III. NETWORKS AS A COMPLEMENT TO SYSTEMS

- Organizational systems versus network organization
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Organizational systems versus network organisation

The interdisciplinary and intersectoral round-table discussion took place as one of the working groups of the preliminary meeting on "Exploring the Network Alternative" which was held at the University of Concordia, Montreal, Quebec, Canada, 18-20 November 1976 (see report on pages 352-355). The purpose of the discussion was to examine the problem of clarifying the concepts associated with "network".

The orientation was provided, in part, by background documents which drew attention to the increasing use of "network" in connection with "people-groups" and certain kinds of interorganizational activity, as distinct from various conventional uses such as in "social networks" of individuals (which are a special preoccupation of a certain school of sociology). Orientation was also provided by informal presentations from Dr. M. Vidyasagar (electrical networks and grids), Dr. R. M. Chen (automation control circuits), Dr. P. Dansereau (biological and ecological systems), and Dr. Joseph Fiksel (networks as mathematical objects). A case history of a network of individuals and groups based in New England was presented by Marc Sarkady (Another Place), complemented by a presentation by Linda LeClair (American Friends Service Committee) on one of that network's particular concerns, namely to campaign against the establishment of a nuclear plant in the area.

The extracts presented here focus on the main theme of the discussion during the round-table: as to whether there was any real distinction between a "system" and a "network" and, if so, what that distinction was, particularly in the case of networks of individuals, groups and organizations. This point was also explored in the group on "Complexity" during the meeting of the International Foundation for Social Innovation, Paris, March 1977. The summary report by R. P. Dubarle is included in this issue, pages 369-372).

The transcripts have been edited by one of the participants, Anthony Judge, without submitting a draft to the original group. Speakers are not identified by name for this reason (and also because not all speakers could be identified from the tapes). Known speakers are identified by bold letters A, B, C, D, E, F, G and H. Unidentified speakers are labelled by the letters X, Y or Z, as appropriate. The editor is however responsible for the final wording since discussion of related themes has been omitted as well as detailed exploration of some points. The original participants, and others, will be invited to make further comments in the light of this report.

It may be asked why it is necessary to adopt the space-consuming method of reproducing the (almost) verbatim statements made during the discussion, rather than a synopsis, which would normally be adequate. The answer is that it is in fact the original statements which best reflect the current "information confusion", the relevance of unexpected insights, the avenues which could be explored, as well as the provisional nature of any conclusions at this stage.

It may also be asked, as was done during the discussion, whether the differences, if any, are significant, rather than simply a matter of terminological preferences, current fads, or plain quibbling. Specialists from some disciplines may be quick to reply.

Those reading this report of a discussion between specialists from different disciplines, together with others interested in the social significance of such a distinction, may recognize that the matter is not so simple.

The issue itself is however very simple. Terms such as "international system", the "establishment system", or "the System" are widely used, whether by social activists, academics, or politicians. For some they have extremely negative connotations, and such people increasingly prefer to think in terms of "networks", and "networking", which for them represents a distinct method of organization (or minimal organization). Are they deluded and misinformed, or is there a real distinction between working in (or with) systems and working in (or with) networks?
A It seems to me that we’re not struggling with two different things — content and structure — but with at least three different levels. We start with the assumption that there is something we might call a network or a network structure in various fields — in electrical phenomena, in political systems, and so forth. Each of those networks carries different kinds of messages — carries different content. At one level we can see aside whether it’s a pro-nuclear network or an anti-nuclear network. The content of it is one level. Another is the structure of the network; what are the characteristics of structure how do they differ — morphology. Then there is a third level which we keep sliding in and out of and that is the epistemological questions that the whole thing raises. For example if in fact you have a vocabulary that you can use in electrical terms, can you transfer that to biology, or social networks without a whole set of assumed analogies — and so on.

So it seems to me there are questions of language, semantics and epistemology at one level. There are questions of morphology at another level, and there are a whole set of questions about the character or substance of the network at another level.

My own interest is not in the content, so called, but in the structure, and also epistemology. We had Dr. Vidyasagar give us a kind of elementary lecture yesterday on the terms used in electrical networks, and to me it was interesting to see how well elaborated the vocabulary is. I would like to know what the parallel — if there are parallel terms — would be for biology, for ecosystems, for political systems. Might there in fact be parallel vocabularies for each of these fields, all of them saying different things? Perhaps I should say here that as a writer, a student of social change, interested in emerging political institutions and so on, my concerns are with analogies I might be able to fetch or borrow out of this discussion we have today...

B Could I come back to this problem of network or system — if one directs the way the network functions is it still a network? I’m interested in the flip. You chose system in your example, is this system embedded in a network? If we take the example of the anti-nuclear campaign, they were concerned with a system to handle that issue. The system was still embedded in a network and when the issue disappeared the system will disappear as a system. The network may well remain.

C I would think the reverse. A system as I see it is definable in terms of agency, source, process, trophic level. And this is unique to a particular trophic system. That same combination of elements does not repeat itself but goes through a series of variations. Within each ecosystem there is of course a network. Whether the network is contained in an ecosystem or extends beyond it, or whether it is auto-regulated or dependent and feeling out to other ecosystems is very relevant.

To me network is a sort of in-ner-vation of one or more ecosystems. It may be two ecosystems will be so interdependent and the loops between them so small that that network will appear to have more cohesion than either of the two ecosystems, especially if they are indeed absolutely interdependent.

B Can we focus on a terminology or glossary? It seems there are reference books we could use to build this. There are some critical areas of terminology, such as «node». I would be happy as a first round of a glossary to put down about 150 concepts and at another meeting to go through and decide on their relative usefulness.

A I don’t think it is a question of which are more important and which are less important. I think you could map which concepts recur from field to field and which concepts are discipline-specific, then you could question the difference. I was thinking of more than one column, biological terms, mathematical terms, political terms, etc.

B I like the suggestion of «columns» and perhaps another column to suggest social implications. For example «maturity» of an ecosystem or climax — we don’t have a feel for this in social networks, but it is well defined in ecosystems. What interests me in the notion of maturity is that there is a measure of how mature the system is which is in fact related to the number of «links» between species at different trophic levels.

There is a well-connected economic network that for generations has plundered Indonesia’s outer islands of their wealth, and particularly the Moluccans of their spices. It is a network controlled at the highest levels. (International Herald Tribune. 13 June 1977).

C A mature ecosystem is homeostatic and very largely self-regulated or else has long been associated with other ecosystems in a self-regulating complex.

B We jump immediately to the conclusion that this is what we would aim for in a «limits to growth» idea. If in ecology there is a sense of what kind of system this would be, one could gain one or two insights as to how it might be in a social system.

C I think what we are aiming for is better and more far seeing controls that will have to manage even more of the existing ecosystems of the planet.

B The interesting thing is who manages «who manages» and whether it is still possible in this society to imagine some unique central controller who is managing the planet through various subsidiary controllers. This is no longer a viable model. We have to work with a network of controllers of more or less the same level. We don’t have recourse to an ultimate controller who could in fact make the system work.

... It’s one of the law’s oversights, a abuse built into the system. But we do what we can... The misfit network went to work; the crowds gathered, screeching their epithets, swaying to their adolescent, useless chants. (Robert Ludlow, The Gemini Contenders. Panther, 1977, p. 212).

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58, chairman of the Northern Economic Planning Council in 1965-70, masterminded a web of corruption... Mr. Taylor said the corruption system was operated through Smith’s network of public relations companies...
C Natural ecosystems are harmonious but this harmony and stability, maturity if you want to call it that, has been achieved at the expense of efficiency.

The White House « on the assumption that the bill will pass, plans a wide network of 600 businessmtn... to be part of an elaborate network of government-industry relations ». (New York Times, 13 May 1974).

All natural ecosystems are relatively, rather inefficient. Take the Sequoia forest, it is doing a very poor job. Of course take down the Sequoia forest and put in Douglas fir and you'll get a tremendous crop in no time at all.

A But I think the point is still valid. If the measure of efficiency is how many Sequoia you grow, it would be a very efficient system. Well, what I've heard resonating in the background of this conversation is the idea of maturity, the idea of mature networks. What I begin to think is maybe one can view a social system as a process ofé growing networks and that one can even think in the form of « social agriculture » in which you are « artificially fertilizing » the society so that it produces certain kinds of networks. That's just the imposition of an agricultural analogy on sociology.

B I find that very interesting. I'm still troubled by this problem of network or system. Do the systems fit into the network or do networks fit into the system? I think it a problem because we run the risk of people saying well you can't use this word « network » when basically it's just a « system ».

D It seems to me that it's a choice of model. If you want to focus on loops, on exchanges then you're thinking about networks. If you want to focus on boundaries and demarcations then you think about systems. The other thing I notice is that people who think about systems seem to like to have a box that has one purpose, whereas people who think about networks have a feeling the network may have many purposes. There are two ways of getting things done, you can set a purpose and then bring people together to work on that purpose, or you can go around looking for interesting people and bring them together and put them on the back. In both cases you will have something happen, but in the one case you don't know what's going to happen — you have a feeling it will probably be good, because you've had some discrimination in whom you have brought together.

X A network is a means. A network is exploited by a system.

A You like the word network and I wonder how you see that in terms of people talking about establishment systems.

A I think that what he says is so and the list of suggested differences (see page 365) are essentially connotations.

B Well this has consequences that if you want to build a systems model you are quick to define boundaries.

A You say the « systems » model. Is it a different model or is it simply a different vocabulary for describing the same kinds of relationships? Is there something that defines it? I think it's a valid issue for us to focus on. I need to be convinced that there's a real life difference, as distinct from a set of linguistic preferences, but I do not deny that there might well be. I want to be educated on that.

X A system can describe an organization or a manufacturing process. Can a network do the same?

C May I volunteer a definition? A network consists of strands that ensure the cohesion of the system and/or allows it to tie up with other systems.

D It may be that or a network may cross many systems.

A Network is the « innervation » of the system. It ensures circulation within the system and occasionally ties up with other systems.

The slave must surround himself every night with a network of string that would sound alarm bells if anyone attempted to approach in the dark. (Harry Harrison. Deathworld 2. 1964, pp 41-2).

A Bell Telephone and Bell Canada use both terms to refer to the Bell « system » and the « telephone network ». Now the Bell system is a social, economic and political organization. The network is a physical structure to them. That may be because the entire company is run by engineers.

D And it is a North American « telephone network ». The Bell « system » manages a component of the North American telephone network.

B I find that an interesting contrast. Because then for me the network is larger than the system. The system is a way of controlling part of a network.

A But they could be co-extensive.

X Or they could be the other way around.

A One big telephone company for all of North Americans and several in Canada. But consider the question that was asked over here about a manufacturing system as producing an end product. Can a network work that way too? Maybe that will lead us somewhere. It has to do with time — with networks through time.

X Can I ask why it is so important to differentiate between a system and a network? Should the difficulty not tell us something?

B I think the reason why it is important lies in the fact that there is a whole literature and many organizations concerned with systems of one kind or another. And it seems to me that there is a whole other area of concern with networks. And the people concerned with networks are not necessarily served by, or interested in, what the people concerned with systems are doing.

A I think there is a real political difference in the two words.

D The unipurpose thing I think very important.

A And I think people react rather strongly in different ways to the two terms. We talk about system and they think the thing is imposing itself on them, whereas being part of a network that's always sexier.

X It may change with time.

A It might, but it seems that is the present political loading.

X What about exploiting the technology of systems then. A system does something, never mind the political implications. System has a purpose and a methodology. I think surely they overlap in many ways.

B I think that the advantage with networks though is that they are multi-purpose. They are prepared to respond to a variety of conditions and problems.

X Systems can too.

B Only if we define them in advance, and this is the problem.

D Is it not a problem of connotation and emphasis?

X Again, it depends on who is describing the system and for what.

A I think we should spend more time on this as it really is the background to anything else we might discuss.
There is so much terminology linked to systems and if there is a distinction we have to make it. The telephone is a democratic technology as distinct from, say, broadcasting where you have a centralized information factory which pumps out an image. A telephone system — one of the problems — is that it was by law they had to provide service — they have to give it to anyone who wants it. They can’t make political or other kinds of distinctions. What that means is they have no control over demand. The system is activated by the consumer. A I think there would be something more interdisciplinary about a network.

C Should we ask ourselves whether it is at all possible for a system to exist without having some kind of network as an inner structure? My answer would be no. Any system has some kind of an interior network. That is a minimal proposition as far as I am concerned. Now whether the network does and can extend to more than one system, the answer is of course yes it can. In fact, there would be very few systems that had a very self contained network not extending beyond their boundaries. This is almost unimaginable and certainly very exceptional.

A But what is the distinction?

