the author must necessarily include himself) are only interested in ensuring that our own perspective is well-placed in the limelight of the stage. And in fact debate within the international community is more characterized by divergence and diffuseness than by focus and clarity. So that on the one hand there is the simplistic imposition of « bandwagon » topics (which usually last from 2 to 5 years) and on the other a cornucopia of unrelated preoccupations.

SOME ATTEMPTS AT A REMEDY :

STRUCTURE

A number of approaches to alleviating this situation have been made :

- **interdisciplinary** meetings, programmes, organizations, think tanks, periodicals, etc : it is now accepted that these are in most cases simply multidisciplinary aggregations of perspectives. Interdisciplinarity is viewed with disdain and suspicion in all disciplines and by all institutional divisions – however much lip service is paid to it.
- **world modelling** exercises have attracted much interest but do not appear to have led to any breakthrough of significance to action on the problem complex. And of course there are competing world models... a model of the real problem.
- **situation rooms** are favoured by the military and some corporations. They are of course ideal for implementing a strategy where the power structure is hierarchically ordered. They are of little use in the complex world where the problem is to harmonize the relationship between competing hierarchies, respecting those whose conditions are not so effectively represented. It is noteworthy that the United Nations could not design and effectively use such a room.
- **information systems** (5) have been designed to give access to a body of literature covering broad spreads of problems. This is the case with many intergovernmental agencies. Unfortunately bibliographical information seldom implies ease of access to the publication (often « unavailable » or « to be ordered »). On the hand 50 references do not facilitate selection. Worse still, the authors usually present conflicting or unrelated perspectives, necessitating further research (and thus perpetuating the malaise).

Other such approaches could be cited, but each is in some way blocked in its effectiveness.

FURTHER ATTEMPTS :

DESTRUCTURE AND PROCESS

If the above attempts are considered to be a « 2nd order » approach to the situation, it is possible to identify what might be considered a « 3rd order » approach :

- **think tank networks** as typified by the International Federation of Institutes for Advanced Studies and possibly the more recently created institutional network of the United Nations University. But these have not yet produced any breakthroughs either and have problems in ensuring that their networks work.
- **networks of the wise** as typified by the Club of Rome, the World Order Models Project, and the International Foundation for Development Alternatives. Again, although they have increased sensitivity to problems they fail to reach consensus on solutions. And, above all, they fail to produce credible and politically viable approaches to implementation. Their conclusions are not actionable except perhaps in a very limited sense.
- **process and context :** abandoning organizational structures, many attempts have been made to bring the knowledgeable and/or wise together in ideal (or specially selected) environments and to facilitate by sensitive techniques the process of interaction between them. These exercises have resulted in many interesting books, and have built and maintained interpersonal relationships valuable to those involved, but cannot be said to have led to any breakthroughs.
- **networks of information systems** (5) : attempts have been made to interrelate the information systems of different agencies using competing classification systems, standards and hardware. This is typified by the UN Inter-Organization Board for Information Systems and Related Activities or the UNESCO/ICSU World Sciences Information System (UNISIST). Such systems, if they get beyond the policy stage, do not assist the user to find the question that he does not know he needs to ask. The user is confined to the framework from which he approaches the system.

Again it is perhaps possible to identify other 3rd order approaches, but each would be found to be blocked in its wider effectiveness.

NATURE OF THE PROBLEM :

ACTION

As will emerge below, it would be presumptuous to assume that the nature of the problem can be adequately formulated from any one perspective (b). For this reason, in searching for a « 4th order » approach, it is necessary to proceed by indirection accepting the paradox to which such a search is subject.

Without identifying « the problem », its nature can be sensed from antinomies such as the following :

- **process versus structure :** approaches which emphasize specially designed structures are found to be too constraining and are often somewhat sterile; those emphasizing process tend to be diffuse and unable to focus.
- **« action now » versus « next year will be better » :** advocates of many approaches excuse their lack of results by statements such as « these things take time », and of course they often do; on the other hand the frustration of the « action now » school is often justified.
- **« experts know best » versus « grass-roots action » :** there is increasing concern that the experts do not in fact know best – particularly when they disagree violently amongst themselves; but on the other hand they are aware of dimensions of a problem situation to which the non-specialists have not necessarily been exposed.
- **« brick signing » versus « building the cathedral » :** in whatever action is undertaken there are those who are strongly influenced by the desire to ensure that their particular contribution is recognized and this is indeed necessary in the existing reward system; and yet it is the programme as a whole, blending the efforts of many, which needs to be brought to fruition and is usually placed in jeopardy by such concrete recognition of human development (c).

(b) As both Ashby's Law and Gödel's Theorem would suggest.

(c) Could cathedrals have been built if each brick was signed ? - And yet that is the principle on which the knowledge system is based.

