

Complexity: 3

Organizational Forms in Response to Complexity

The two earlier papers in this series appeared in the April issue of *Transnational Associations*. This paper and the two following papers in this issue complete the series which was presented by A.J.N. Judge as an introductory report to a session on Complexity at the Journées d'études, 28-30 March 1977, Paris, of the International Foundation for Social Innovation. Portions of this paper will appear as « International organization networks: a complementary perspective » In : Paul Taylor and A.J.R. Groom (Eds) *International Organizations: a conceptual approach*. London, forthcoming. The original appendix to this paper will appear in a forthcoming issue of *Transnational Associations* together with other materials on the distinction between « systems » and « networks ».

As the following quotations make very clear, there is now a widespread recognition our institutions are unable to respond adequately in the face of the increasing complexity of their environment, particularly since they are handicapped by the attitudes and consequences of their own traditional approaches to such stresses :

- « Evidence is mounting that the environment which managers seek to control — or, at least, to guide or restrain — is increasing in turbulence and complexity at a rate that far exceeds the capacity of

vide new and improved methodologies to affect management's intentions. Faced with the consequences of force-fed technological change, and the concomitant changes in the social, political, psychological, and theological spheres, there is real danger that the process by which new concepts of management control are invented and developed may itself be out of control relative to the demands

that are likely to be imposed upon it ». (Introduction to a 1968 management conference session of the College of Management Control Systems. The Institute of Management Sciences).

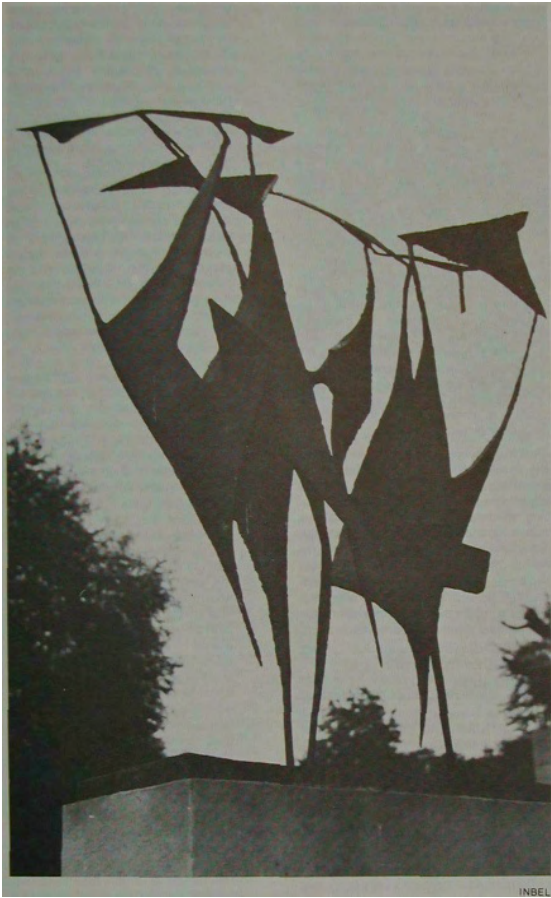
- « Social institutions face growing difficulties as a result of an ever increasing complexity which arises directly and indirectly from the development and assimilation of technology. Many of the most serious conflicts facing mankind result from the interaction of social, economic, technological, political and psychological forces and can no longer be solved by fractional approaches from individual disciplines. (Bellagio Declaration on Planning ». In : Erich Jantsch (Ed) *Perspectives on Planning*. Paris. OECD, 1969).
- « Scientists and business and political leaders in virtually every country are becoming increasingly aware that the human race is facing

more crises than its social and political institutions can handle adequately...

Many important steps are now being taken to meet these problems. These steps, however, are often shaped to fit existing institutional patterns or to be politically or commercially expedient, while other measures of perhaps equal or greater importance have not yet been started. Moreover, the multitude of crises and their complexity and interactions so overburden the mechanisms that have been designed to handle them that there is a valid fear that these mechanisms will break down at the critical

worse ». (R.A. Cellarius and John Platt. Councils of Urgent Studies. *Science*. 25 August 1972. pp. 670-676).