C To me the network is some kind of conveyor of whatever is operative within the system; what I would call in my vocabulary resources, however understood, whether it’s oil or information. It is still a resource and in order to pass from one state to another, to be transported and transformed by some kind of energy, it has to borrow the pathways of a network. We were considering hierarchies this morning and I think there are hierarchies in a system, and there are bound to be hierarchies in a network. Some channels within a network are all-purpose conveyors and other channels are highly specialized and carry only one kind of information.

E For me a system is more defined and constrained than a network. Think of the distinction between a heuristic and an algorithmic process with certain restricted inputs and predictable restricted outputs. Heuristics are processes which operate on a whole class of things with only partially predictable results. This may just be my yearning for a network to be very flexible, so that you never know for sure what’s going to happen. I tend to think of a system as something predictable.

C It’s predictable in as much as you know what is being carried and what mechanisms will stop or will forward the resource. There are all kinds of signals that say go and stop, or on and off. A network is full of on and off signals, whether you’re dealing with a bubulous plant that has a rest period, or whether you’re dealing with a bank that has opening and closing hours. There is a stop and go — now what activates the stop and go?

E Well I would talk about the banking system, because banks are among the most predictable, in their mode of operation.

A I suspect that you would find many bankers who would be very unhappy with your describing the system as predictable, when the money system...

C You’re looking at a different system than I am. As a user of banks, I am looking at the surface manifestations of branches and transactions and things of that kind; so I think we’re looking at different systems.

E Yes, but I think that they’re looking at a different system than I am. As a user of banks, I am looking at the surface manifestations of branches and transactions and things of that kind; so I think we’re looking at different systems.

X You’re looking at the mechanics. You can describe the mechanics and interconnections quite precisely because you know what is being carried and what mechanisms will stop or forward the resource.

A You don’t build a solar system.

F And you wouldn’t call a solar system a network.

E Well, OK, maybe that’s a point that we can work on.

B I think that the predictability in something like a solar system, or an ecosystem, derives more from what we want to identify.

A Is that predictability, what we call predictability, isn’t that really a reflection of a level of human mind, rather than some objective fact — until Newton we couldn’t predict very well.

C There might be some natural factors that the predictability is high where the freedom is low. If there are few possible alternatives for a resource to engage in one or more circuits, then the predictability is high.

G It seems that you might be able to say that a system is a subset of a network, but that you might not be able to say it the other way around.

A We said it the other way around this morning — but I’m not sure that anyone is persuaded of either of those alternatives. As we said before, you couldn’t call a solar system a network. It seems to me a good place to begin to look for the distinction. Is the distinction simply a matter of predictability? It seems to me that it’s always the human being that’s doing the prediction, nobody else is doing it. How well we do that or how poorly we do that varies.

X Doesn’t it fail for lack of interconnections — channels and nodes — channels of information flow within the solar system.

B Let’s take that a step further. Assuming that we have an interplanetary society, in which communications were taking place between all the different planets. Those communications would in effect, as they patterned themselves, constitute a network, which would have a much more unpredictable component than the solar system as we know it now.

G Is it the difference between open and closed systems? That an open system is a network, and that a closed system we would not want to characterize as a network.

B I agree; but what bothers me there is that we’re defining a network in terms of a system, and I’m not sure that it shouldn’t be the other way around. When you said in your opening statement that a system has network as an inner structure, the network is inside the system; and then you add to that that few systems have self-contained networks.

C The system can be coherent, I think that was the term that I used, as much as it has a network that irrigates its different parts, that allows it the distribution of resources that makes it what it is — whether it’s a bog or a bank makes no difference. The network must in some cases extend outside of the system.

X I think that a better example of the distinction we’re looking for is the surface communication network. We take a map and there is a road, a network of surface communication; but it pervades how many systems — farmland, industrial development and urban.

F Could one possible distinction be that the system could be goal-directed, whereas I don’t think, at least so far, that network can be.

D Well, the emphasis is there. Usually when you try to design a system, you
try and establish a hierarchy of goals, so that the system won't be conflicted within itself. A telephone network for instance can be used for thousands of purposes.

D Or it may have the meta-goal of bringing people into communication; or there may even be a meta-meta goal of sustaining hope (which I suspect may be behind a lot of these systems here).

B What about the distinction we were looking at this morning between the Bell «system» and the «telephone network»? There is in sense the Bell system is managing the telephone network.

C That really could be an error in vocabulary, because something or other calls itself the Bell system. I would go so far as to say that rarely, if ever, is a network co-extensive with a system.

A I still don't see the difference.

D It's two different ways of modelling things. In system modelling you think a lot about boundaries and boundary conditions and about teleology and purpose, and the purpose of the components; and in the network you think a lot about what properties you're going to concentrate at nodes, and what kind of flows you're dealing with, and the rates of flows.

A But still they could be in the end be identical. You can go into the process in one sense in the case of the system, looking for a goal or purpose, etc.; and into the network shooting for other things. There is no mutual exclusivity. You could come out with two things that look alike.

D If you improved your system model you might find that you'd have to use a model that had a network configuration. Or as you improved your network model, you might find that parts of the network had a lot of integrations and were not so much connected with themselves, and not much connected elsewhere. So you might as well put a wall around them and call them a system.

C The important distinction to my mind is that the system generates resources, including information. The network does not generate anything, it conveys, that's all it does.

A But if all a network does is convey, passively, what about human networks, or social networks, where each of the nodes — each individual as a node in the network — transforms the information flowing through it?

C No, it is not the network itself that transforms. The system is a matrix, and the network is the invention thereof. So, at a certain point in the network, the network reaches to an area where, for instance, vegetable is transformed into animal material.

There is a threshold which is crossed, a transformation that is effected; and a channel exists or does not exist or is blocked, or is on, or is off, which conveys this new information from one node to another.

A But translate that into human beings. If we're talking about a social or political network (we were talking about the experiments and additional deterioration); or we have a political party. The political party is a network. It's not a party, it's a network. At one end somebody says, «Let's stop the building of this nuclear plant in New England», and that filters through the network. By the time it comes out the other end it may say «Let's help build that plant!»

In consequence, apart from this network of relations linking up every kind of object (physical, metaphysical, mental, real and unreal in so far as they have «psychological reality»), the symbolic order is established by a general correlation between the material and the spiritual (the visible and the invisible) and by the unfolding of their meanings (J.E. Cirlot, A Dictionary of Symbols. London, Routledge, 1971, p XXVIII).

C It is not the network that generates the information. It is the President of the Aluminium Company who says he wants to close the plant; this decision is made in the Executive Offices. He picks up the telephone and this already-generated-information is, through the wires, transferred as a message that the plant must be closed.

A You're still conceding in that case that the wires of the telephone system as the network, I'm saying forget that. Let us take all the technology out of it. We've got a group of people who form an invisible college, who are interested in ecology before anybody else is interested in ecology. They telephone each other, and so on. Now in loose parlance we call them an ecology network. What's happening though is that as the information moves, through that system...

B Why did you say «system»?

A OK... Well, the reason is that I'm still not convinced that there's a distinction — I'm still using the two terms tentatively, interchangeably, until I can find a good distinction. But what I am saying is that if we all leave this room, we would be a network on networks, whether we like it or not — a meta-net... Assuming that we don't use any special communications technology to communicate, what makes us different from a system. We decide that a network is a such-and-such; and then we have friends out there who are also interested in networks and so forth. By the time I go home and tell my wife what we talked about here, I will not deliver it in the form in which I received it, I will re-generate that information. It passes through me and comes out different. So that in that sense the network is not just a passive conveyor, in the sense that a telephone network is a passive conveyor.

C The system is the community of presumably knowledgeable people who have gathered together. That is the system. The matrix is the round table. Suppose that we come out with a definition that we think is pretty good, and we decide that this has to be communicated to Professor so and-so. We then borrow another network, using the telephone, to convey this same information.

A But in fact the message that passes through this node would not come out the way it went in. What I'm saying is that, even as in a human network, it's quite clear that if the individual humans are nodes in that network, those nodes are quite capable of generating, or re-generating, or altering the message; so are certain mechanical systems capable of doing that — of transforming the information that comes into them into another form.

B But only in certain ways. When you talked about the solar system as being predictable, what you were saying is that we can describe the way in which the parts are related. When we talk about the circulatory system, we can describe the way in which it operates, and for all intents and purposes we assume that all circulatory systems of all human bodies operate like that. And in that sense it's a static model — we can draw a picture of all circulatory systems for all people, and it's going to be the same for each one. But in a network we could never draw a picture of a network that would fit for all cases; so a network is dynamic in a way that a circulatory system is not.

B I feel the lack of inputs from other areas, from medicine, from topology or some specialized branch of mathematics. I can list 10 or 20 such areas which I would like to feed into this process so that we can just see what kinds of concepts we might usefully deal with. Work is required and that will be done in some sort of preparatory document for a future meeting or as a follow-up to this meeting. But what I would like is some feedback on how you feel about where we might go from here with respect to the terminology in question.

H I'd be happy to give you some input as a mathematician concerned with networks.

A I was just going to say. My own feeling is that the time is valuable and I would rather we spent the time on substantive discussion than on procedure for constructing the next meeting.

(This debate will be continued in the next issue of «Transnational Associations»).
H Traditionally, networks have been thought of as collections of nodes joined by lines. Now when people talk about a system they often draw diagrams that look very similar to this. They simply draw boxes with arrows between them. Now I think that is the basic difference. There is a difference in the notion of the system where you have, say, various boxes with flows between them and so on, and the network. In the sense that the network is a representation of some substantial material object whereas a system represents process or abstractions. In other words, each of the boxes in the system represents something that is going on, perhaps some kind of communication or a creative process, or some process of combining elements or separating elements, or whatever. In a network the individual nodes actually represent entities or positions. It's a more fundamental kind of representation and I personally have worked much more with this sort of representation than with systems.

To put it very simply, the nodes represent simple objects or concepts or whatever. But if they represent concepts, that departs from their being something that exists, something tangible. Let me give you an example of a concept. For instance, one field that I've worked in is in modelling human memory in which I used nodes to represent concepts such as "warm". But what is it? It's a simple concept. It's not a conglomeration of ideas. It's not a process or a set of equations or a transformation. A node is just a thing we can some how deal with, that we can separate as an entity, and we can also postulate that this thing has a relationship to other entities. Anyway a system is definitely a more complex notion. It requires more definition of what's going on and it usually involves a flow, a dynamic process. A network is much simpler. It exists in and of itself, even if a network isn't doing anything, it's still there.

X How does a network do this?

H At this point it might be useful to talk about particular kinds of networks because we are talking about a mathematical object which is very general and networks can be applied to lots of situations. Let's take a biological example. If you take a micro-organism, you can think of the cells of the micro-organism as being a network because they are very closely connected. Each cell does communicate with its neighbours. So you can think of this as a communication network. Now this network definitely does something. It somehow manages to grow, to propagate, to feed itself, and so on. So networks do things in particular contexts. If you can conceptualize some material object or some organism as a network, then you can talk about what it does, and the interesting thing is trying to figure out how it does that given its structure.

B We have different concepts of network control networks for example. Here you are talking about a biological example, you are talking about a way a network grows. Now I've been interested in the distinction between the way a network grows according to a fixed pattern and the way a network might evolve. In other words how it adopts a new pattern, a different pattern. Have any of you ever heard of the mathematical game called "life"? It's really a kind of a process. What he does is he divides a plane surface into a grid pattern, and then he puts some entities into some of the cells. These represent things that exist and that grow. They have the power to propagate or they will also vanish under certain conditions. What he does is he goes through steps, one step, after another and at each step some of these entities will (according to these rules) either appear or disappear in the cells. So if you have an evolving network, if you are evolving according to very simple rules, he has shown that these networks can expand, they can contract, they can throw out branches, they can break up into distinct networks which actually move away from each other, and so on. They do all kinds of amazing things depending on their shape at any one time and the distribution of the entities. For instance starting from an initial shape, the system will go through a number of transformations. It may expand and then contract, and eventually it may reach a stable point where it just oscillates, it can do a flip-flop kind of thing. There are a lot of people now working with this sort of network, and seeing how they evolve different patterns.

X You know you just used the word "system". Could you go back to the biological cell and show the network of the cell. One back. You've described the network of the cell, how is the cell a system?

H Now you can think of an individual cell as a system in the sense that it does certain things. A system generally has inputs and outputs and transformations upon them, so the cell takes in food, takes in oxygen, it creates certain proteins, it does a certain amount of work and also sends off some products for other cells.

E I was going to say that's exactly what the system does.

X I don't see any difference between that description that you've just given and the network, at least in the case of a human/social network.

You could visualise a human being as a system as a whole, or as a network of smaller components, each of which is a little system.

