SOCIOLOGY AND SYSTEMS ANALYSIS

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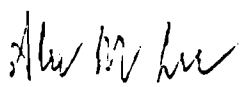
PREFACE

The Management and Technology (MMT) Area of IIASA organizes, from time to time, seminars on topics that are of interest in connection with the work at the Institute. Since MMT sees the importance of investigating the broader management aspects when using systems analytical tools, it was of great interest to have Professor Henk Becker from the University of Utrecht give a seminar on "Sociology of Systems Analysis".

As his presentation at this seminar should be of interest to a wider audience, it is now presented in the IIASA Collaborative Paper Series.



CONTENTS

1. INTRODUCTION.

Last year IIASA published a book on Pitfalls of Analysis, edited by Majone and Quade. In that book systems analysis is characterized as "a form of applied research designed to acquire a deeper understanding of sociotechnical problems and to bring about better solutions". According to the editors the expression "policy analysis" is preferred when public problems are addressed. (1).

In this statement the word sociotechnical attracted my attention. IIASA studies problems of energy, food supply and the environment, to name a few. The systems involved show a combination of technical and social problems. As a sociologist I ask myself to what extent my discipline could contribute to the "socio-" part of systems analysis.

The term policy analysis also set my mind to work. In the social sciences "policy analysis" is interpreted as "analysis for policy-making" but it is also seen an "analysis of policy-making". In the book edited by Majone and Quade problems of policy making systems play an important role. Systems analysts want to design implementable programs that are worthwhile not only in their own eyes but in the user's perspective also. Maybe recent advancements in the "analysis of policy-making" can help systems analysts to increase the impact of their work on policy-making.

The last chapter of the book deals with the pitfalls of language. In this lecture language is a pitfall too. As soon as a sociologist tries to communicate with members of the natural sciences, mathematicians and so on, mutual understanding becomes difficult. C.P.Snow lectured on "the two cultures" of "the literary intellectuals" and "the scientists" (Snow, 1959). The gap between sociologists and natural scientists is also wide. I hope to provide an adequate basis for understanding by (i) using a step-by-step approach, (ii) defining my terms and (iii) giving arguments and making control possible. The "scenario" for this presentation reads as follows:

step 1: describes the subject matter of sociology, and the activities sociologists undertake with regard to this subject matter;

step 2: describes some results of sociologists that meet standards common to the applied empirical sciences;

step 3: looks at applied systems analysis and at potential contributions by sociologists to this field;

step 4: broadens the view from sociology to the social sciences in general and to an interdisciplinary approach;

step 5: gives some perspectives.

I invite my audience to play the role of the sociologist for one or two hours. What is feasible and what is reasonable, keeping the characteristics of the subject matter of sociology in mind? During this mental simulation I ask them to keep to the scientific standards they are used to in their own discipline.

Do the applied empirical sciences share a common set of standards? Do the medical sciences, applied physics and applied sociology agree upon a number of criteria? In my opinion they agree upon the necessity of:

(a) systematic observation of the practical problem involved, and of its environment;

(b) systematic prediction of developments in the problem and its environment and of outcomes of interventions (by medical practitioneers, by policy makers etc.)

(c) the construction and use of theories in order to interpret the results of a and b, and in order to summarize experiences with an eye to solving similar practical problems later on (2).

None of the applied empirical sciences uses these standards blindly. They agree upon the necessity to allow for divergence from the standards, as

soon as they cannot be met, temporarily or permanently. For instance in research into the behavior of terminal patients in hospitals and of their relationships with members of their family, doctors and nurses can only (at this stage) apply these standards to a limited degree. Applied empirical scientists must be prepared to meet the common standards. If they are able to meet these standards they can just go ahead. The applied empirical scientist claiming lower standards must be able to give arguments for his claim! (3).

2. CHARACTERISTICS OF SOCIOLOGY.

The subject matter of sociology consists of the following components:

a) social behavior;
b) collective social phenomena;
c) the relationships between a and b.