- « Since problems were for so long deemed to be immutable, functions already assumed became more important than aims... In the sequel, within each of these functions, new goals were interred



from extrapolations of goals already achieved, the functions defied the problems to be met, and reassessment of the problems at hand did not lead to the redefinition of the function... The rigidity, fragmentation, and institutional competitiveness of bureaucratic practices are

obviously both causes and consequences of this state of affairs. Bureaucratic development is partly a result of the vagueness of aims pursued. The determination of new

wever, to overcome these weak-

nesses, which also stem from the inclination of bureaucracies to resist innovation. For these reasons, contemporary societies are called upon to challenge certain forms of organisation that can no longer render the services they require, because in these societies, change and uncertainty have become the constant companions of prosperity. Thus, it has become a commonplace that many new problems, over the last quarter of a century, have been recognized too late by the government machine.

which has often been moved to action only by the advent of a crisis... For this reason the identification of emerging problems is a function that tends to be overlooked by traditional public administration and therefore cannot be wholly integrated with it... » (Organisation for Economic Cooperation and Development. Science, Growth and Society, Paris OECD 1971, pp. 60-61).

- «... increasing specialization makes all problems more difficult. With more economic and social development, the subdivision of labor is carried to extremes never dreamt of in previous historic periods. The more effective and efficient organizations and planning bodies are those that operate for narrow and segmental purposes, thereby rendering much more difficult any effort to achieve mutual adjustment or coordination. The more able, honored and highly valued expert is the one who works within an increasingly narrow sphere and who has great difficulty in communicating with other experts as well as laymen ». (Bertram M. Gross. Strategy for economic and social development. Policy Science, 2, 1971, p. 353).
- « Institutions, firms and (thanks to television) private citizens today receive critical information very quickly indeed; the aggregate picture at federal level is slow by comparison to materialize. To put the point the other way round, then, the body politic has wildly overactive reflexes. In the body physiologic this is the condition of clonus — it is symptom of spasticity. If we live, as I suspect, in a spastic society it is because of clonic response. And by the expectations of these arguments, the clonus will get worse ». (Stafford Beer. Managing modern complexity. In : Committee on Science and Astronautics. US House of Representatives. The Management of Information and Knowledge. Washington. US Government Printing Office, 1970 p. 45).
- « Many of our institutions seem to have inadvertently reached a critical size beyond which they are virtually uncontrollable in any coherent fashion. This tact of life was aptly described by Richard Bellman, in accepting the first Norbert Wiener prize for applied mathematics (1970) : I think it's beginning to be realized that our systems are falling apart. We don't know how to administer them. We don't know how to control them. And it isn't at all obvious that we can control a large system in such a way that it remains stable. It may very well be that there is a critical mass — that when a sys-

(em gets too large, it just gets automatically unstable. We see these problems in our educational Systems, in our legal systems, in our bureaucratic systems, in our transportation systems, in our garbage collection systems, and so on... Similarly, as the complexity of societal operations increases, automatically and hierarchically organized bureaucratic structures (whether business, education, government) then develop communication overloads near the top and discouragements to entrepreneurship and responsibility lower down... There is a serious mismatch between modern industrial-state culture and institutions, and the emerging new image of man. This mis-match produces such reactions as the growing challenge to the legitimacy of business institutions whose primary allegiance appears to be to their stockholders (typically other corporations) and managers, the growing disenchantment with the technocratic elite, the decreasing trust and confidence in governments, all revealed in recent survey data. The mismatch could result in serious social disruptions, economic decline, runaway inflation, and even institutional collapse ». (Centre for the Study of Social Policy, Changing Images of Man. Stanford Research Institute. 1974. p. 230, 232, 240).

These quotations do not however make what kind of organizational forms would be most appropriate to this complex environment or, more important, how to facilitate the continuing emergence of more appropriate organizational forms in response to the changing configurations of the problems they seek to encompass. To fulfil its function, any such facilitative open-ended process needs to avoid pre-defining the nature of the forms to which it will give rise. Whilst at the same time providing a context from which such forms can emerge.