A Well, the distinction they think you were trying to make was that in the case you said that the network is there (whether it's doing anything or not) and the system is doing something. I would argue in the case of any living network it is doing something whether we value that production or not, whether we call it production, whether we call it doing something. The very act of being is doing something.

H There is no argument here. I just talked about a network as an abstract concept. As soon as you talk about a network as a living system or a living organ then it is doing something. A Yes, but a network can exist without influencing outputs in the sense that you just used the term. The example of the "invisible college" is one which I keep in mind. A group of people who share papers, ideas, and so forth could conceivably do that without the concept of input as we know it. It is the people individually who are perhaps getting the input. They are generating the information which flows through the network. It doesn't have to go outside. Now you could call it a closed system I suppose, but that diverts the nature of the discussion.

H We shouldn't quibble about terminology. What we should try to get at is the concepts involved. A network is something that consists of nodes and arcs. Now just for terminology's sake, let's say that a system consists of components and links between them. Now there is no reason that you cannot view a system as a network. You can say this system is a network of components, you can say that if you want to. My only argument is that in order to make the concept of system meaningful, each component must itself have dynamic properties. In other words, it does not.
you anywhere if you create a large system that is just static.

A network can just sit there. You can conceptualize a network without attributing any particular movement or change to its components.

If not there a question of control involved here when you were talking about the system prior on? There was a notion that the component of the system had things coming into and out of it, it was transforming them?

A Would you then say that the nodes of a network do not change? The only thing that can happen is that the network grows by producing more nodes or less nodes, but the nodes themselves do not do anything. The most consistent thing is the transforming.

H Strictly speaking yes. There's no reason you can't have a network in which you take the nodes and you put something in each of the nodes, something that does something but that does not change the structure of the networks. You see, the structure of the network is intrinsic to the network itself, whether those nodes do something or not. A good example is the kinship network, because you can define a kinship network without worrying about what the individuals are doing. In other words you just draw a family tree and there it is.

Now, you can also consider each of these nodes as a functioning individual and that individual is some kind of system or organism, and you can also have these people relating to each other by human behavioural interactions.

A What I hear you saying is that a network is simply a representation of a system. I mean I know that it's not and you probably won't agree with that, but that is what I am deriving from what you are saying.

H I am saying a network can be viewed as a system but that the network has a fundamental structure which is something peculiar to the network whereas the structure that we attribute to systems is an abstraction that we've created. It is a convenient type of modeling device that we've created, in order to separate the functions of a certain whole or organism, or portion of society, or whatever. The boxes in a system representation are abstractions we've created. We decided that there are certain components or certain functions which are being performed, and it's useful to conceptualize them this way. A network is a more fundamental structure which we are somehow perceiving in the thing that we are trying to model. We take that as given before we even talk about change or dynamism, it's a fairly simple distinction.

X In both cases you have an abstraction. The same natural system can be conceptualized as various networks or as various systems. It seems that you think that the process character in the system case is not only in the flows between the boxes, but also in the boxes. Whereas in the network case, it could only be in the connections, the nodes themselves are not doing anything.

H I am saying that these nodes themselves could be systems, could have system properties attributed to them. In fact they can be subdivided.

X So all you say is that they are not analysed further at the given modeling stage; that would also hold for each about system box.

H It's not necessary to analyse them in order to create this model.

X Tell us about topology. I think maybe we are worn out.

Y I don't agree with you that this is a waste of time. I am beginning to think that it's really quite important because after all the structure thought through language and sometimes we talk about systems and we aren't sure what it is exactly we are saying. We talk about the telephone system and yet we talk about the telephone network and we mean something different by those two concepts, but in spite of all this time we've spent if I had to write an examination on the difference between the two, I would find it still difficult.

Z Could we address ourselves to the telephone system versus the telephone network?

X Presumably one can prove something with this network theory and presumably the kind of things you can prove with network theory are different from the kind of things you can prove with certain kinds of system theory.

Y If you want to talk about people you could talk about the social system versus the social network and you'd be talking about quite different things.

Z We might be talking about the same thing in different ways.

X Could we also look at this. The main reason why computer people find that systems work better is that they represent the flow of control.

R What about their use of data network versus computer systems?

H Let's talk about telephone systems. Now what is a telephone network? Very simply a telephone network is a bunch of little phones that are connected together. There is a phone in every house and there are lines linking them and some of the links go through central clearing houses and so on, and then they go back down to other phones, a telephone system is something much more complicated.

E So the physical network is there. It may or may not be used. It may only be used from time to time. Just like a ditch in the ground, it's there. Sometimes the rain gets in and water runs in it. You can break one of those links and you can move a node, etc.

H The telephone system is something much more complicated. In fact, I wouldn't presume to define that in any particular way because any individual in Bell Telephone might define that differently, depending on his function. One way to look at it would be in terms of the telephone information system, in other words how is information transmitted, how is it routed. It's all done by electronic hardware. Now there is another level you can look at the system, that's the human decision level and that goes a little further than just the data set. How are lines administered? How is policy ma-
In terms of how phones are maintained, how they are installed? How is the whole organization created which will support this? The former can be automated but not the latter. The key distinction seems to be in effect the network gives you the set of constraints.

When you didn't have automatic exchanges you worked through operators and there were certain limited possibilities — the rate of flow of messages, the manner of using them and all the rest of it. The system is conditioned by the constraints that the network describes. The minute you speak in terms of greater flow and the way it's being used, you are talking about a system. In this sense, most of the policy decisions in the telephone system do not take into account all the actual nodes of the network. What they do is they take a lump sum, the averages, forecasts. They think of them in a conglomerate sense. They are forced to because they can't possibly look at everyone.

A It would be really helpful if you took the same distinctions and transferred it out of the telephone network or system to say a political network or system. Let's try that.

H You can think of a social network as a network of individuals. do you want to look at it at that level. It's up to us to choose a level: people, organizations, states, etc. So here's individual people, p₁, p₂, etc. Now in this case it's a bit more complicated because you don't have the fixed links. You might want to consider it as a dynamic network in which different people are associating with each other at different times. That gets kind of complicated. The minute you itemize it you are talking about a system. If you talk about a network that changes at each instant then you are right, it becomes very difficult to deal with it, certainly on a theoretical basis.

A What I thought you were leading toward was a definition that would say that one could define those links between p₁ and p₂ as not being active all the time. They don't require any physical connection. They really are like the ditches before the rainfall. They are predispositions, they are relationships.

E You know what bothers me every time we discuss the nodes, we get into trouble because there is an unknown quantity like what happens when we don't get free passage of information, or we get distortion. So because you have a change of a message going through, then you say you no longer look at that as a network. You start worrying about maybe that's a system.

H I don't see why that should bother you because in effect the node is a law, it has the same kind of problem. You've got to look at it in terms of the physical constraints or institutional constraints. Within that you then determine how it operates: which is the system aspect. If we want to make a distinction rather than engage in semantic exercises then I might just say that for our own purposes, the minute we begin to talk about the "thing" that has variations in flows or patterns, we are talking about "systems". But when we refer to "networks" we really have to say what the constraints are within all that effort operates, whether physical or biological (at any point in time), because moving from the operator to an automated system means that we have changed the technical constraint.

X We talked about time variant networks and certainly in electrical network theory all networks have time variance, they keep changing.

Y So that the networks themselves would change but what they are doing. What they are doing is not place in place if they do anything that takes place in time they become systems.

H I think we are quibbling over terminology here. You could call it a system but it still retains all the basic properties of the network, so it's a time variant network.

A We are only quibbling over terminology if in fact we confine this to the mathematical description. As soon as we try to apply that to social systems, we are not quibbling about technical terminology anymore. We have to know the difference.

H I think if you look at it in the application context of a particular problem then we'll find that we won't be worrying about the words we are using. It'll become clear as to what kind of model suits best and whether you choose to call it a network or a system-type network.

X It might be easy for us to represent something which doesn't change with time as a network, but we may be obliged to use such system representation when we are talking about something which does change.

Y It's not only time, it's also complexity that's important.

B You made a distinction between a pattern and a process and it seemed to me that if your distinction is that a network is a pattern and a system is a process then I would disagree with that; in the sense that a pattern is also a process only it's of a different duration.

Z A network can be described apart from its function is a sentence on which we ought to agree or not. There's no such thing as a system apart from its function.

X What about the solar system?

Y The solar system functions but not in a purposeful manner. Well, purposeful in terms of man's purposes. But there are certain systems that we can describe and that we cannot control, and this is where the question of control comes in. They really do not have what we call time, but we do not necessarily have any say as to the process, as to how they function. However we can describe them and use a systems-type of description. I guess, we could differentiate in the sense that a network may be static whereas a system is usually or invariably dynamic.

H Consider a chart that describes a dynamic system. The chart itself may not change but what is going on, what is represented, is a changing system. So we have a diagram that describes a static structure initially. Now once we've defined the terms of that structure, we can then presuppose certain kinds of changes, even evolution of the structure itself.

X Does it become a system?

H It doesn't have to become a system unless you choose to view it in this way and then you would no longer be designating individual units as the components of your system. You would be designating some kind of processes or relationships.

A Can I ask you a question? I think we've sort of been haggling around this and I don't believe we really should. Is the way you're describing it a more or less accepted way of dealing with it among mathematicians.

H I'm giving you the "party line".

A Now the question. We may be in a different party. We may have a different party line. It's important for us to know. Will the biologist accept this? The mathematician does, the mathematician accepts this, now will the biologist accept this?

C By all, the biologist can choose to use that.

A Will the economist accept this? He would.

Y The interesting thing is, though that there is no party line, I did an overview on the use of systems analysis in the federal government for an applied
It’s interesting to think about the new way? I want one moment. The one thing which you are putting torn in I d, by now the network within example the people certainly person or node, or the degree of control differentiates from a of time. You could have take it for granted that what in effect you are talking about is relating boxes, when you set up your system, you are doing is facilitating, or it could be controlled. I’m looking for a better use of it, you’d probably have to effect the change in all the links and all the means of relating the transfer functions that exist.

A Are you talking about this tendency to create alternative paths?
A I am thinking of real networks as I know them and trying to abstract and see how they are represented, to see whether they can be represented in these terms.
Y Well, I think the subtlety of control has a lot to do with it. In other words, the behaviour of the human animal is such that, as we mentioned before, he can resent any obvious manipulation.

B But let’s talk about trying to control the network as a whole. The network functions for a purpose. People join up to stop something, or plan to exchange information about ecology or physics or something else. Suppose you want to stop an exchange of information you can have a very difficult time because you are going to have to really end the whole network.

Z When you can anticipate all the alternative pathways then you are in a better position to control.

Y In economics if you are ever going to evaluate, you’ve got to exercise your imagination but in order to make it a meaningful policy-relevant exercise, that imagination has to have a sense of network, that is a sense of the potential relationships as well as the actual relationships that might exist.

H Well, in any case if you are trying to control a network it will probably not help just to alter certain portions of it, you’d probably have to effect the change in all the links and all the means of relating the transfer functions that exist.

A I see that as a useful observation about networks.

B I’m not convinced that there are examples of networks that can be controlled. Let’s take the telephone network versus the telephone system. You can talk about the Bell system which is something the Bell company can control in the United States but they cannot control the telephone network and the network that links the Bell network (the U.S. part of the network) to the European part. The telephone network stretches inter-continentally and only part of that is controlled by the Bell system. So the network cannot be controlled. I’m looking for a better example.

A Would you agree that networks cannot be controlled?
H Well, I’ll say that if you can isolate a network, if you can definitely put boundaries around it and say that’s your domain of interest and that there is nothing outside the network that could affect it, then you can control it. But the trouble is anything that we try to model as a fine network always has little connections leading outside of that domain.

B A good example I think are the innumerable cases in which secret police - neutralized - political revolutionaries by putting them in jail, by sup-
But also had a special kind of structure which was explained to some extent. As far as I am concerned my interpretation would be that part of the network was galvanized into a new form which I would consider to be a system or organization. The way those links were drawn the information was passing out from the centre to the periphery. It was admitted that they were organizational links.

And people from the periphery travelled to the centre to do their communication. A Yes, but there wasn't horizontal communication between the different elements of the periphery which is part of the characteristic of the network as they originally defined it. So I think there are two levels. This is in effect the core of the distinction.

Z The issue changed the form and the network became controllable for a particular purpose.

A Could we just broaden the notion about slipping from the network to the system? Could we perhaps just hear about the controls in the systems in order to get this conceptually together?

H OK, I guess we've made it clear that if you try to go into a network and just alter it by just changing certain patterns you are likely to have a lot of consequences that you do not predict. Maybe continuous control is one way of avoiding that but that takes a lot of energy. You need a very complex control mechanism.

A Aren't we saying that any system or any network operates within an invisible web of constraints be it legal, social, cultural, etc. and there is a kind of space within which you operate which changes, of course from moment to moment, and once you've specified that network you are not going to be able to describe the system to control it.