- **« detached operators » versus « self-reflexive participants » :** it is widely assumed that those acting on problems are in some way white-coated and hygienically detached from them, as in a labortory experiment (« If you are not part of the solution, you are part of the problem »), and indeed some measure of detachment is necessary to acquire the freedom to act; and yet those acting are part of society and need to be aware of the manner in which their actions contribute to the problem they claim they are attempting to solve and how they block appropriate understanding of its solution (« If you do not recognize how you are part of the problem, you cannot understand the nature of the solution required »).

One might cite other such dimensions by which we are torn in our approach to problems. But the point to be made is that the structures and process via which we approach problem clarification and solution model very effectively the factors which render us unable to bring the problems into focus and deal with them (d).

NATURE OF THE PROBLEM : CONCEPTUALIZATION

The current banner under which society is attempting (once again) to bring its concerns into focus is the : « application of science and technology to development ». Could it be that there are elements in the conception of this banner which are themselves an obstacle to achieving what is purportedly intended ?

(a) **Science, technology and development :** there are many that assume that the meaning of these terms is clear and well-defined and that the problem lies with « application » (see below). And yet even a cursory search will reveal great confusion as to the manner in which « science », « technology » and « development » should be understood (5). At this level, for example, there are es many initiative to « redefine » development; to focus on the « changing purposes » of science (e); or to introduce the notion of alternative/appropriate/intermediate forms of technology.

But these initiatives would seem to be primarily concerned to shift understanding from an existing concept – now argued to be inadequate – to a new concept which will hopefully be more appropriate. It is perhaps necessary that at one level a definition should be assumed to be clear, such as for certain educational purposes. It is equally necessary to push simultaneously for a re-conceptualization. But it is unfortunate that the re-conceptualization should primarily be conceived in terms of « out with the old definition and in with the new » – however good the new may be. For it is absolutely certain that no such definition will attract universal support (even if it is not subject to misinterpretation), and that there will be competing definitions with all that that implies.

To reflect adequately the process in which we are embedded, what appears to be missing is a recognition that we are confronted with a situation in which simultaneously we have :

- those focusing on a single definition (of which there may be many of different degrees of sophistication).
- those moving from an inadequate definition (one of the above) to a new one (possibly one of the above)
- a need for a broader framework which could respect and facilitate these different conceptual innovations and manoeuvers and ensure some degree of continuity rather than an inbuilt guarantee of discontinuity and hiatus between successive « definitions »,

Irrespective of the necessary conceptual spadework to clarify new dimensions of « science », « technology » and « development », it is vital to resist the temptation to treat these terms as **nouns** rather than **verbs.** There is a need to recognize that :

- development is the **process** which facilitates and necessitates the redefinition of development
- science is the **process** which facilitates and necessitates the redefinition of science.
- technology is the **process** which facilitates and necessitates the redefinition of technology.

This somewhat paradoxical characteristic is at the heart of these processes (whatever their superficial or short-term manifestations). Development, for example, would not be development if it did not continually create a new situation in which its own nature was redefined, whether with respect to the image of man or to the goals and values of society, or to the structures appropriate to it. For at each stage it is more able to respond to the consequences of the prevailing perspective and to « ingest » them as an appropriate constraint on the new perspective whose emergence is thus facilitated and stabilized. The phrase « in the light of the emergent positive and negative feedback » might be therefore added to each of the three statements above. For it is these which introduce the normative dimension in process-oriented rather than ad hoc terms – the latter merely providing short-term understanding and response (however practical) and necessitating a hiatus before the subsequent version is recognized, namely a form of built-in discontinuity foreign to the continuity of social processes.

Similarly technology is essentially the innovative modification or reconceptualization of existing technological processes in the light of the latter's inadequacies but in terms of what they have rendered possible.

This paradoxical, self-reflexive or « self-organizing » characteristic focuses attention on the limitations of the linear concept of « progress » (primarily of western origin). This concept is well illustrated by the use of an appropriate annual increase of GNP as an indicator of satisfactory development. But even reconceptualizing « development » is usually only aimed at switching to another more subtle quantitative increase which will itself prove to be inadequate once its limitations are understood.

Once « reconceptualization » no longer seeks for some quantitative basis of increase, but rather for some more subtle « pattern of complexification », a new dimension is opened up. Unfortunately, and characteristically, it is the difficulty of rendering such alternatives distinct and comprehensible which encourages many to continue the search for simple quantitative indicators of development. And in fact it is probably only with the simultaneous use of more complex mathematical descriptions and innovations in representation that the necessary subtlety and elegance can be adequately conveyed.

Lest this be considered a convenient escape, it is useful to refer to traditional non-western concepts of development and change which may be based on a circular rather than a linear approach. Clearly the Chinese classical concepts of change, for example, are elusive to the western mind. Were they to be represented mathematically as modifications in a phase space or as field effects, the mathematical « distance » or difference in sophistication between western and eastern concepts would be apparent.

The challenge is clearly to find some basis on which they can be reconciled. Some exciting leads towards this are given by Erich Jantsch and C H Waddington (6).

But whatever the most subtle image that can be generated, the paradox remains :

- more refined versions will necessarily continue to be generated
- for reasons of comprehension or preference, different images of development will continue to hold sway simultaneously (despite efforts at conceptual imperialism).