One of the sources quoted above recommends that :

• *In order to sustain our complex societal system, we may systematically reconstitute massive bureaucratic Structures into organizations with relatively autonomous subsystems (in effect, decentralization). This adaptive form of organization would seem better suited both to cope with complex tasks and to provide more satisfying work for the people involved ». (Changing Images of Man. p. 232).*

This is only one component of a possible solution however and ignores the unresolved question of the nature and dynamics of the linkages to be maintained between the decentralized units and how to enable the use of centraliza-

tion when it is appropriate. The problem is clarified in the following :

The map of organizations or agencies that make up the society is, as it were, a sort of clear overlay against a page underneath it which represents the reality of the society. And the overlay is always out of phase in relation to what's underneath; at any given time there's always a mis-match between the organizational map and the reality of the problems that people think are worth solving... There's basically no social problem such that one can identify and control within a single system all the elements required in order to attack that problem. The result is that one is thrown back on the knitting together of elements in networks which are not controlled and where network functions and the network roles become critical ». (Donald Schon. Beyond the Stable State; public and private learning in a changing society. London, Temple Smith, 1971).

The key questions therefore concern the nature of any alternative organizational forms which might be usefully explored and the problems of facilitating the emergence of organizational networks, their auto-galvanization, their transformation into other configurations, when appropriate, or even their disso-

lution. (On this latter point it is important to recall that many organizations are often simply memorials to antiquated perceptions of problems).

Alternative forms of organization

1. It is a frequent complaint of those dissatisfied with existing organizations that most of these bodies are based on a western model or concept of organization. As such it is claimed that they do not reflect the style, practice or tradition of organization in non-western societies. This said, however, the formal organizations in such societies tend to differ very little in structure from the western model, except perhaps in the degree of direct or indirect government influence on their activities. Whether organizational forms currently emerging from the Chinese social experiment, for example, could be employed in other contexts is a matter for attention, but there seems to be little evidence of any widespread use of such distinct forms.
2. There has been much discussion of the forms of organization which could result from increased worker (or student, etc.) participation in management. Whether such forms are sufficiently distinct to result in the desired improvement in ability to respond to a complex environment is a matter for discussion.

3. Deliberate efforts have been made in some cases to create minimally structured organizations which blur into formal networks of individuals groups or institutions. The Club of Rome is one example. The conditions under which such forms are appropriate need to be clarified, as well as the specific possibilities of minimal structuring. Note the commune-type experiments.

4. The pattern of links between organizations across geographic boundaries or fields of concern may be such that the resultant network effectively constitutes a loose organization in its own right but at a different level. Such « Organizations » emerge without being deliberately designed and created. It would be useful to know how this process could be facilitated.

5. The relations between members in an organization are conventionally governed by statutory and procedural provisions detailed in appropriate documents. With the advent of computer data networks linking widely dispersed terminals, a new form of computer-based organization is emerging. The rules governing the interaction between the members are precisely embodied in the computer software via which the member-users interact through the data network. This technique, known as computer conferencing, has given rise to what are being called « on-line intellectual networks ». Some of these already cross national boundaries, linking many institutions (including institutional investors). Clearly the rules governing the participation of member-users can be modified to include most of those which are essential to the functioning of a normal organization.

6. The increased use of the technique noted in the above paragraph could also be accompanied by sophisticated modifications to control procedures in organizations. The current range of organizations is limited because of the need for simple voting and control procedures and easily understandable membership groups. The calculating and display power of the computer permits the use of complex weighted voting techniques to allow for a considerable variety of possible distinctions and means of safeguarding against abuse. For example, one member might be allocated 10 votes on one issue range and 70 on another, with the total votes from particular voting blocs being weighted in terms of a complex index itself governed by a weight changing at an agreed rate over the life of the organization. This would permit a much more subtle make-up of organization membership, reflecting

more closely the relative interests, capabilities and qualifications of members. The variety of organizational structures would therefore increase. Such « computer-structured organizations » could be successfully created from combinations of members which would currently be considered improbable or unstable.

7. The above techniques make possible the existence of organizations which only - cohere » and « exist » on particular issues, or which might have a wide voting membership on one issue, but a very limited voting membership on another. This takes us to a point where the concept of art organization as a distinct and well-defined structure (other than in computer terms) is replaced by an emphasis on the potential components of a structural pattern at any one time and the stimulus necessary to call each of them into play. This formalization of inter-organizational dynamics is foreign to conventional thinking about formal organization but is close to the normal intuitive understanding of the operation of networks of small groups, informal organizations and pressure groups. (This concept of a « potential association » is discussed below as a possibility for network design).