H Consider this case let's assume that you have control. A welfare system sets up certain goals namely that whoever wants to see a doctor should be able to see a doctor. We have a constraint in the sense that there are just so many doctors. Then you find that time per patient goes from 30 to 15 minutes because of the way in which the system is being used. But we then set another constraint, namely no patient on the average will have less than 15 minutes. When we do that we then have to control people. We then have to say within these goals, constraints, configurations we don't know what would happen if we put a dollar deterrent fee. Now you then have a different network when you add that particular variable. The network is how people will act: patient to doctor, patient to hospital. But the rate at which the patients move is a system function.

B You're associating quantity with system quality with network.

H Well, the only problem there is knowledge or information mushrooming to the extent that you can't control all the information that you have. To design an ideal system you want to use as little information as you can and control as much as you can or know as much as you can about what is happening. The problem is selecting the right points at which to get you information.

X Maybe one could look at some of the situations where one would intentionally use network rather than systems analysis. I find systems-simpler. They seem to be able to do everything.

H They are much more general. A system description can be used for almost any kind of dynamic process; social, biological, organizational systems are much more flexible because the concepts are so broad. A network is a very specific type of structure and people often misuse the notion of a network where it just does not apply.

A But hang on a second, you are quite correct where you can define the
boundaries. When you can’t define the boundaries you have to go back to network.

H If you can’t find boundaries, that may mean that you can’t do anything at all. It doesn’t mean the network will necessarily help you anymore with assessing the problem.

B One of the problems that I have come across is that in dealing with many different kinds of organizations you can define what’s happening within each organization, but you run into big problems when you try to find out what happens between organizations.

H OK I can see what you are trying to say. In other words in a system you want to get a very detailed description of the behaviour and interaction of all the components which may not be possible, whereas you could create a network model which at least shows the existence of those components and the fact that they are related in some distant way whatever it is. In a system you need a detailed description of the behaviour or the performance of all the components as well as the interaction between those components. It may not be possible to obtain this kind of description. You see the boxes which we use are really short-hand notations for aggregations of people. Even in the case of an individual, we don’t know enough about the human psyche. The person’s mood may change from day to day, and so forth. You are dealing with generalities, the predictability of which is not too high.

C I think a very nice example of this is a biological system. We were taught to model a cell as a system and what you get to realize is that a biological system is so complex that it’s almost impossible to figure out how to control it, because you cannot really describe it. Even a simple cell, is incredibly complicated, let alone a conglomeration of cells. And yet we know that these constitute a system, and we know that it works. In fact it’s a self-regulating system. There are all kinds of enzymes and various glands and organs manufacturing the proper amounts of chemicals to maintain this incredible balance throughout the body.

B Have you seen the metabolic pathways chart? It’s a big chart about 150 X 100 cm. It represents all the processes within the cell and the links between the different enzymes. Now what intrigues me is that I don’t think that could be defined as a system, but it can at least be represented as a network.

C This is essentially what we try to do, namely to represent the cell as a network, realizing that we can never hope for an accurate systems description of it.

B What you are saying there sounded really good but then as I began to think about it what you are saying is that a network is an ill-defined system. It’s a system in which we simply can’t specify the interaction between the components or the nodes.

H No, what I was saying was that if you have a system which cannot be well-defined, you can at least give an ill-defined network representation of that system. It’s not to say that all network representation must be ill-defined. In physical sciences you can define it more precisely.

Z All systems are natural but some of them are more natural than others in the sense that self-regulation appears in forests, in cells, in something which pertains to the biosphere itself but it doesn’t seem to appear in what you were saying about a telephone network. And why? Because telephone networks are a small fragment of a big complicated system. We sort of look at the local complexity and so I think...
System Network Complementarity

« System » versus « Network »
The definition of « system » (like that of « structure ») is the subject of continuing confusion and often heated debate. It is not surprising therefore that the implication that « network » is in some way distinct from « system » tends to give rise to vigorous debate as recently occurred in Montreal. It is the math-based pure and applied sciences which are most disturbed by the possibility of any distinction. Clearly, in purely formal mathematical terms, both system and network consist of an interconnected set of elements. But once account is taken of the nature of those elements, the manner of their interconnection and the properties of the resultant whole, then the distinctions between definitions of system and of network became confused especially where value-related questions are raised concerning the relative equitability of different social structures.

The question of interest may be less the distinction, if any, and more the connotations of the terms in contexts associated with international and organizational activity. The question may then be why is there a preference for « network » instead of « system » under certain circumstances. Consider the distinctions in the case of a road system / network, a telephone system / network or a concept system / network before reflecting on the case of an interorganizational system / network. Under what circumstances is there a negative connotation to either term?

The Distinction in Practice
The following suggestions have been made as to how the distinction tends to be made in practice.

1. Systems tend to require more information for their description than networks, since flows must be described as well as structural relationships.
2. Systems are described primarily with quantitative information (which is both difficult and costly to obtain and has a short useful life), whereas networks may be described with non-quantitative structural information (which is more readily available at lower cost and has a longer useful life).
3. Systems tend to have a unique (or ultimate) controller regulating the state of the system as a whole, whereas networks tend to have a plurality of controllers (if any), with a relatively high degree of autonomy. (In other words, systems tend to be centralized in some sense, whereas networks tend to be decentralized or polycentric).
4. Systems tend to be associated with imposed structures or patterns (even if limited to the choice of the system boundary), whereas networks tend to be associated with emergent structures or patterns.
5. Systems tend to have well-defined boundaries (even if they are open-systems) whereas the outer-limit (or fine detail) of a network is ill-defined and not of major significance to its description.
6. Systems tend to have well-defined, stable goals or functions, whereas networks, if they have any, may have ill-defined goals, a plurality of goals (possibly fairly incompatible), or may change goals relatively frequently.
7. Systems tend to have a more limited tolerance of changes to their environment, whereas networks tend to maintain a fair degree of invariance and coherence even in the event of highly turbulent transformations to their environment.
8. Societal system descriptions tend to be meaningful only at a macro-level to detached observers, whereas network descriptions retain their utility even when limited to the immediate environment of an involved participant at a particular node of the network.
9. Systems, and particularly their dynamics, tend to be difficult to represent, whereas complex networks can be represented with relative ease.
10. System components tend to have outputs, along relatively well-defined paths, resulting from (and predictable from) their inputs, whereas the nature of the outputs, if any, of the nodes in a network tends to be much less predictable, as is the pattern of nodes linked at any one time.

Complementarity
Rather than attempt to resolve the distinction between system and network, it may be useful to conceive of the two terms as being different but complementary conceptual approaches to a structure-process continuum. When a system perspective is used, in prac-
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<td>Maximizing survival potential and growth of system</td>
<td>Individual self-advancement through organizational unit success in achieving system milestones</td>
<td>As above, but significant introduction of computer use at each level speeds up feedback</td>
</tr>
<tr>
<td>NETWORK STYLE</td>
<td>Adapting to emerging conditions</td>
<td></td>
<td></td>
<td>Dynamic evolving networks of personal and organizational units, living system or organization</td>
<td>Maximizing relevance to perceived problems</td>
<td>Stimulus of individuals and organizational units by new problems and possibilities</td>
<td>As above, plus more extended use of interactive communications modes, remote terminals, video conference techniques, etc., enabling widely distributed decision centers to interact swiftly</td>
</tr>
</tbody>
</table>
tice the emphasis is on the properties and the characteristics of the whole conceived as a set of interlinked processes (over which a measure of centralized control is described). The structure supporting the processes if considered at all, is perceived and represented in terms of its gross features. When a network perspective is used, in practice the emphasis is on the properties and characteristics of the continuous pattern of linkages constituting the structure. The processes which may occur in the network, if considered at all, are perceived and represented in terms of the pathways through the network (the mapping of which constitutes the initial challenge). As the concern with processes builds up, the perspective shifts towards the system focus. Whereas concern with detailed representation of the structure shifts the perspective towards the network focus. The system perspective therefore tends to be used when the structure is assumed to be relatively simple and conceptually well-defined but where the complexity of the processes poses a challenge to conceptualization and representation. The network perspective, conversely, is used when the processes are assumed to be relatively simple and well-defined but where the structural complexity poses a challenge to conceptualization and representation.

Footnotes

INTERNATIONAL ORGANISATION NETWORKS: A COMPLEMENTARY PERSPECTIVE

Introduction
This chapter first discusses briefly the extent to which an interorganisational perspective is currently used in connection with the theory or practice of international organisation. The distinction between 'network' and 'system' is then examined and the complementarity of the two perspectives in relation to a structure-process continuum is emphasized. An attempt is made to sketch out a network model of society and the challenge it poses for data collection. The availability of data on organisational and related networks is then discussed before reporting on one extensive data collection exercise which demonstrates the feasibility of the approach. Some directions for analysis, and the possibility for predicting various kinds of network growth, are then considered. Finally, the question of network design and various policy implications are examined.

The conventional approach to the analysis of organisations, and especially international organisations, has focused on individual organisations. These have either been studied in isolation as particular cases (embedded in an environment of pressures and processes) or considered as members of a set on which some form of quantitative analysis could be performed (members, personnel, budget, and the like). Both these approaches tend to avert attention from the pattern of linkages between existing international organisations or to the 'international organisation' which emerges from any relatively stable pattern of linkages across national boundaries. Clearly there are exceptions to this statement. For example, Edward Miles has undertaken a number of studies of the complex of international organisations concerned with special issue areas (e.g. space, law of sea). However, he is more concerned with the particular case and less with the general problems of analyzing and describing such patterns of structural interaction. There has also been much work on the analysis of transactions or exchanges across national boundaries and on the formation of coalitions between nation states. The former tends naturally to emphasize the flows rather than the pattern constituted by the set of flows. The latter is, of course, primarily concerned with the nation state as an actor, and the power blocs constituted by such coalitions, rather than their fine structure.

William Evan, in his introduction to a reader on inter-organisational relations, makes the point that: "One basic assumption, however, has unified researchers from diverse disciplines and vantage points, viz., that a significant amount of the variance of organisational phenomena can be accounted for by concentrating on intra-organisational variables..." In recent years, one can detect a rising tide of discontent with the predominantly intra-organisational focus of organisational research. One expression of this discontent is as follows: 'Too much sociological theory and research has been based mainly on the model of a single organisation, and attention has been focused on its internal processes, by and large. Surely this dominant model is not sufficient to analyze newer and more complex organisational forms such as the interlocking networks of organisation in the civil service, the multi-campus state university, regional consortia of educational institutions, multi-outlet distributive organisations in business, and multi-plant industrial concerns. Having become rooted in its social and technological environment and more complex ways, organisations find themselves both constraining and being constrained by these environments in new ways. Yet investigators of formal organisations have barely begun to attack these new relationships.'

There has of course been no lack of studies of the 'international system' but these have tended to focus on aggregated quantitative data relating to geographical areas or individual nation states rather than to organisational 'fine structure' which is the vehicle for the international system. Where a network orientation has been specifically used, it has been applied to the network of relations between nation states as in the case of Doreian, Harary and Miller, Schofield or Vaughn. Although Vaughn, in his analysis of the EEC, also includes enterprises and the Commission itself. Where individual organisations or groups of organisations have been considered they tend either to have been studied in terms of their use as control mechanisms for the international system (e.g. the United Nations) or as being limited in their activities by features of that system. Again the richness and diversity of the interacting organisational forms has been ignored (for example, the variety of forms discussed in Chapter 2 of this volume).

Efforts to move towards a broader perspective have been made: by various people advised by Chadwick Alger, focusing on problem-area organisation networks; by Else Boulding, in connection with women's organisations and religious groups; and by Diana Crane, in extending her work on discipline-related networks of scientists and the invisible colleges to networks of international scientific and professional associations. The author, partly in collaboration with Kjell Skjelsbaek, has explored possibilities of tracking evolving networks of international organisations. This resulted recently in the establishment of a data base on networks of organisations, problems, treaties, disciplines, and the like, which was used to produce the Yearbook of World Problems and Human Potential.

Before considering the contribution of research on social networks or the distinction, if any, between 'system' and 'network', it is useful to note the emergence of the use of 'network' in the practice of international organisations.

'Network' in practice
It is no exaggeration to state that the number of interlinked international organisation units is such that no one has a clear overview or understanding of how the complex functions (if at all, as some would have it). This was first clearly stated in 1969 with respect to one international organisation system in the Capacity Study of the United Nations Development System under Sir Robert Jackson, who commented,

'For many years, I have looked for the "brain" which guides policies and operations of the UN development system. The search has been in vain. Here and there throughout the system there are offices and units collecting the information available, but there is no group (or "Brain Trust") which is constantly monitoring the present operation..." (vol. I., p. 12).