The strength of the more subtle dimensions is that they place much greater stress on the individual's (in)ability to comprehend the nature of change or development (at some level) and his or her role embedded in it. To the point that, in a special sense, the degree of development of the individual and his environment is determined by that person's ability to re-conceive it in the light of a more powerful and wholistic image. Without exploring this any further, it need only be mentioned that this opens the way to « conceptual » (or perhaps « attitudinal ») revolutions which would in some measure substitute for conventional structu-

(d) Many problem action debates can be caricatured by the situation in a meeting room, smoke-filled to the point of reduced visibility and tear-filled eyes, in which the societal problem under discussion is « air pollution ». And yet the process is so designed that no one will open a window (if the technology permits), suggest that it should be opened, or recognize how the situation models the « real » problem which is the topic of the debate

(e) An agenda item of this conference.

ral revolutions by reconceptualizing existing patterns of relationships (changing the significance attached to them) in existing structures without the need to destroy them in the manner frequently advocated. It may be that the most operationally effective approach to development could emerge from an individual's change of attitude to his/her existing context (thus redefing the knower-known complementarity), rather than by attempting to modify the world-as-experienced without bringing the experiencer into question.

There is something intellectually primitive in the constant striving to move from the now experienced as containing « wrong elements » (to be rejected) to a future condition in which these have been eliminated. In practice the « wrong » and the « right » as perceived by different groups tend to co-exist (even engendering one another) over very long periods of time despite the elimination exercises. It is time that attention was devoted to the reality of the interface between right and wrong rather than focusing positively on the one and negatively on the other and exploiting the energy which the dichotomy generates in society (f).
Whilst these remarks have primarily emphasized « development », they are also true of science and technology.

(b) « **Application to** » : The use of this term implies a manipulative relationship which has not proved successful in the past. This is only to say that if science and technology are to be conceived as processes, then they cannot be « applied » like some tool or lever to « jack up » the development process. How processes should be exposed to one another is not at all clear, as the fumbling interventions in ecological processes have so frequently demonstrated. It is almost as though « application to » is currently conceived as a 2-valent operator when the situation calls not so much for an N-valent operator, or for a continuing search for an (N+1)-valent operator, but rather for an approach which could tolerate, nurture and blend a full range of approaches (reflecting the varied preoccupations and levels of perception) in which N varied from 1 to whatever is possible in our society. Processes can not be successfully « applied to » one another. A more appropriate understanding is that they should « harmonized » as phases, a concept which could benefit from the thinking of those concerned with electronic circuit design where this is a well-defined problem. The concept of « frequency entrainment » is particularly suggestive of how several processes may bring each other into phase.

The Ten Oxherding Pictures *1. Undisciplined.*

« WISDOM »

An immediate response to the deliberate complexification introduced in the previous section is that it exceeds the capacity of anyone (especially including this writer) even to delineate it adequately. The questions raised flow beyond the categories and structures which can normally be used to contain and order such considerations. They easily lend themselves to the accusation of being « purely philosophical » or unrelated to the « real problems » to which priorities should therefore be oriented. And yet no « practical approach » can guarantee that its undertakings will not be out-maneuvered or nullified to the point of actually proving counter-productive – as has been demonstrated so many times over the past decades. The source of such strategic weakness is to be found in the more complex considerations on which it is apparently impossible to focus within any existing framework or by any existing process (g).
The concept of the « application of science and technology to development » reflects this weakness. As argued above it tends to be interpreted through poorly related substantive categories rather than processes. The level of « contextual comprehension » required to see the interrelationship of such processes has been but poorly explored and is necessarily difficult if not impossible to communicate with available techniques (7, 8, 9).
It is useful to explore the possibility that the attitude appropriate to this complexity is one of « wisdom » – a term which has passed out of fashion with the rise of the specialized approach and the fragmentation of the family, despite the respect traditionally accorded to the elders. This attitude may perhaps be characterized as :

- process (verb) rather than category (noun) oriented (h)
- a level of comprehension byond concern for knowledge of data elements and their interrelationship and an awareness of the function of different levels of comprehension (i)
- a built-in sensitivity to values relating to human development in harmony with the development of (or respect for) the natural environment, from which it is only possible artificially to separate humanity
- a strategy or action-oriented stance concerned to effect development in the above sense and aware of the consequences of the necessary risk-taking which calls into question the status and existence of the actor
- a sensitivity to the issues raised by problems of comprehension and the difficulties of communicating whatever is comprehended
- a sensitivity to the continuing education of those participating in any such exercise as a process which complicates the manner in which they function; participation is also a process of growth
- a sensitivity to the weaknesses in any form of action, whether visible or only to be revealed by their future consequences or by opponents of the action.