8. Clearly the above trends would encourage the emergence of issue-oriented organizations, presenting all the characteristics of a permanent formal organization except that they would be designed to terminate after a period of days, weeks or months. Such bodies might even be rapidly « created - by computer from a pool of members who have registered interest in participating in any such bodies when activated by a sufficient number of requests in response to an urgent issue. The whole procedure of informing members, registering statutes, obtaining funds and initiating action would be handled through data networks. A situation might emerge in which considerably more temporary « computer-formed organizations » of this kind existed than those of a more permanent conventional nature. Clearly this would have many implications which cannot be explored here.

Network design

Just as the distinction between an organizational system and an organizational network has not been resolved so there is a paradox involved in implying that networks can be « designed » and « operated » rather than that they emerge and evolve in an essentially unpredictable but synergistic fashion. (It may be that designed or operated networks should more appropriately be called systems). Whatever

the case, the following represent some lines of development which merit further discussion.

1. Inter-organizational design

There is little available knowledge on inter-organizational design for the obvious reason that whenever there is any organizational initiative, there is a natural tendency to design a single organization, however large and cumbersome, and little incentive to explore the possibility of inter-organizational networks with a minimum of centralized control, if any. An editorial comment introducing a chapter of readings on « designing a managing interorganization systems » states : « Given the

organizational relations, it may seem both premature and hazardous to concern oneself with normative questions of designing and redesigning inter-organizational systems ». (William Evan, Inter-Organizational Relations. London, Penguin, 1976).

The three articles included there as illustrations of potentially useful approaches, make the point that much remains to be done. One deals with strategies for resolving interorganizational conflict, the second focuses on the Antitrust Division of the US Department of Justice, and the third examines the role of computer-based communications systems in effecting inter-organizational linkages (in a product marketing context). None gets to grips with the actual design of interorganization networks and the paradox that implies. There have however been a number of studies of decision-making in an inter-organizational environment.

2. Matrix organization

This approach, developed and implemented by NASA for the moon project, is a major step toward network design but fails (in that respect) since it is a single-purpose structure in which the purpose is formulated by one body. Within the matrix structure each participating body, whether controlled by NASA or not, is considered to be at the intersection of influences from other parts of the structure and itself in turn influences several others. It is a system which tends to diminish the visibility of authority and to emphasize consensus as an operative mode. Operating decisions are part of the give and take of specialized units struggling for a share of the system's total resources.

3. Ad hoc networks

The insights derived from use of a network model as a way of structuring perceptions concerning society can be used to move towards the development of an alternative style of organization.

In testimony in 1975 before the Committee on Foreign Relations of the United States Senate, Alvin Toffler

outlined this possibility in the case of international associations (NGOs), in response to a question on how to organize a wide variety of interest groups into a coherent network :

** The question raises extreme difficulties. When you say I mistrust world government, what I mistrust is centralization of power, and I think we should not find ourselves in a position of opposing the notion of world order based on decentralized power or pluralistic power. We have got to find an alternative structure which deals with both these questions. The ready assumption that if we can centralize power we will be able to solve our problems, is a traditional assumption that grows out of our industrial-era experience. I think it applies less and less. One of the reasons I argue the case for much more attention to the NGO's is that the NGO's form the potential for any number of temporary, mission-oriented consortia that could be brought together, whether they are environmental organizations or scientific organizations or organizations con-*

cerned with community development of food or whatever the issues are. It is possible to put together temporary consortia to deal with specific problems. Now, in order for that to work you have to have some coordination or management. But what I am describing need not be a pyramid.

Now, here is one way to verbalize the alternative organizational structure. Think of the pyramid. Then think of a thin frame, a very thin frame which is essentially coordinative, which is a thin layer of management and direction, with a whole series of essentially temporary organizational clusters of modules that have relatively short life spans, and among which people float quite freely. They move from one module to another rather than being frozen in a single bureaucratic niche. If we pump some funds into the non-governmental sector, we might help to create precisely this thin coordinative system at the top. We would then have a basis for a very large, very diverse, very flexible, ad-hoc organization that could operate in the international field ».