Elsewhere it is noted in the Study that,

'in short, there are now simply too many separate, inconsistent, incomplete information systems relating to some facet of development cooperation activities, and these systems are undirected or uncoordinated by any central authority." (vol. II., p. 223).

The situation remains the same in 1977. There is no unit within the UN system which records the existence of all other units in the system or has a mandate to do so. This shows how difficult it is to obtain an overview of the interlinkages in even one large organisational complex. The impression of complexity and the operational constraints imposed by it have led those working with or within such environments to use the term inter-organisational 'network' to describe their perception. The term is also used to describe any complex of organisations (UN or not) which may be relevant to a particular issue. As will emerge from the discussion of the relationship between 'network' and 'system' there is obviously a well-founded reluctance to speak of a 'system' under such circumstances. (Sir Robert Jackson even went as far as to refer to the UN development system as a 'non-system'.)

In such an environment, therefore, when a proposal is now made for the creation of some broad-purpose organisational instrument, there is a tendency to advocate the creation of a 'network' of some kind even at the intergovernmental level. This deliberately avoids introducing the kinds of systemic linkages which are perceived as having malfunctioned in previous exercises.
Consider the following examples:

1. United Nations International System for Information on Science and Technology (UNISIST) is a continuing, flexible programme based on a jointly UNESCO-ICU study whose aims are to coordinate existing trends towards cooperation and to act as a catalyst for the necessary developments in scientific and technical information. The ultimate goal is the establishment of a flexible and loosely connected *network* of information services based on voluntary cooperation. (UNISIST Newsletter, 1st January 1973, page 2.)

Studies by international organisations of their environments also lead increasingly to documents which refer to the existence of "networks" of one kind or another.

2. Multinational Corporations in World Development. While the terms "corporation", "firm" and "company" are generally used interchangeably, the term "enterprise" is sometimes preferred as clearly including a network of corporate and non-corporate entities in different countries joined together by ties of ownership.

"By contrast, most developed countries belong to a network of advanced economic, and even political, relationships which allow for more successful economic and political bargaining." (ECOSOC report on Multinational Corporations in World Development, page 4.)

When employed in connection with multinational corporations, the term may be used with negative connotations. At the national level studies have been made to identify the networks constituted by "interlocking directorates" which are viewed as undesirable.

It should also be remembered that the term achieved widespread use with the development of espionage and, more recently, terrorist networks. It is appropriate to note that a 1975 conference of the United Nations Institute for Training and Research, in identifying the main problems of using the potential of NGOs in social and economic development, included that of developing the network of NGOs and made suggestions for a "network approach." In a 1976 review of the action of environmental NGOs, a similar point is made at length in a report to the United Nations Environment Programme. The author has recently described 34 practical problems hindering the utilization of NGO networks. Alvin Toffler, in testimony before a US Senate Committee in 1975, has also stressed the importance of a network focus. The Alliance for Voluntarism, a consortium of 14 U.S. volunteer groups has recently launched a research project on inter-agency collaboration which will focus on the question of networks.

There appears to be an emerging awareness amongst practitioners that the concept of a network, network organisation and 'networking' is appropriate to the current rapidly changing conditions which constantly give rise to fresh problems and unforeseen requirements for action — requirements which cannot be rapidly and satisfactorily distributed to organisations working in isolation within rigidly defined programmes. Networks are perceived as permitting all the decentralization necessary to satisfy the need for autonomous organizational development and individual initiative. They also permit very rapid centralization, canalization, and focusing of resources the moment any complex problem (or natural disaster) emerges which requires the talents of an unforeseen configuration or constellation of organisations.

**Social Networks**

There has been a considerable amount of work on 'social networks' by which is meant primarily networks of individuals, usually analyzed in terms of the pattern of their relationships around one individual. Arnold Toynbee favours the conception of society as the set of such networks.

'Society is not a crowd or cluster or clump of human beings; it is a set of networks of relations among human beings. Every human being is linked with others in a number of networks which are not mutually exclusive and are also not coextensive with each other.'

A very useful clarification is made by J. Clyde Mitchell as follows:

"When Radcliffe-Brown ... defined social structure as "a network of actually existing social relationships" ... he was using "network" in a metaphorical and not an analytical sense. His use of the word evoked an image of the inter-connections of social relationships but he did not go on to specify the properties of these interconnections which could be used to interpret social actions except at the abstract level of "structure". Perhaps more often than not the word "network" when used in sociological contexts is used in this metaphorical way ... but the metaphorical use of the word, however common it is, should not prevent us from appreciating that it is possible to expand the metaphor into an analogy ... and use the concept in more specific and defined ways." But despite the amount of work done on social networks, very little of it deals with inter-organisational networks. When it does, it is either at the community level or between individuals in institutional structures. There does, however, seem to be a marked sensitivity on the part of scholars in this area to the implication that much work remains to be done on inter-organisational networks. Some believe that development of formal analytical procedures is far ahead of the ability to collect adequate data. Consequently there is resistance to the optimistic note sounded by scholars such as Francois Lorrain:

"The abstract notion of a network is undoubtedly called to play a role in the social sciences comparable to the role played in physics by the concept of euclidean space and its generalizations. But the poverty of concepts and methods stands in dramatic contrast to the immense conceptual and methodological richness available for the study of physical spaces. A whole reticular imagery remains to be developed. At this time a network is understood to contain simply nodes and links and little else." (Paraphrase and translation).

The formal analysis of social structure from a network viewpoint is therefore still in its early stages. In a review of the literature Scott Boorman notes that, to a large extent 'the most fundamental problem is still the pre-formal one of whether networks matter: or, to put the question more definitely, when do networks matter and what kinds of social networks are operative in given circumstances? One of the continuing problems with the network concept is that it is deceptively vivid as a metaphor and all too elusive in practice. The still unfinished task of the theory is to give more concrete instances where a network perspective really buys something for scientific sociology in addition to a largely new vocabulary and a set of appealing metaphors. Since the study of social networks has focused on individuals, it remains to be seen to what extent the weaknesses of the approach would also apply in the case of organisations, particularly since data on relationships between large numbers of organisations may be more easily collected and as such any analysis would tend to be more relevant to decision-making about the network and about particular organisations in it. It is not for nothing that one of the early studies in this area was funded by the US Office of Civil Defense.

'System' versus 'Network'

The definition of 'system' (like that of 'structure') is the subject of continuing confusion. It is not surprising therefore that the implication that 'network' is in some way distinct from 'system' tends to give rise to vigorous debate. It is the mathematics-based pure and applied sciences which are most disturbed by the possibility of any distinction. Clearly, in purely formal mathematical terms, both system and network consist of an interconnected set of elements. But even when account is taken of the nature of those elements, the manner of their interconnection and the properties of the resultant whole, the distinctions between definitions of system and of network are confused especially where value-related questions are raised concerning the relative equitability of different social structures. The confusion and overlap is illustrated by the following definitions taken from the Yearbook, of which the first two are for system and the last for network.

1. Any recognizable delimited aggregate of dynamic elements that are in some way interconnected and interdependent and that continue to operate together according to certain laws and in such a way as to produce some characteristic total effect. A system, in other words, is something that is concerned with some kind of activity and preserves a
kind of integration and unity, and a particular system can be recognized as distinct from other systems to which, however, it may be dynamically related. Systems may be complex, they may be made up of interdependent sub-systems, each of which, though less autonomous than the entire aggregate, is nevertheless fairly distinguishable in operation.

2. A regular interacting of an interdependent group of items forming a unified whole. A set of elements standing in interaction as expressed by a system of mathematical equations or an organization seen as a system of mutually dependent variables. A system may be characterized by: a particular relationship between elements which turns a mere collection of elements into something that may be called an assemblage; a pattern in the set of relationships which turns the assemblage into a systematically arranged assemblage; and a unified purpose which turns the systematically arranged assemblage into a system.

3. A group of elements which may be partially or completely inter-connected. The connections (termed branches or arcs) can represent roads, power lines, airline routes, information flows, predator-prey relationships in an ecosystem, logical relationships, or the generalized channels through which commodities flow. The elements (termed points or nodes) can represent individuals, communities, power stations, airline terminals, water reservoirs, libraries, organizations, namely any point where a flow or relationship of some kind originates, or terminates. In a more general case, the elements or points in the network may themselves be subnetworks composed of combinations of other kinds of elements.

The characteristics of the network's elements and relationships can be described by values, which may or may not be quantitative. The values can be fixed or they can vary in some way with time. Thus the relationship between two points may not exist during a particular period of time (as in an electrical circuit), or several possible relationship paths may exist between two points (as in a telephone circuit). Different types of relationship may exist between the same two points.

The question of interest may be less the distinction between system and network, if any, and more the connotations of the terms in contexts associated with international and organisational activity. The question may then be why is there a preference for 'network' instead of 'system' under certain circumstances. Consider the distinctions in the case of a road system/network, a telephone system/network or a concept system/network before reflecting on the case of an inter-organisational system/network. Under what circumstances is there a negative connotation to either term?

The author recently presented to a meeting in Montreal the following suggestions as to how the distinction tends to be made in practice. Further points appear in the report of the debate.18

1. Systems tend to require more information for their description than networks, since flows must be described as well as structural relationships.

2. Systems are described primarily with quantitative information (which is both difficult and costly to obtain and has a short useful life), whereas networks may be described with non-quantitative structural information (which is more readily available at lower cost and has a longer useful life).

3. Systems tend to have a unique (or ultimate) controller regulating the state of the system as a whole, whereas networks tend to have a plurality of controllers (if any), with a relatively high degree of autonomy. (In other words, systems tend to be centralized in some sense, whereas networks tend to be decentralized or polycentric.)

4. Systems tend to be associated with imposed structures or patterns (even if limited to the choice of the system boundary), whereas networks tend to be associated with emergent structures or patterns.

5. Systems tend to have well-defined boundaries (even if they are open systems) whereas the outer-fringe (or fine detail) of a network is ill-defined and not of major significance to its description.

6. Systems tend to have well-defined, stable goals or functions, whereas networks, if they have any, may have ill-defined goals, a plurality of goals (possibly fairly incompatible), or may change goals relatively frequently.

7. Systems tend to have a more limited tolerance of changes to their environment, whereas networks tend to maintain a fair degree of invariance and coherence even in the event of highly turbulent transformations to their environment.

8. Societal system descriptions tend to be meaningful only at a macro-level to detached observers, whereas network descriptions retain their utility even when limited to the immediate environment of an involved participant at a particular node of the network.

9. Systems, and particularly their dynamics, tend to be difficult to represent, whereas complex networks can be represented with relative ease.

Complementarity of system and network perspectives

Rather than attempt to resolve the distinction between system and network, it may be useful to conceive of the terms as being different but complementary conceptual approaches to a structure-process continuum.19 When a system perspective is used, in practice the emphasis is on the properties and the characteristics of the whole conceived as a set of interlinked processes (over which a measure of centralized control is described). In the extreme case the set of processes can be viewed as energy field effects. The structure supporting the processes, if considered at all, is perceived and represented in terms of its gross features. When a network perspective is used, in practice the emphasis is on the properties and characteristics of the continuous pattern of linkages constituting the structure. The processes which may occur in the network, if considered at all, are perceived and represented in terms of the pathways through the network (the mapping of which constitutes the initial challenge). As the concern with processes builds up, the perspective shifts toward the system focus, whereas concern with detailed representation of the structure shifts the perspective towards the network focus. The system perspective therefore tends to be used when the structure is assumed to be relatively simple and conceptually well-defined but where the complexity of the processes poses a challenge to conceptualization and representation. The network perspective, conversely, is used when the processes are assumed to be relatively simple and well-defined but where the structural complexity poses a challenge to conceptualization and representation.

Expressed in these terms, the complementarity of the two perspectives highlights the problem of description, analysis and policy formulation in relation to global society. A focus on the system process dynamics, as typified by the current approaches to world modelling, is obliged to eliminate structural (and especially fine structural) features to reach a level of aggregation which renders the analysis viable. A focus on the network of fine structure would presumably only be practicable if the complexity of process characteristics was highly simplified. Either filter can be employed, but both cannot yet be removed together and result in any practicable comprehensible investigation.