Clearly even the effort to establish such a list is presumptuous in the sense that it implies an ability to « encompass » all these attitudes in their totality and to arrive at closure at a particular point in time – an ability which is called into question by the underlying attitude. Any attempt at defining wisdom necessarily fails to capture the attitude on which it is based for which the defining operation is but a particular tool (amongst several), each with recognized in-built limitations (j).
If its nature defies precise definition, perhaps wisdom can best be referred to as that « standpoint » that **consciously** encompasse or embodies within itself, both the strengths through which it can act and the weaknesses which impede that action (k).
It is a conscious mirror of the condition it strives to supersede (l). Wisdom would seem to internalize an image of the environment in all its aspects in order to be able to adopt a strategy acting out of a sense of that wholeness rather than of some part of it only (m).

(f) There is a conceptual analogue to the high-rise luxurious apartment/office building (a sophisticated conceptual model ?) with slum dwellings (the concepts accessible to the man-in-the street) at its base.
In a different metaphor, it is one thing to control a plague of wolves, but it is another to eliminate all wolves (as environmentalists are now realizing).

(g) Is it possible that Gödels Theorem could be generalized to include problems of comprehension ?

(h) Cf. David Bohm's concept of « holocyclation » (10).

(i) Clearly, for certain purposes, it is both obvious and appropriate to treat the earth as « flat »; at another level it may be considered round and the sun understood as « rising » over the horizon; and at another, the solar system as a whole may be considered as stationary; etc. In the same way « development » and « science » lend themselves to comprehension from different (but related) perspectives.

(j) « ... there is another kind of limit which is built into the way in which the mind constructs reality. There is a limit inherent in the nature of explanation itself. Every description tries to be complete, but by the very nature of a description it cannot be total. A description is a limited thing; it is the map and not the territory. A description can only work because it is not the whole, and so it is a form of vision through blindness » (11, p. 149).

(k) « Nihil humanum me alienum puto ».

(l) « Let me not be raised up until the world is raised up with me ».

(m) « Tao is obscured when men understand only one of a pair of opposites, or concentrate only on a partial aspect of being. Then clear expression also becomes muddled by mere word-play, affirming this one aspect and denying all the rest... The wise

In the light of Chinese taoist thought, wisdom would appear to be that type of awareness which « moves with », (is « in tune with », « in harmony with », or « transparent to ») the flow of change and development – a sense of the « tao » or **wu wei** non-action (n).Wisdom would there be the attitude which engenders and is engendered by development. Conversely the essential nature of development can be most fully understood by those who are aware of flowing with it. This mode has been effectively contrasted with conventional western thinking, by Erich Jantsch (24). Numerous efforts at alluding to its elusive nature have been made in zen sayings, for example, and in descriptions of « non-action » as the « emptiness » from which effective action should necessarily emerge. These reflect levels of comprehension on a continuum of progressively more subtle standpoints (o) each giving rise to a more adequate pattern of action than the previous one, although the « adequacy » is only apparent from subsequent standpoints, themselves inadequate from those preceding them.

2. *Discipline Begun*

« OPERATIONALIZING » WISDOM

The preceding sections have noted the lack of sucess of existing approaches in coming to grips with the complexity of our situation, as well as noting some characteristics of that complexity (« development » etc) which make it easy to slip into patterns of action whose built-in weaknesses only become apparent in the longer term and to those who happen to be sensitive. It was then suggested that only by moving beyond such categories as « science », « technology » and « development » or such operators as « application to » can a wholistic standpoint begin to emerge which, by its very nature interrelates the divergent perspectives, incompatibles, complementarities, etc which fragment current understanding and any sense of direction.

This said, however, what can be done to facilitate the emergence and expression of this attitude or standpoint ? It is only too clear (as discussed above) that the existing approaches to improving strategic multi-focus sensitivity are failing to

3. *In Harness*

breakthrough other than in a scattered and somewhat diffuse sense. It may perhaps be argued that this is all that can be expected under the circumstances and that it is foolish to hope for, or to seek, any « quantum leap » into a new level of awareness of how these questions may be approached. Even if this second view is correct, it is nevertheless instructive to work out what has **not** been done, that **could** be done with existing technology, and which **might** catalyze such a breakthroug Namely what is the **experiment** that has not been attempted ?

Just to recap in the light of earlier comments, it is not simply a question of generating new models, institutions, indicators or other such specific instrumentalities which necessarily compete with each other and their predecessors and are usually, these days, very short-lived as a vehicle for new insights. Rather **some kind of communication environment is required to facilitate, and provide continuity to the ongoing process by which any such specific tools are engendered, considered, criticized and superseded.**

Without aiming to be complete, some of the characteristics required of this communication environment are determined by the need to counter the following tendencies usually associated with the generation of the specific tools above :

- diffusiveness, namely the prevailing tendency to explore new issues without any concern for how such explorations are to be integrated into a larger pattern; most information systems cater to and reinforce diffusiveness.
- erosion of collective learning ability arising from diffusiveness, general lack of continuity and inability to store and interrelate elements of knowledge in a form which encourages creative retrieval.
- domination, monopolization and manipulation of research patterns, including problems of elitism in knowledge generation.
- lack of concern with knowledge integration; inability to integrate alternative (competing) perceptions and paradigms.
- boring, repetitive, self-defeating debates verging on conceptual incest (with all the consequences of inbreeding).
- inability to move between simple and complex responses to an issue according to need and without disparaging either.
- inability to face « hostile » perspectives creatively, namely without ignoring, rejecting or misrepresenting them (8,14).
- trivialization of knowlege generation due to the relationship between the evaluation and reward system and the publication of documents (reports, etc) or formal verbal presentations.