Nor does Toffler limit this technique to NGOs:

** ... we need to think in terms of the creation not of a single center, or a single world government that will some day govern the nations of the world, but rather in terms of a self-regulatory network of transnational institutions, multiple institutions, a polycentric system. Such a transnational network can provide a higher degree of stability for the planet than the centralized model based*

on a single international governmental organization... we must first recognize that the U.N. is only a tiny piece of » swiftly emerging transnational mosaic or network of institutions which are part of the new super-industrial system. This network consists of thousands of organizations and millions of individuals around the world in continually shifting relationships with one another ... (Alvin Toffler, Hearings before the Senate Committee on Foreign Relations, 94th US Congress, 1st Session, 1975).

4. Potential association

An innovative response to the new operational requirements necessitated by the approach suggested by Toffler is that of the « potential association ». Such an association would, as such, not have » members » in the conventional sense of a defined set of individuals or units of organization subscribing in common to a particular set of views. The emphasis would be switched to objectifying the tenuous concept of a group of bodies which could link together in different transient patterns under different appropriate conditions. The need to centre attention on existing organizations (with their tendency to self-perpetuate and constitute obstacles to social change) is diminished in favour of recognition of the range of potential patterns into which the component entities in the potential pool could « gel » in response to new conditions. A meaningful and dynamic social framework for conventional, « permanent » organizations is thus supplied. Thus whilst society may, with the use of an approach of this type, form a highly ordered (low entropy) complex at any given time — satisfying short term, stability requirements — the high probability of switching to completely different high order patterns at later points in time supplies the « randomness » (high entropy) condition essential to the facilitation of social change and development in response to new conditions.

In other words we have a means of ensuring high social stability at each point in time with low predictability over time, or alternatively, and paradoxically, we can think of it as a potentially (i.e. unrealizable) highly ordered situation over time which « contains » a sequence of very disordered situations. An advantage of this is that people and power groups have somewhat greater difficulty in taking up feudalistic roles in potential structures (if in fact it is possible to do so).

5. Organization tensegrity

There appears to be an unexpected formal analogy between some architectural design constraints and aspects of organization and network design.

Architecture is no longer restricted to simple arches and domes which derive their stability by allowing structural weight to impinge on the compressive continuity of bearing members and protecting the result by occasional tensional reinforcement — an approach which bears considerable resemblance to the conventional hierarchical organization. Instead of thinking in terms of weight and support, the space enclosed may be conceived as a system of equilibrated omnidirectional stresses. Such a structure is not supported by the lowest level. It is pulled outward into sphericity by inherent tensional forces which its geometry also serves to restrain. Gravitation is largely irrelevant (cf. R. Buckminster-Fuller, Synergetics. New York, Macmillan, 1974). Many parallels can be explored with the organizational development from hierarchies to networks and away from

structural implications of worker (or student, etc.) participation in management). The value of this is that considerable thought has already been given to the nature, construction and stabilizing forces within the resultant architectural geodesic and tensegrity structures. It may well be that this will provide the necessary clues on how to design some useful organizational networks for those cases where the hierarchical form is no longer appropriate. (This theme will be explored in a forthcoming issue of Transnational Associations).

Some policy implications

1. Facilitation of network processes

It is clear that intra- and inter-organizational networks are growing, multiplying and evolving in response to perceived social problems and possibilities for action. These changes are in large part unplanned (and unfunded) from any central point and appear to be self-correcting in that « excessive » development is compensated by the emergence of counteracting networks. Little attention is given to facilitating this growth so that in some cases it may be considered dangerously spastic. Despite this the network of organizations (international, national, and local) of every kind and with every pre-occupation, represents a major unexplored resource. The (synergistic) potential of this network, if its processes were facilitated, is unknown.

Possibilities for facilitating these processes include :

- facilitative (as opposed to obstructive) legislation
- subsidized postal and telephone communications
- creation of facilitative environments where organizations and people can meet and interact informally to catalyze, wherever possible, the emer-

gence of action programmes or formal collaboration

- creation of information systems and devices to facilitate the development of new contacts in response to new issues (e.g. social action yellow pages, network maps, on-line intellectual communities, community interaction software packages, etc.)
- examination of the significance of the number and reticulation of organizations in a society as a social indicator, both in terms of development and quality of life.

The elements of the strategic problem at this time include :

- a vast and largely uncomprehended network of perceived problems and problem systems, on which no single body has (or possibly could have) adequate information.
- a vast and fragmented network of conceptual tools and knowledge resources which is not (and possibly could not be) comprehended by any single body.
- a vast and largely uncomprehended network of agencies, organizations, groups and active individuals spanning every conceivable human interest on which no body has (or possibly could or should have) adequate information.