On the question of the importance of fine structure Donald Schon comments that,

'The map of organisations 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 . . . 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 the network functions and the network roles become critical.'20

In the introduction to the Yearbook of World Problems and Human Potential 1976, (see note 17) the author raises a related question:

'To what extent is the complexity of the problem system with which humanity is faced greater than that which its organisational and intellectual resources are capable of handling? Worse, is there a widespread unacknowledged preference for simplifying the representation of complex problems? And how many systems down to less than 10 elements so that they lend themselves to easy debate in public and in a policy-making environment (as might be suggested by some work of communication psychologist George Miller)? Are organisational and conceptual resources then marshalled and structured to match the problem system as simplified rather than to handle it in its more dangerous complexity, thus running the (unacknowledged) risk of leaving the problems uncontained and uncontrollable by the resources available? Does this suggest a
corollary to Ashby's Law of Requisite Variety which might read: "That any attempt to control a psycho-social system with a control system of less complexity (i.e. of less variety) than that of the psycho-social system itself can only be made to succeed by suppressing or ignoring the variety (i.e. reducing the diversity) in the psycho-social system so that it is less than the relative simplicity of the control system?" Such suppression tends to breed violence, however.

Some of these matters were recently explored during a panel on complexity as a constraint on social innovation during a meeting of the International Foundation for Social Innovation.21 Such views suggest that it is of value to explore the possibility of representing aspects of global society as a network, especially the networks associated with international organisation.

Network model
There does not seem to be available any well-articulated conceptual model of the network structure of society. Such a model would be based upon the stable networks of interpersonal relationships whose existence is established by the many social network studies. It would include (a) the growth of such networks in terms of their present pattern as 'structural formula', (b) the multiplication of parallel networks distinguishing themselves by different priorities regarding the same field of concern, (c) the periodic changes in structure of the network in response to occasional changes in the state of the environment (e.g. activation of political networks at election time), and (d) the evolution of such networks, namely the emergence of new forms as a result of marked changes in the pattern of 'structural formula' (possibly determined by 'saturation' or 'maturation' thresholds). Within such a model it should be clear how changes in the network of interpersonal relationships are catalyzed by changes in (a) the network of concepts making up the body of knowledge, (b) the network of values in terms of which activities are undertaken, (c) the communication and information networks which facilitate contact and exchange and (d) the networks of treaties, laws and regulations which regulate or inhibit such contact and exchange. It should be clear how changes in relationship patterns are catalyzed by events such as isolated (or periodic) meetings 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 organisations. Such changes are provoked by changes in the perceived nature of the network of problems with which any particular zone of the interpersonal or inter-organisational network is confronted. Indeed there is considerable interaction between the various kinds of network noted above, leading to sympathetic structural changes, whether resulting in fragmentation or greater integration. (None of this is effectively registered by currently proposed social indicators.) Clearly new concepts, values or problems give rise to new meetings, new organizations, new information systems and new regulations. These in turn catalyze the emergence of further concepts, values or perceived problems. There are many shifts and waves in the changing patterns of relationships. Many patterns are extremely short-lived and cannot constitute a basis for institutions of any permanence. Others survive for, and are exhausted by, a single meeting. Others give rise to information systems, possibly of rapidly diminishing significance. And of course some give rise to organisations through which particular networks of inter-personal relationships are activated and supported for long periods. The emergence of organisations in this way leads to the establishment of formal or informal networks of relationships between such bodies at the same level, with others at a 'lower' level (e.g. member organisations), or with others at a 'higher' level (e.g. bodies of which it is a member). Such networks themselves provide a framework through which new concepts, values or problems give rise to new meetings, new organisations, new information systems and new regulations. And the forms of the networks are themselves modified, to a greater or lesser extent, by such activity and by ongoing structural developments in the 'parallel' network of concepts, values or problems.

The structure of any of these networks is not only a matter for detached observation. Much energy is devoted by individuals and organisations associated with these networks to reordering them. Domains of influence are established around focal points: specific problems, values, and concepts are given territorial characteristics and stimulate appropriate behaviour. Portions of the network are ordered, bi-directional relationships are made uni-directional and focused on particular nodes. Efforts are made to rationalise these changes by establishing hierarchal structures with well-defined boundaries, whether from existing networks or as a development within existing networks.

Just as hierarchies are created and embedded in networks, so there are networks which emerge and evolve within and between hierarchical structures. Very large hierarchical structures (e.g. the United Nations) are associated with very complex networks. Other hierarchical structures may be nested within such networks. A set of otherwise unrelated hierarchies may be tightly linked by networks (e.g. interlocking corporation directorates, invisible colleges) which may extend between different kinds of hierarchies (e.g. old boy networks).

The model should also make clear how the variety of organisational forms and preoccupations is generated and interrelated within such networks (which would appear to be information analogues of the complex food webs which interrelate very diverse species in nature). In particular it would be valuable to clarify the functions of an organisational variety of form and preoccupation and the advantages and disadvantages of reducing or increasing such variety. This would also help to determine the current significance of antiquated institutions and of the bodies created for fun or out of whimsy (e.g. the Association for the Promotion of Humour in International Affairs). Do such bodies perform any useful function or would society function better if such organisational clutter was rapidly eliminated?

Data availability
Assuming that a model such as that sketched out above constituted a useful representation of one aspect of societal activity, the question is whether the relationships represented could be adequately captured in an information system. There is a considerable gap between the richness and diversity implied in the above model and in those depicting the international system as made up of some 150 states linked through an equal number of intergovernmental bodies and alliances into a handful of power blocs. An equivalent perspective is common at the national level within each nation state.

Clearly whilst it would be desirable to examine global society in terms of social networks of individuals, this does not seem to be practicable, although the implications of such networks should be borne in mind — particularly when considering the significance of census data on individuals abstracted from such networks. And although census data is available on individuals and on the commercial enterprises by which they are employed or from which they purchase products, none is readily available on the groups and associations in which they are active and through which their views are expressed and frequently moulded. The importance of such information to government is illustrated by the fact that when it is collected such data tends to be maintained in central registries for official purposes often linked to national security and personnel vetting. Such data is also actively sought both by commercial groups eager to expose association members to particular products and services and by opinion forming bodies (e.g. the UN Office of Public Information) eager to orient association members to new values, issues and fund-donating opportunities. It is appropriate to note that data on national and local government units and their relationships is frequently also difficult to obtain in any systematic manner.

In the present circumstances it is perhaps fortunate that such national and subnational data is not more readily available, given the misuse to which it would tend to be subject. In fact, for purposes of initial research and general education, it would be much simpler, less costly and possibly more enlightening to simulate the growth and change of a variety of complex networks (and levels of networks) in a computer environment with suitable visual display facilities. A variety of conceptual and organisational entities and relationships could be
'grown' and analyzed under different conditions and subjected to different constraints. It would be relatively simple to work over extended time periods with a population of $10^4$ or even $10^6$ entities and an equivalent number of relationships which would otherwise constitute a formidable coding investment. It would be instructive to determine to what extent modules from the conventional systems-oriented world models could be blended into such a framework. In relation to the formal analogue noted earlier, such a simulation might explore the following questions noted elsewhere by the author (see note 17):

6. Can the relationships between problems (or between organizations) be usefully conceived as analogous to the food webs and trophic levels within which animals are embedded? Does this help to suggest why different kinds of problems emerge as being of major importance at different times? How might the evolution of problems and problem systems be conceived in this light?

7. From what is the stability of a 'problem ecosystem' (as it might emerge from the previous point) derived? Is it useful to distinguish between degrees of (negative) maturity of problem ecosystems and to attempt to determine the amount of energy required to maintain them? Is anything suggested for better understanding of problem systems by the fact that a highly diversified ecosystem has the capacity for carrying a high amount of organization and information and requires relatively little energy to maintain it, whereas, conversely, the lower the maturity of the system, the less the energy required to disrupt it. Thus anything that keeps an ecosystem oscillating (or 'spastic'), retains it in a state of low maturity, whence the possible danger of simplistic reorganisation of organisational, conceptual, or value systems. Is the problem of understanding and organizing the maturation of natural ecosystems of a similar form to that of understanding and organizing the disruption of problem ecosystems?

Data collected
Partly in an attempt to explore the possible characteristics of a model such as that sketched above, a special programme was initiated in 1972 by the Union of International Associations (publishers of the Yearbook of International Organizations) jointly with Mankind 2000 (which initiated the series of International Futures Research Conferences). This programme resulted in 1976 in the publication of an experimental 13-section Yearbook of World Problems and Human Potential. Each of the sections is devoted to a particular kind of entity (whether international organisations, world problems, values, multilateral treaties, and the like.) Each section is structured on computer files as a series of entities linked together in networks. Entities in different sections are also linked in networks. A summary of the number of entities and relationships is given as Table I (see p. 403).

The kinds of relationships that could be registered in this way clearly depend on the nature of the entity-pair so linked. Formal relationships (e.g. membership, consultative status) were registered between organizations, but most relationships could only be established as related subjects (e.g. a treaty on 'child labour' and a world problem of 'child labour').

Some data collected for the 1977 edition of the Yearbook of International Organizations (a companion volume to the above publication) is useful as an indication of intraorganizational networks (relating to international organisations). This has been presented as Table 3 of Chapter 2 and summarizes the national member links to international bodies. Clearly it does not cover intra-secretariat links.

This project illustrates the possibility of tracking complex networks involving international organisations although it remains to be seen how best the data tapes can be analyzed and whether they can be effectively updated as is intended.

Directions for Analysis
Organisation is best depicted as a network. The mathematical theory of networks derives largely from certain branches of topology and abstract algebra. The theory of graphs is often presented as a kind of general theory of networks; however, other than in the area of operations research, it has not proved itself to be very useful in sociology. The theory rarely handles networks with several distinct types of relation-ship, each with its own configuration of links. It is precisely such networks which are of most interest in sociology. It also tends to exclude networks in which some of the points have links back to themselves, and it is often just such networks which are important in representing social structures.

A final disadvantage of the theory of graphs is that it only offers a fairly limited range of means of global analysis of networks. In such a situation it is not possible to provide more precise descriptions of networks as structures with particular characteristics, or as made up of sub-structures with particular characteristics. It is therefore difficult to distinguish clearly between networks of different types; especially since an adequate description depends upon structural rather than quantitative information. It is curious that none of the sciences appears to have developed a terminology to facilitate communication about irregular, complex, multi-dimensional structures.

Conventional analysis of networks provides information on such characteristics as number of nodes, number of links, centrality of a node and interconnectedness of a group of entities. Such characteristics give very little information on the structural features, patterning or irregularities of a network.

The term network generally implies the presence of
(a) relationships between a particular node and some more central node (i.e. 'vertical' relationships);
(b) relationships between a node and less central nodes (i.e. a network of more than one level);
(c) relationships between nodes having a similar relationship to a more central node (i.e. 'horizontal' relationships);
and possibly also:
(d) relationships between a particular node and more central nodes other than the one noted in (a) (i.e. a network with several centres);
(e) relationships between a particular node and nodes more central than those noted in (a) and (d) (i.e. a network with links across levels, or 'jumping' levels);
and possibly also:
(f) direct relationships between the most central node(s) and the least central node(s);
(g) relationships such that the node which is the least central under one set of conditions may be the most central node (in the extreme case) under another set of conditions.

Clearly networks vary a great deal in their possession of one or more of these characteristics. The first three are typical of most formal organisations (organisations as networks), although (c) is less frequent or raises problems, in organisations of a more bureaucratic style. An organisational hierarchy, having characteristics (a) and (b), may therefore be considered as an ordered network. The degree of ordering is decreased or diluted (at least in one sense) with the presence of the other characteristics. To the extent that the last four characteristics are embodied in networks, and particularly the last two, there is a tendency for the networks to become less formal and more difficult to document. This does not of course necessarily imply a decrease in their functional significance in society — it may even imply an increase.

The degree of centralization raises a difficulty in that some may prefer not to apply the term network in situations where centralization is high, particularly where this implies ultimate control by a single centre. Others, however, may consider that situations of (very) low or 'variable' centralization are not of immediate interest, whether or not they can be adequately studied.

The problem in determining directions for analysis is that so little of the considerable body of literature on social networks has been explored in terms of its relevance to the study of inter-organisational networks, and few of the scholars interested in social networks have any interest in inter-organisational networks except as networks of individuals. It is appropriate to note that Johan Galtung has recently suggested that 'structural analysis is indispensable at any level of society analysis, from inter-personal to inter-national'. He advocates the use of this approach for the development of a needed range of social indicators, particularly of relevance to development.22
Predictive possibilities

The data available and the manner of its organisation suggest interesting possibilities for predicting:
- the growth of networks, namely the extension of an existing network of a given pattern or 'structural formula'
- the multiplication of networks, namely the emergence of parallel networks with a different slant or mode of activity in relation to a common subject domain
- the evolution of networks, namely the emergence of new forms with the occurrence of marked changes in the pattern or 'structural formula'
- impact-effects within and between networks.

Such prediction is not confined to networks of organisations and is in fact dependent upon examination of the interactions between networks of organisations, occupations, disciplines, problem-areas, and the like. Growth or evolution of any of these networks will tend to provoke corresponding growth or evolution in the others with which it interacts.