4. *Faced Round*

- failure to separate specific increases in knowledge from the verbal introduction, explanations and « packaging » by which they are presented or conveyed (i.e. tendency to « drown » insights within lengthy papers) (15).

CONFIGURATIVE CRITERIA

The above criteria are all expressed negatively and it is not clear that practical and constructive corrective measures can be formulated and implemented. Examining the above points however, many of them may be interpreted as due to an

man therefore, instead of trying to prove this or that point by logical disputation, sees all things in the light of direct intuition... The pivot of Tao passes through the center where all affirmations and denials converge. He who grasps the pivot is at the still-point from which all movements and oppositions can be seen in their right relationship » (12, p.42-43).

(n) « The non-action of the wise man is not inaction... From emptiness comes the unconditioned. From this, the conditioned, the individual things. So from the sage's emptiness, stillness arises : From stillness, action. From action, attainment » (12, p.80). « The wise man, then, when he must govern, knows how to do nothing » (12, p.71).

(o) The subtle relationships between such standpoints have, for example, been illustrated by two well-known series of 10 zen « ox-herding pictures » in which the ox may be interpreted as any (or all) objectified conditions(s) over which mastery is sought. The successive levels of comprehension of this task bear the following names in the Kaku-an series : searching for the ox; seeing the traces; seeing the ox; catching the ox; herding the ox, coming home on the ox's back, the ox forgotten, leaving the man alone; the ox and the man gone out of sight; returning to the origin, back to the source; entering the city with bliss bestowing hands (13, p.127-144).
N.B. The 10 illustrations in this article are from another series.

5. *Tamed*

absence of a « configurative » feature. By this is meant that the context for the generation of knowledge is not structred such as to facilitate any trend towards focus, integration, or paradigm transcendence. Rather any innovation in knowledge tends to « create » or « occupy » new territory, namely there is a sense of « open expanding frontier » and a lack of need to respond to tensions arising from the « sympathy » or « antipathy » of the innovation to previous or parallel innovations. There is no innovation « population pressure »; there is always the freedom to escape confrontation, the significance of alternatives, and responsibility for « pollution » of the psychic environment by previous efforts. Each feels free to cut up the conceptual universe according to some new set of categories, thus defining as irrelevant (or non-existent) any alternative perceptions.

The question therefore arises as to what are the consequences of introducing limitations on this degree of freedom. Clearly, and typically in controlled settings (e.g. a conference, an institution, programme or an information system), participants, may be required to focus on a pre defined topic, geographical area, time period, method, ideological framework, etc. This appears to avoid the problems and even gives the illusion of an integrated (« wholistic ») perspective, but in effect only ensures that others are brought up in other such settings – none of which are able to handle the question of mutual irrelevance or incompatibility.

Such a specialized approach constitutes a very primitive response to the problem. The question is whether « irrelevant » or « opposing » perspectives can be juxtaposed in such a way as to respect the felt « distance » between them, recognizing links of « sympathy » or « antipathy ». The results of such juxtaposition would depend upon the number of distinct or « incompatible » perspectives and can be described as a « configuration » (7, 16). The elements of a configuration cannot usually be related within a single theoretical framework, namely there are « discontinuities » between them bridged by praxis as, for example, between the business management concerns of: finance, production, human relations, marketing, research, etc.

Such confirguration would define and limit, to some degree, the freedom of the perspectives by showing how their relationship to their peer perspectives can be perceived (p). Two questions are:

(a) whether such configurations can lead to the emergence of more comprehensive, sensitive and strategically valid attitudes.
This is a matter of experiment.

(b) whether any existing communication technique could facilitate the emergence of such configurations. Communication technologies are now very sophisticated so that an appropriate experiment could be undertaken.

6. *Unimpeded*

CONFIGURATION FORMATION : FACILITATIVE TECHNOLOGY

There now exists a new communication technique which has many features which could prove valuable in facilitating processes which lead to the emergence of « collective wisdom ». One label by which it is known is « computer conferencing » (17, 18, 19). To its users it appears rather like a combination of: a conference telephone call, telex, word processing, data storage/retrieval, and a number of related applications. As such it is believed that it will have a dramatic impact within the ongoing revolution in the information/communication industry and the spread of (home) computer terminals and widespread access to data networks.

Although this technique is currently used mainly to facilitate complex patterns of message exchange amongst 5 to 50 people (possibilly at distant locations), its use in this way is highlighting previously disguised communication problems which the technique itself can be developed to solve to some extent. This particularly applies to some of the problems identified above.