These networks, and others, are not static structures. They are changing rapidly in response to pressures and opportunities perceived in very different parts of the social system. As such they, and their component sub-networks, are not controlled or controllable by any single body, if only because the complexity cannot be handled by any single body or group of bodies. The strategic problem therefore is how to ensure that the appropriate organizational resources emerge, and are adequately supported, in response to emerging pressures and opportunities. But it would seem that this must be achieved without organizing and planning such organized response — for to the extent that any part of the network is so organized, other parts will develop (and probably should develop) which will favour and implement alternative (and partially conflicting) approaches. The challenge is therefore to develop the meaning and constraints of what may be termed a network strategy. This is an approach which facilitates or catalyzes (rather than organizes) the emergence, growth, development, adaptation and galvanization of organizational networks in response to problem networks, in the light of the values perceived at each particular part of the social system.

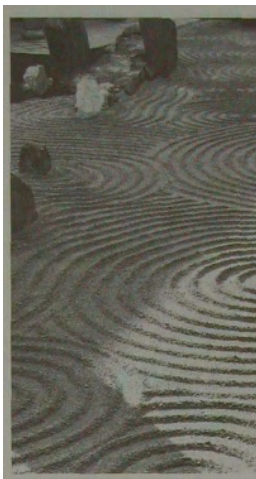
3. Network vocabulary

Whether amongst academics, policy-makers, administrators, or other practitioners, the frequency with which « network » is now used is not matched by any increasing facility in distinguish-

hing between types of network. Because clear and simple concepts are lacking, together with the appropriate terms, discussion of such social complexity can only be accomplished, if at all, by the use of extremely cumbersome and lengthy phrases which tend to create more confusion than they eliminate. A vocabulary is required which is adapted to complexity. In the absence of such a vocabulary, debate tends to avoid discussion of issues which emerge from such complexity and concentrates on issues which can be adequately expressed via the existing vocabulary. This creates the illusion that the issues which can be discussed are the most important because of the visibility accorded them by the vocabulary at hand.

There is therefore a real challenge to the social sciences to identify concepts associated with complexity and to locate adequate terms with which to label them in their relation to systems. The development of such a network vocabulary would provide a powerful means for objectifying and de-mystifying the complexity of the organizational, problem and conceptual networks by which we are surrounded within which most of our activity is embedded.

A.J. *



Organization of Meetings for Discussion of Complex Issues

Parts of this paper were originally presented as part of a report to the 6th International Congress on Congress Organization (Kyoto, 1975) and were published in International Associations, 1976, issues 1 or 2.

Other portions formed part of the introductory material for some sessions of the 7th Congress (Hamburg, 1977) which was subsequently cancelled.

With the increase in the complexity of society and its problems and with the increase in the number of groups and institutions whose views must be inter-linked to ensure an innovative response to any new issue, it is obvious that the role of meetings as focal points has become of considerable importance. But whilst the number of local, national

standing of the psycho-dynamics of meetings.

It is still standard practice to rely heavily on what can be achieved in a plenary session governed by a rigid time schedule with the consequent emphasis on the contribution of main speakers from an organizer-controlled podium and with effective limitation of the open

1. the main invited speakers
2. the potential participants informed, invited, or even subsidized.
3. the physical constraints of the space for plenary, parallel and small group sessions.
4. the geographical location of the meeting in relation to the location of potential participants,
5. the time available,
6. the constraints imposed by a multi-lingual audience.

ed. as has the variety of issues with which they deal, the form of such meetings has remained essentially the same. Although not applicable to all types of meeting (see below) it is nevertheless valid to note that the basic form of a meeting has not changed over the last half century or even a longer period — despite increasing recognition of the complexity of the issues discussed and despite considerable increase in under-

of commissions or small group discussions is used, there is still a major problem for participants to allocate their time between parallel groups on related topics, and for the meeting as a whole to receive and integrate the work of such groups once completed.

In a very real sense the content and results of the meeting are predetermined by the choice of :

As is well known, much is also predetermined by the (« behind-the-scenes ») activities and intentions of the organizers and sponsors in structuring the programme and ensuring that the meeting * flows smoothly ».