1. Network growth

It is possible to make use of existing ordered subject domains, applied against semi-ordered domains of organisations, problems, disciplines or occupations, to detect subjects which have a significant probability of being expressed in organisations, problems or like phenomena.

The simplest and most common example of an ordered subject domain is a hierarchically organised thesaurus (e.g. the Universal Decimal Classification system). Specialized thesauri have, for example, been developed to order occupations, commodities, economic sectors, and diseases.

A simple procedure (perhaps overly simple in the light of further investigation, but an advance on the current state of affairs) that can be adopted, is to check off in any such hierarchy the nodes for which corresponding organisations, problems, or the like exist. Then, by inspection, it is possible to note unchecked nodes which are apparently 'late' in being activated in terms of any such correspondence. This may best be clarified by the following diagram:

![Diagram showing network growth]

The solid circles indicate checked nodes for which a corresponding organisation, problem, or appropriate phenomena exists, whereas the unfilled circles indicate the lack of any such correspondence (or lack of adequate data). The degree to which any particular branch is 'filled' may be considered to exert a 'probability pressure' on the change in the status of those remaining unfilled. This approach at least raises the question as to why a particular correspondence has not been found. This may be very useful, in the case of organisations for example, to identify domains in which a formal organisation has not been created because an organisational substitute has been found satisfactory (e.g. a periodic meeting, a journal, a treaty). The possibilities of this approach emerged in the collection of information on world problems. Where these were related to commodities, economic sectors, diseases, or occupations, gaps in any hierarchy of problems immediately became apparent and raised useful questions.

Clearly there are possibilities for refining this technique by exploring matches between several hierarchies simultaneously. Matching the disciplines against the (ILO) catalogue of professional occupations brings out underdeveloped features of the latter which may suggest areas of emergence of organisations, problems, and treaties. This approach is not limited to matches between hierarchies. It may also, and possibly more realistically and usefully, be applied by using computers to detect degrees of correspondence between any isomorphic structures. This would of course be more appropriate in the case of those networks which cannot be usefully assumed to be hierarchically ordered. In this way it could well prove possible to explore the manner and speed at which networks of organisations are likely to develop specialized branches to break down some subject domain -- possibly to a point of saturation at which a paradigm shift becomes necessary.

Where parts of the network are tied to geographical regions (e.g. Scandinavia, Europe, Caribbean), the presence or absence of particular regional components could be used in a similar way to predict the emergence of others. For example, European professional regional organisations are likely to emerge before equivalent African or Asian bodies. It might be possible to estimate the degrees of lag for certain categories between different regions. (This would of course be dependent on the national and sub-national networks.)

2. Multiplication of networks

In attempting to predict the emergence of organisations it is of course not possible to limit attention to the simple breakdown of subject fields. Even a superficial check of the range of international organisations shows that a particular subject may be the focus of an organisation with slants or modes such as:
- study of/research on
- in support of
- media information about
- specialized documentation on
- funds for
- providers/producers of
- users/consumers of
- affected by
- professionals of
- workers in

This would of course be dependent on the national and sub-national networks.

Presumably at some stage it will be possible to clarify the possible scope for organisation formation by combining a series of factors of this kind.

3. Evolution of networks

In the absence of any analyses and comparisons of organizational networks which could be used to distinguish types of networks, or structural formulae for networks, it is only possible to suggest that networks may be subject to structural shifts after periods of growth. (Some indications may possibly be gleaned from the literature describing transport and communication networks within and between urban centres.)
When a network has grown, in terms of a given formula, it appears to reach a point of strain, in relation to the demands placed upon it, at which some new structural formula becomes desirable. (From a strictly formal point of view, the need for such changes and their nature is evident in the evolution and morphogenesis of biological forms.) It is through such structural transformations that new varieties of organisational network emerge. This is perhaps most clearly seen in the emergence and increasing complexity during the twentieth century of inter-organisational networks, whether in terms of financial control (e.g. holding companies, inter-locking directorates) or movement of products (between corporations producing or using goods and services). It is less clearly documented in the case of the academic environment. Other possible models of interest might be developed from efforts to define the emergence of conceptual relationships between disciplines – particularly since it is probable that this would influence the interrelationships between the corresponding professional or scientific associations (cf. Jantsch, Wahlin, Kedrov).

4. Impact-effects within and between networks
The structure of the international system of bodies which have mutual effects on one another may be described as a network of organisations and associations. Some of the bodies in the network may directly effect some of the problems in the problem complex which may also be described as a network.

In considering how impact occurs and is transferred (i) between organisations, (ii) on to problems, (iii) between problems, and (iv) from problems onto organisations, a series of possibilities of increasing structural complexity may be borne in mind. To illustrate this series,

<table>
<thead>
<tr>
<th>TABLE 1: IMPACT STRUCTURES OF INCREASING COMPLEXITY</th>
</tr>
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<tbody>
<tr>
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<td>&gt; (p + 1)</td>
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</tbody>
</table>

(+) Note that impact is understood as being transferred from left to right through these structures (i.e. divergently in most cases), but there exists an equivalent (mirror-image) sequence in which impact would be effectively transferred from right to left (i.e. convergently). Structures from the two sequences can be combined or linked together, provided that they match.

Consider the structures illustrated in Table 1. A particular element transferring impact-effects may do so as follows:

1. Directly onto the target structure (i.e. no branching, 1 element).
2. Via a series of intermediary elements (i.e. no branching, more than 1 element).
3. Via two branches, both going direct to the target structure (this case could possibly be combined with the first).
4. Via two branches, one going direct to the target structure and the second via one intermediate element.
5. Via two branches, both with more than one intermediate element.
6. Via two branches, each with one element connected to that in the other branch.

The situation is complicated by the fact that most of the above structures contain branches, implying a divergence of impact. But clearly if the impacts were transferred from the branches, rather than to them, there would be convergence of impact through the structures:

```
       - - - - -
         |     |
       - - - - -
         |     |
       - - - - -
         |     |
       - - - - -
         |     |
       - - - - -
```

This therefore gives a second series of structures for transferring impact. Structures from each series may be combined:

```
       - - - - -
         |     |
       - - - - -
         |     |
       - - - - -
         |     |
```

The structures may be combined in branching or converging series, and even with loops back to an earlier structure – thus constituting networks of varying degrees of complexity. (Note that normally a structural element can not be considered an 'absolute originator' of impact nor an 'absolute sink' for impact.)

Up to this point the elements making up the structures have been considered as made up entirely of organisations or entirely of problems. But impact can be transferred between organisation and problem structures as noted above. In other words the structures considered above can be either organisations or problems, and they can transfer impact to organisations or problems (in similar structures).

This leads to mixed impact-transferring structural sequences of the following types:

1. Organisation to Organisation
   1.1 to Organisation
   1.1.1 to Organisation (OOOO)
   1.1.2 to Problem (OOPP)

2. Organisation to Problem
   2.1 to Organisation
   2.1.1 to Organisation (POPO)
   2.1.2 to Problem (OPPO)

3. Problem to Organisation
   3.1 to Organisation
   3.1.1 to Organisation (PPPP)
   3.1.2 to Problem (PPPO)

4. Problem to Problem
   4.1 to Organisation
   4.1.1 to Organisation (PPPO)
   4.1.2 to Problem (PPPP)
Clearly these sequences can be further extended to cover more complex patterns of interaction between organisation and problem networks. It should be stressed that the organisation structure, for example, in any of the above sequences (e.g. PPOP) may itself be a complex sequence of structures as discussed earlier. To the extent that it is advisable to distinguish between intergovernmental organisations and international associations (i.e. non-governmental structures), the organisation structures must be split into two types (e.g. O and O').

This approach would probably demand that the problems be also split into at least two groups, those recognised by intergovernmental organisations and those recognized by international associations (e.g. P and P').

Combining these together would result in description of impact chains of such forms as OPO'OPOP', etc. Whether or not this split (namely O and O' and P and P') is made, the real situation is probably much more complex because of the network characteristics which would give impact networks such as

$$\text{PPOO} \rightarrow \text{OPPOOPPOPOP} \rightarrow \text{PPOOOG}$$

Such situations are somewhat more complex than those addressed by conventional studies of impact such as whether organisation A makes an impact on B. Clearly organisation A may not make an impact directly on B, but it may do so on C and D (perhaps via many intermediate bodies or problems) which then may make an impact on B.

The social sciences are some way from being able to describe such sequences and track impacts through them. It is even uncertain that there would be any consensus that such an approach is relevant to current preoccupations which depend upon simplification of complex situations to render them communicable within the political arena. At some stage it may be possible to track the movement of impact through such structural sequences in terms of how different structural components amplify, dampen or store and release impact under different conditions. The meaning of 'impact' may well be as elusive as that of 'electricity', whose movement through circuitry the above situations bear some resemblance. The question of the distinction between positive and negative impact would also have to be considered.

Network design

a. Interorganisational design

There is little available knowledge on interorganisational design for the obvious reason that whenever there is any organisational initiative, there is a natural tendency to design a single organisation, however large and cumbersome, and little incentive to explore the possibility of interorganisational networks with a minimum, if any, of centralised control. As William Evan notes in an editorial comment introducing a chapter of readings on designing and managing interorganisational systems: 'Given the state of the art in research on interorganisational relations, it may seem both premature and hazardous to concern oneself with normative questions of designing and redesigning interorganisational systems.' (See note 2.) The three articles he includes as illustrations of potentially useful approaches make the point that the purpose is.

b. Matrix organisation

This approach, developed and implemented by NASA for the moon project, is a major step toward network design but in itself is inadequate because it has a single-purpose structure in which the purpose is formulated by one body and is thus more like a 'system'. 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.

c. Potential association

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 organisation. In testimony before the Committee on Foreign Relations of the United States Senate, Alvin Toffler outlined this possibility in the case of international NGOs, in response to a question on how to organize a wide variety of interest groups into a coherent network:

'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 organisations or scientific organisations or groups concerned 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-organisational 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 organisational 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-hococratic organisation that could operate in the international field.' (See note 11.)

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 organisation... we must first recognize that the U.N. is only a tiny piece of a swiftly emerging transnational mosaic or network of institutions which are part of the new super-industrial system. This network consists of thousands of organisations and millions of individuals around the world in continually shifting relationships with one another.' (See note 11.)

Elsewhere the author has discussed the concept of a 'potential association' as an innovative response to the new operational requirements necessitated by the approach suggested by Toffler. Such an association would, as such, not have 'members' in the conventional sense of a defined set of individuals or units of organisation 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 appropriate conditions. The need to centre attention on existing organisations (with their tendency to self-perpetuation and to constituting 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 'get' in response to new conditions.

A meaningful and dynamic social framework for conventional, 'permanent' organisations is thereby 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 later to completely
different high order patterns supplies the 'randomness' (high entropy)
condition essential to the facilitation of social change and development
in response to new conditions. In this connection Johan Galtung’s
view of the importance of high entropy for world peace is noteworthy:

"Thus the general formula is: Increase the world entropy, i.e.
increase the disorder, the messiness, the randomness, the un-
predictability - avoid the clear-cut, the simplistic blue-print, the
highly predictable, the excessive order... Expressed in one
formula, this seems to capture much of what today passes as peace
thinking, particularly of the associative variety." 21

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).

d. Organisational tensegrity
There is an unexpected formal analogy between some architectural
design constraints and aspects of organisation 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 organisation.
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 out-
ward into sphericity by inherent tensional forces which its geometry
also serves to restrain. Gravitation is largely irrelevant.

Many parallels can be explored with the organisational development
from hierarchies to networks and away from oppressive structures. 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 tensignty structures. 22 It may well be that
this will provide the necessary clues on how to design some useful
organisational networks for those cases where the hierarchical form is
no longer appropriate.

Policy Implications
1. Facilitation of network processes
It is clear that intra- and inter-organisational networks are growing,
multiplying and evolving in response to perceived social problems and
possibilities for action. These changes are in large part unplanned (and
unfinanced) 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 organisations (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 organisations and
  people can meet and interact informally to catalyze, wherever possible,
  the emergence 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)
- examination of the significance of the number and reticulation of
organisations in a society as a social indicator, both in terms of
development and quality of life.

2. Network organisational strategy
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, organisations,
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
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
organisational resources emerge, and are adequately supported, in
response to emerging pressures and opportunities. But it would seem
that this must be achieved without organisating and planning such
organised response - for to the extent that any part of the network is
so organised, 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 organises) the emergence, growth,
development, adaptation and galvanization of organisational 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 distinguishing 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. Johan Galtung, has for example, offered
suggestions for a simple vocabulary, with a minimum of terms as well
as for some graphic symbols that can be used to depict various structures,
from family relations to international conflict formations, across levels
of social organisation. 23 The author has also suggested a series of
terms as an illustration of the possibilities. 33 The development of such
a network vocabulary would provide a powerful means for objectifying
and de-mystifying the complexity of the organisational, problem and
conceptual networks by which we are surrounded and within which
most of our activity is embedded.
Notes


11. Alvin Toffler, 'The USA, the UN, and transnational network', (Extracts from testimony before the Committee on Foreign Relations, 94th Congress 1975), *International Organizations*, 27, 1975, 12, pp. 593–599.