Some of the advantages include:

- possibility of « registering » precise substantive contributions in statements which are a fraction of those normally required for an academic paper (15)
- possibility of « indexing » each such contribution so that they may be interrelated in complex patterns (20)
- communication in written mode in such a way that participants can either contribute simultaneously or with whatever delays they consider appropriate, and at whatever speed they consider comfortable (possibly with intermediate translation, such that each receives communications in preferred languages)
- possibility of using the same technique simultaneously, to clarify meta-problems, inter-personal obstacles to communication (style, etc), tentative insights, etc.
- possibility of indicating relationships of « sympathy » and « antipathy » (i.e. opposition, support, contradictions, etc) between contributions (8)
- possibility of experimenting with alternative patterns of re-ordering the substantive insights in search of more meaningful or comprehensible patterns.

Clearly these possibilities constitute a new kind of environment within which concept configuration can emerge.

CONFIGURATION FORMATION : FACILITATIVE SOFTWARE

Two types of investigation of this technique could be usefully envisaged:

(a) **« Small » group** (e.g. 5-12): Here the object would be to determine whether the technique could be used to order the insights of the individuals into configuration which would reflect appropriately the perceived sympathies and incompatibilities of their positions. This investigation would be most significant with individuals with a wide variety of perspectives who agree that some pattern(s) connecting their perspective need(s) to be discovered. Note that use of the technique to date has been confined to groups with a common topic (usually technical) of interest (19). Note also that it goes beyond the classical small group « communication net » experiments, especially if the number is greater than 6-12 (13, 21).
One approach would be to combine the approach with face-to-face sessions so that participants could mix written exchanges (ie. via computer) with face-to-face exchanges in smaller groups (2-4) or as a plenary group. This would offer a means of using the advantages of both modes and of overcoming their disadvantages.
The modes could be mixed:
- simultaneously: namely, written exchanges facilitated during face-to-face meetings

(p) The distinction between « peers » within a configuration and between **different** configurations (one being « more adequate » or superseding the other) needs to be discussed separately (7).

7. *Laissez Faire*

- sequentially: namely, face-to-face meeting sessions between written exchanges of whatever duration was considered necessary (e.g. 4 hours written; 1 hour face-to-face)
- intermittently: namely sequentially but with face-to-face meetings at much longer intervals (e.g. once a month, or once a year).

Note that the three approaches could themselves be combined.

The concern would be how to reinforce insight pattern formation and to facilitate the generation of patterns whose subtlety would make them too fragile to persist for sufficient time for any collective comprehension within any conventional face-to-face setting. The possibilities of this approach remain to be explored. Use of this technique to date has considerably increased the ease of message exchange but is only just beginning to confront the problems of pattern formation and the possibility of special software or « groupware » design to assist this (20).

(b) **Large groups** (e.g. 15-200): Here the object would be to determine whether (the technique could be used to « filter » insights of participants and « funnel » them to concerned sub-groups. The problem is that participants need assistance in processing the number of insights continuously generated in a group of that size. They want access to the insights which reinforce or extend their current positions. They also need exposure to (opposing or alternative) insights which stimulate them to rethink those positions. Finally they are creatively stimulated by **occasional** exposure to **some** insights which are not related to their own preoccupations (e.g. as intellectual « roughage »). The filtering and funnelling should also lead to the emergence of groups of participants focusing on sub-sets of any larger pattern.

Conventional indexing procedures are not sufficiently sensitive to the requirements of such a dynamic setting. Software amendments can be made as the needs and possibilities become clearer.

8. *All Forgotten*

Clearly experiments of type (a) and (b) could be blended into support for ongoing activities as a new type of communication environment.

CONFIGURATION FORMATION: GROUPWARE PROBLEMS

Of special importance in connection with existing or emergent insights is the manner whereby participants push themselves into interaction patterns as a result of exposure to insights which are not immediately supportive of their own position.

At the simplest level, there will be those who are **in favour** and those who our **against** a perspective. This can be called a 2-level configuration and is the one most characteristic of intellectual discourse (or of its absence). Clearly, as has been discussed elsewhere (7), 3-level, 4-level and higher level configuration patterns may emerge under favourable conditions (q). In each case it is the pattern of **constraints** between the viewpoints asserted which is as important to the stability of the configuration as the viewpoints themselves (r). This leads to the notion of « tensed conceptual networks » discussed elsewhere (14, 21).

Suitable software developments may facilitate transitions between configurations and help to provide stability (s) for them (so that they can be the subject of collective reflection):

- in the search for more subtle patterns
- in switching between configurations according to the matter on which concern needs to be focused.
- in switching to simpler patterns to facilitate communication of some new level of insight.

The communication technique may therefore be used as a kind of « receptacle » or « container » which interrelates a variety of concerns and focuses them in relation to some common center (t) for an adequate period of time. The configuration design of each such container could be facilitated by suitable software but the approach needs to be explored (23). Clearly it is very different from conventional classification and indexing (whether of the coordinate or facet variety). Although it has a relationship to the concept of « evolutionary indexing ». Presumably the development of such software would be associated with a computer library of possible or better-known configurations which could be tested for appropriateness.

9. *The Solitary Moon*

ACTION INTEGRATION

The computer conferencing technique responds to three aspects of the strategy problem:

- formation of concept configurations, clarifying relationships between incompatible concepts
- comprehension of concept configurations otherwise difficult (if not impossible) to grasp as a whole
- indication of the configuration of action linkages corresponding to the concept linkages and thus opening the way to new styles of organization and programme integration.

And, as suggested elsewhere (1), such a configurative approach facilitates, and is facilitated by, the emergence of more configurative attitudes in the individual and in interpersonal relations – namely the more subtle dimensions of human development.

(q) These is an interesting analogy to the emergence of solid planetary bodies (characterized by elements with complex concentric electron shell patterns) following the fragementation and subsequent cooling of portions of the original solar gas (characterized by elements having a single electron shell with two configurations). The communication technique « cools » and re-directs the energies of a two-position debate so that a variety of more complex patterns can emerge.

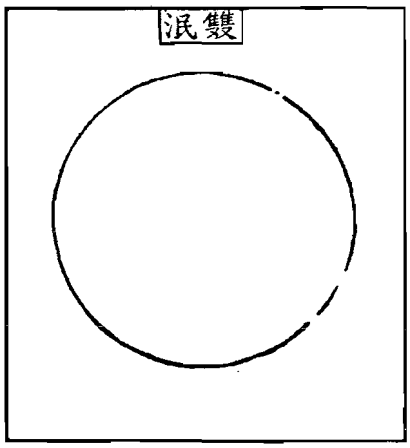
(r) It is not unlikely that advice such as the following is based on a precise understanding of configuration which could be used as a discipline for intellectual dialogue: « For those who seek Enlightenment there are three ways of practice that must be understood and followed; first, disciplines for practical behavior; second, right concentration of mind; and third, wisdom... If the three ways of practice are analyzed, they will reveal the eightfold noble path, the four viewpoints to be considered, the four right procedures, the five faculties of power to be employed, and the perfection of six practices » (22).

(s) By analogy, the concept of the « half-life » of an element subject to decay.

(t) Other helpful analogies are the configurative designs of radiotelescopes, radar antennae, parabolic mirrors for solar power, or electromagnetic containers for plasma in fusion experiments.

CONCLUSION

The preoccupation of this paper has been with the conditions necessary to move beyond current forms of dialogue and discourse in order to facilitate the emergence of what has traditionally been termed « wisdom ». This unfashionable term is at present only reflected in what is called in French a « Conseil des Sages » – a structure which is used very rarely, and within which « wisdom » may perhaps be considered a euphemism. And yet outside such arenas one is already in the domain of specialization and insensitivity to alternative perspectives. It is such structures that can provide the « keystone » to counterbalance the interests of competing specialities and provide a framework within which the « hubris » between such zones of conceptual coherence may be respected. An arena is required within which the perceived chaos between systems, and some measure of ignorance of their functioning, may be confronted as a continuing reality in order that better questions may emerge.



10. *Both Vanished*

In recommending the use of computer conferencing, the stress is on **the need to apply science and technology to develop continually the « application of science and technology to development »** – with all that this implies for continuing redefinition of the nature of the preoccupation and the status of those involved. This goes far beyond the design of information retrieval systems, such as conceived by the ICSU/UNESCO World Science Information System (UNISIST), which are locked into traditional definitions of science, and are insensitive to interdisciplinarity, social values, practical relevance, non-elitist alternative perspectives, and the human development of its practitioners.

The answers available from such retrieval systems are at present only those to uninteresting questions which reinforce the initial specialized perspective of the questioner. They do not answer the question which the questioner does not know how to ask or for which he does not recognize his need for information.

The recommended communication environment implies a degree of « self-reflexiveness » (foreign to the conventional think-tank mentality) in which the dynamics within the « Conseil des Sages » are consciously perceived as modelling the problem complex and knowledge resources which it is attempting to match. The recognized by-product of success is then the non-incidental collective human development of those participating in the configuration-building process.

With the present rapid development of data networks, it will prove possible to undertake much consultation, education, and other advisory work between individuals and institutions in distant countries using computer conferencing systems. This is already happening in the USA (19). This could place developing countries in a much better position in relation to those from whom they wish to receive such assistance :

- continuing contact over longer periods
- greater variety of possible contacts, permitting continuing access to alternative viewpoints
- more sensitive relationship emerging from such on-going dialogues
- better definition of need and better matching of resources to need
- better contact amongst groups of users in different developing countries to clarify their conception of their needs.

The recommended communication environment therefore provides a unique way for refining dialogues, linking dialoguing groups, and ensuring appropriate interaction with those able to provide new insights or benefit from them. These may have concrete programme oriented (ad hoc) preoccupations or they may (also) attempt to explore the significance which emerges from deepening the nature of the dialogue – perhaps the most important function for society of any « Conseil des Sages ».