In a further effort to stimulate academic study of international nongovernmental nonprofit organizations, it seemed useful to bring together into one list many of the areas which have not been researched or which merit further attention (*). This is done below. It is hoped that even if the topics selected do not cover the major areas of interest, they will at least serve to highlight any lacunae. Comments would be welcomed. As a complement to this initiative, the authors have prepared a bibliography of about 1000 articles and documents which represent as much of the literature that could be located in the time available (**).

The term "transnational association networks" was chosen in order to provoke comment on the adequacy of the current term "international nongovernmental organization". "International" is not applicable to many INGOs; and the current increasing use of "transnational" seems more appropriate. "Association" is used because international "organization", in the literature and in practice, is nearly always associated implicitly with IGOS. "Networks" is added in the plural because most bodies are embedded in several inter-organizational networks — this is usually ignored and INGOs are analyzed as isolated entities. The properties of the network and the nature of an organization's involvement in it, may be more significant than that of the sum of the "isolated" entities or an aggregation of their transactions.

"Nongovernmental" is dropped because there are many mixed, "intersect", organizations particularly in the developing and socialist countries — also in some cultures "non-" may mean something very close to "anti-". To define "X" as "non-governmental" is a plain confession of inability to conceptualize "X", and in practice means that "X" can only be conceived of in relation to government — and, in practice, as the "hand-maiden" of government. For this reason, at the national level, terms with a positive connotation are mainly used as appropriate (e.g. "voluntary", "professional", etc.)

1. Political and General Aspects
1.1. Changing aims and programmes of international associations consequent upon the evolution of world problems and the setting up of other international bodies, governmental and nongovernmental.
1.2. The work of transnational associations as an element in mitigating or exacerbating members' intransigence in the unilateral defense of their own sectional interests.
1.3. The development of the concept of "international" and "transnational" association.
1.4. The part played by transnational associations in the establishment of intergovernmental bodies.
1.5. The degree to which transnational associations can reflect public opinion.
1.6. Reasons why transnational associations may be unsuccessful in attaining their objectives.
1.7. The effective powers given to organs in transnational associations.
1.8. Voting systems within transnational associations.
1.9. Role of association networks in the democratic process.
1.10. Transnational association networks and the open or pluralistic society.
1.11. Transnational association networks and the integration of the world system.
1.12. TANs and issue formulation in the democratic process.
1.13. TANs and the generation of political will.
1.14. TANs as an underdeveloped "Third World" of the social system from which political will and support is extracted for the governmental and economic sectors.
1.15. TANs, feudal systems, and the structural theory of revolution.
1.16. Contribution of TANs to the adoption of intergovernmental conventions.

2. Sociological Aspects
2.1. Analysis of the structure of transnational associations and their networks, as compared with their aims.
2.2. Classification and typology of organization in a transnational setting.
2.3. Functional substitution between styles of organization in different settings and over time.

2.4. Association networks as an institutionalization and in some cases, a « reification » of informal interaction.

2.5. Forms of association which minimize structural asymmetry and dominance of membership by ingroup elites.

2.6. Factors leading up to and affecting creation of new associations in particular parts of the network, and influencing the style of organization chosen.

2.7. Ageing and ossification of particular parts of the association network, and strategies used to combat this.

2.8. Factors affecting the detection and selection of problems for which new associations or programs are required.

2.9. Means of catalyzing increases in association networks activity, particularly in developing countries.

2.10. Association networks as a channel for individual participation in the social process.

2.11. TANs as a vehicle for value generation and expression.

2.12. The « lookout » institution function of associations in the network.

2.13. Systematic data collection on association networks and the national, subnational, and community level as an indication of social development.

2.14. Lag in the development of association networks compared to government, economic, and mass-media structures, and the consequences for ongoing feedback from the people, their progressive alienation, and the current weakness of the democratic processes.

2.15. Impact of the concept of « peoples' organizations » in the Peoples' Republic of China, on the United Nations; consequences for the concept of « nongovernmental organization » and possibilities of convergence towards a new concept of organization.

2.16. Voluntary organization in different cultures and political systems, and the continuum between association networks and tribal and kinship groupings.

2.17. TANs as a means of maximizing point-of-crisis response in a fragmented society in which resources allocation mechanisms are cumbersome.

2.18. Evaluation of the positive and negative consequences of the « proliferation » of associations, and the determination of the social systemic features contributing to it or benefitting from it.

2.19. Development of evaluational tools to determine at what stage in the evolution of its activities a given configuration of associations could benefit from a, possibly ad hoc, coordinating body or some equivalent mechanism, and at what stage it is premature.

2.20. Future trends in association networks, styles of organization, and modes of action — the concept of a « network action strategy ».

2.21. Means of determining which bodies are « irrelevant » in a rapidly-evolving democratic society.

2.22. Problems created for association networks by the fragmentation of bureaucracies (particularly with respect to interdisciplinary programs).

2.23. Speed of response of network components to new needs.


2.25. Association secretariats as personal fiefdoms, and the implications for functions of the organization.

2.26. Parallels between geographical and functional « territory » and examination of possibility that historical processes and empire building in connection with geographical territory (culminating in the nation-state or the U.N.) may be repeated in connection with the functional territories claimed by different non-territorial actors.

2.27. Weighted voting techniques as a means of making more fragile and unstable associations possible and viable.

2.28. Mechanisms of sub-committee formation in academic associations in particular parts of the network, and the implications of invisible colleges.

2.29. Methods of communication between international secretariats and their members.

2.30. Transdisciplinary and crossmodal communication via TANs.

2.31. Ecological advantages of particular styles of organization.

3. Psychological Aspects

3.1. Psycho-linguistic problems in non-Western cultures of using negative descriptors such as « nongovernmental » and « nonprofit » for the elements of transnational associations networks.

3.2. Psychological factors affecting mutual « recognition » of one organization by another, particularly when the one is classed as the negative of the other.

3.3. Psychological factors affecting mutual « recognition » and possible interaction of associations in different parts of the network.

3.4. Compartmentalization of public, interest, and private life on the part of each individual, and its consequences for interaction between government and business bodies, and interest, socializing, or value-elicaborating groups in the democratic society.

3.5. Governmental activity as corresponding to super-ego activity, economic enterprise to ego activity, and association networks to id activity.

3.6. Psychology of government bureaucrat perception of TANs.

3.7. Psychological factors which favor perception of the isolated organization as opposed to the network of organizations in which it is embedded.

3.8. Public and governmental images of transnational association networks, particularly in non-Western cultures.

3.9. History and incidence of misconceptions about the role of association networks.

3.10. Psychology of participation in transnational association networks, as members, HQ executives, field staff, or on the governing board.

3.11. Association networks activity as a vehicle for personal development.

3.12. Personality types attracted to association network activity, in an international setting.

4. Consultative Status and Relations with Intergovernmental Organizations

4.1. Development of the Consultative Status relationship with the U.N. system, since its inception.

4.2. Comparative analysis of the equivalents to the UN Consultative Status arrangement at the national level, particularly in non-Western countries.

4.3. Working relations between transnational associations and Intergovernmental institutions which go beyond official consultative status.

4.4. The UN Consultative Status mechanism as a « badge » and, through threat of revocation, a means of blocking strong opposition.

4.5. Advantages to government of procedures resulting effectively in a « divide and rule » relationship with association networks.

4.6. Procedural devices adopted by UN agencies to provide facilities to, and control over, their respective conferences of Consultative Status NGOs, while depriving such conferences of any recognition.

4.7. Polarization and fragmentation of the transnational association network by intergovernmental policies of « recognition ».

4.8. Methods by which transnational associations arrive at the position adopted in their written or oral statements to intergovernmental institutions.

4.9. Development of the UN administrative distinctions between nongovernmental organizations, youth movements, liberation movements, volunteers, and bodies of experts, and its implications for TANs.

4.10. Effectiveness of interaction between UN officials responsible for NGO liaison, and their interaction with national delegations.

4.11. The status and action possibilities of the administrative office responsible for NGO liaison in each UN agency, and its interaction within the administration with those offices responsible for youth organizations and volunteer liaison.

Feasibility of creating a UN Ombudsman to function as a clearinghouse for interaction, suggestions and proposals between TANs and many components of the UN system.
5. Inter-Organization Relations
5.1. History of inter-association relationships, conditions under which particular forms have become accepted, and nature of forms likely to emerge in the future.
5.2. Comparative analysis of arguments used in different settings to propose and oppose the creation of inter-association relationships or membership of a coordinating body.
5.3. Relations between transnational associations in theory and in practice, particularly in the light of experience with equivalent organizations at the national and subnational level.
5.4. Multi-level structuring of transnational association activity to give several layers of organizations with members which coordinate other organizations.
5.5. Coordinative features of transnational network activity.
5.6. Incidence and causes of the creation of several associations concerned with the same programme area, and competing for the same resources, and the problems or desirability of facilitating a merger.
5.7. Incidence and role of bodies at the national level attempting to coordinate association network activity; their possible relationships to national governments and to any assembly of transnational associations.
5.8. Feasibility and utility of a general assembly of TANs and possible models of interaction with the UN system, and multinational enterprises.
5.9. Analysis of any imitative relationship between transnational associations and the UN, which may tend to cause transnational associations to adopt structures and procedures inappropriate to their resources and special advantages.

6. National-Transnational Dimension
6.1. Relationship between transnational, national and grass-roots associations.
6.2. Relevance of transnational association networks as perceived from the national and subnational levels.
6.3. The extent to which national members participate in the activities and decisions of transnational associations.
6.4. Trend towards universality in transnational associations.
6.5. Problems of regionalization of TAN activity, as it affects association programmes, administration, and policy making.

7. Legal, Fiscal, and Personnel Questions
7.1. History of efforts to introduce a form of legal status for nongovernmental organizations, with particular reference to the reasons for their failure.
7.2. Examination of different mechanisms which could be developed to facilitate transnational association activity.
7.3. Legal instruments required to facilitate the types of transnational association network activity likely to emerge in the foreseeable future.
7.4. Fiscal and fund transfer problems of transnational associations.
7.5. TAN activity as a career opportunity and the possible means of increasing job security in it.
7.6. Problems created by current "international" pension and life insurance scheme procedures for TAN personnel.

8. Transnational Associations and Special Issues
8.1. Contribution and problems of transnational associations networks, in particular issue areas (e.g. peace, development, youth, environment, etc.).
8.2. Transnational association activity in response to natural disasters.
8.3. Effects on development projects of ignoring the presence of association networks, and the effects on those networks of development projects which are successful according to economic criteria.

9. Operational Questions
9.1. Financing of transnational associations.
9.2. Methods of holding and allocating funds (while retaining accountability) that permit them to be moved rapidly to the appropriate point of the association network, which must be developed to respond adequately to a particular emerging crisis.
9.3. Means of reducing overhead costs and increasing organizational effectiveness by use of shared administrative facilities and office space.
9.4. Evaluation of different possibilities for facilitating TAN operations and personnel problems through a network of "international centers" offering shared facilities and run as cooperatives.
9.5. Systematic study of operational, administrative, and information problems of transnational associations.
9.8. Mechanisms by which multinational enterprise funding can be channelled into TAN activity.
9.9. Substituting of information systems for permanent organization to facilitate crystallization of appropriate and ad hoc organizations from the network in response to any given network need.
9.10. Mechanisms to facilitate interaction between TAN and intergovernmental networks, by common information systems.
9.11. Possibility of facilitating association network activity by conducting all member-association transactions via data networks, holding all organization files on computer, and obviating the need for office space at physical locations.
9.12. Use of computer interaction graphics to track and display the evolution of association network activity.

10. Data Collection Needs
10.1. National and local organization foundation in each country on which membership in transnational associations is based.
10.2. National and subnational organizations multi-linked to transnational associations, in the equivalent program areas.
10.3. Links of national government agency departments to transnational associations.
10.4. Links of intergovernmental agency departments to another, and to transnational associations.
10.5. Intra- and inter-organizational structures for intergovernmental and transnational associations, particularly with inclusion of program, projects, and meetings.
10.6. Patterning of organizations with respect to topics in terms of the specialization-multidisciplinary dimension.
10.7. IGO/TAN links and links within the transnational associations network.
10.8. World problems, and the manner in which they are interrelated and the concern of clusters of transnational associations.
10.9. Detailed budgets and fund source data for transnational associations, and their members.