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Annex I

« LIMITS TO HUMAN POTENTIAL » (*)

1. Limited tolerance of Interaction
   - 1.1 Limits to inter-organizational Interaction
   - 1.2 Limits to inter-disciplinary interaction
   - 1.3 Limits to interaction between ideologies
   - 1.4 Limits to interaction between information systems
   - 1.5 Limits to interaction between classification systems
   - 1.6 Limits to interaction between action programmes
   - 1.7 Limits to resource sharing
   - 1.8 Limits to interaction between modes of action
   - 1.9 Limits to interaction between preferred perceptual modes
   - 1.10 Limits to interaction between preferred modes of change
   - 1.11 Limits to interaction determined by levels of ability
   - 1.12 Limits to inter-species interaction
   - 1.13 Limits to interaction between disciplinary languages
   - 1.14 Limits to interaction between languages
   - 1.15 Limits to interaction from territoriality
   - 1.16 Limits to recognition of interaction between problems
   - 1.17 Limits to recognition of interaction between values
   - 1.18 Limits to interrelating pre-logical personality biases
   - 1.19 Limits to interaction between religions
   - 1.20 Limits to interaction between tribes or ethnic groups
   - 1.21 Limits to interaction between classes or castes
   - 1.22 Limits to interaction between cultures
   - 1.23 Limits to inter-personal trust
   - 1.24 Limits to relationships between sexes
   - 1.25 Limits to intra-familial relationships
   - 1.26 Limits to inter-generation relationships
2. Absence of over-arching psycho-social structures
3. Limits to use of hierarchical approaches
4. Limits arising from behaviour in complexity
5. Limited ability to cooperate
6. Limits of knowledge and experience
7. « All in everything »
8. Constraints of space and time
9. Erosion of confidence in organized relationships
10. Loss of community of discourse
11. Erosion of communication and travel ability
12. Assumption that the observer or change agent does not change
13. Limitation of ability to discover and choose
14. Limited ability to recognize problem displacement
15. Erosion of democratic processes
16. Constraints imposed by secrecy
17. Concept of societal complexity limited by imposed constraints
18. Assumption that further human evolution may be ignored
19. Limited ability to face the unknown
20. Limited ability to face the negative
21. Limited significance of rationality and appeals to values
22. « We » and « They »
23. Apathy, cynicism, hopelessness and disillusionment
24. Entrapment and alienation of committed activists
25. Repetition of learning cycles
26. Limited ability to recognize personality needs and problems
27. Nebulous features of societal problems
28. Limited ability to tolerate diversity
29. Limited collective social attention span
30. Limited ability to perceive and describe social processes
31. Limited ability to develop meaningful meta-viewpoints or justify the need for them

(*) Limits to Human Potential. Brussels, Union of International Associations and Mankind 2000, 1976.

Annex 2.

SEMI-HUMOROUS LISTING OF « SYSTEMANTICS » (*)

1. Systems in general work poorly or not at all.
2. New systems generate new problems.
3. Systems operate by redistributing anergy into different forms and into accumulations of different sizes.
4. Systems tend to grow, and as they grow, they encroach.
5. Complex systems exhibit unpredictable beheviour.
6. Complex systems tend to oppose their own proper function.
7. People in systems do not do what the system says they are doing.
8. A function performed by a larger system is not operationally identical to the function of the same name performed by a smaller system.
9. The real world is whatever is reported to the system.
10. Systems attract systems people.
11. The bigger the system, the narrower and more specialized the interface with individuals.
12. A complex system cannot be « made » to work; it either works or it doesn't.
13. A simple system may or may not work.
14. If a system is working, leave it alone.
15. A complex system that works is invariably found to have evolved from a simple system that works.
16. A complex system designed from scratch never works and cannot be patched up to make it work; you have to start over, beginning with a working simple system.
17. In complex systems, malfunction and even total nonfunction may not be detectable for long periods, if ever.
18. Large complex systems are beyond human capacity to evaluate.
19. A system that performs a certain way will continue to operate in that way regardless of the need or of changed conditions.
20. Systems develop goals of their own the instant they come into being.
21. Intrasystem goals come first.
22. Complex systems usually operate in failure mode.
23. A complex system can fail in an infinite number of ways.
24. The mode of failure of a complex system cannot ordinarily be predicted.
25. The crucial variables are discovered by accident.
26. The larger the system, the greater the possibility of unexpected failure.
27. « Success » or « function » in any system may be failure in the larger or smaller systems to which it is connected.
28. When a fail-safe system fails, it fails by failing to fail safe.
29. Complex systems tend to produce complex responses (not solutions) to problems.
30. Great advances are not produced by systems dessigned to produce great advances.
31. Systems aligned with human motivational vectors will sometimes works; systems opposing such vectors work poorly or not at all.
32. Loose systems last longer and work better.

(*) Reproduced from : John Gall. Systemantics; how systems work... and especially how they fail. New York, Pocket Books, 1978. (Reviewed in Transnational Associations, 30, 1978, 11, pp. 491-495).