Sociology studies its subject matter on different levels: micro, meso and macro. It studies it in different situations: in continuity as well as in rapid social change. It studies it under different conditions: from autonomous development to planned transformation.

In figure 1 examples of social behavior and of collective social phenomena are given on the three levels. It does not take much imagination to discover as a rule that social behavior is less difficult to study than collective social phenomena. I shall elaborate on this later on.

Sociologists have only three means at their disposal for data gathering. Their research methodology boils down to:

a) asking questions (orally, by mail)
b) looking (participant observation, hidden observation, observation in a laboratory setting); (4)
c) analyzing sources that already exist (documents like newspapers, minutes of meetings etc.)

Sometimes a sociologist can be lucky. In that case he is able to (i) gather data about a large number of "units of research", (ii) find a lot of regularity in these data and (iii) relate his findings adequately to the practical problem he is working on. In such a case the "common standards" can be met to quite an extend. A strict analysis on an operational level is possible. Checking hypotheses by prediction leads to valid and precise outcomes. Theories can be used to explain relationships, and confirmed theories can be offered for inclusion in the "body of knowledge" of sociology.

Figure 1 Examples of the subject-matter of sociology on different levels.

	micro-level	meso-level	macro-level
a. social behavior	behavior of patients in a hospital ward	behavior of patients as members of a patients' union	behavior of patients in a country, in a continent etc.
b. collective social phenomena	hospitalwards as social systems	patients' unions, hospitals etc. as social systems	World Health Organization

In everyday scientific life one or more of the standards frequently cannot be met. Quite often the sociologist involved is not to be blamed. What are valid excuses?

a) only one or a small number of "units of research"(less than twenty for instance) are available and therefore observations cannot be repeated on a large scale (for instance: a sociologist wants to study why there has never been a substantial socialist movement or a substantial socialist party in the United States of America). Small numbers are a handicap in studying collective social phenomena more often than in studying social behavior; (5)

b) great methodological difficulties in gathering data (for instance: what goes on between a terminal patient and the members of his or her family);

c) difficulties in finding a substantial amount of regularity in a social system, especially when the number of "units of research" is small;

d) ethical boundaries in data gathering (for instance: terminal wards at hospitals, juries in criminal court proceedings)

e) economic limits to data gathering

f) shortage of experienced sociologists and research institutes.

If we look at a particular report by a sociologist, we may come across a valid excuse of a different kind. The sociologist involved can point out that his project is part of a "research program", and that in the course of this research program other sociologists have solved preliminary problems or are engaged in projects complementary to his. As part of a research program an essay may be valuable and may be no violation of the common standards. A lot of applied empirical sciences have difficulty in meeting the common standards similar to those in sociology. I shall give some examples:

a) in astronomy often "unique" objects have to be studied; our earth has one moon only, and its origin is difficult to study (compare Mitroff, 1974);

b) difficulties in obtaining data exist in psychiatry, neuro-physics etc., for instance in obtaining data about the humain brain;

c) finding enough regularity has proved to be difficult in meteorology (weather forecasts in a country like the Netherlands, even on a basis of 150 years of observation) and in studying turbulence in waterways (harbors, around dikes) and in the air (around airplanes).

d) laboratory experiments on animals are also limited by ethical norms.

e) in all sciences economic limits exist, they slow down the growth of the body of knowledge;

f) in a lot of applied empirical sciences shortage of experienced research personel and of adequate research institutes sometimes leads to research under sub-optimal conditions.

Neither sociologists nor other applied empirical scientists remain passive towards their handicaps. In sociology the research methodology has been improved quite considerably over the last decades. Constructing theories has led to a lot of advancement. Giving a "state of the art" report is not possible in this lecture, however. I shall give some examples only.

3. SOME RESULTS OF SOCIOLOGISTS.

First I shall give some results of sociologists studying social behavior. As an example I take education on the one hand and economic and social inequality on the other hand. The main source is Boudon (1973).

The quarter of a century since the end of World War II may be described as the era of educational expansion. Almost everywhere in the developed countries, governments have tried to end the separation between elite and non-elite streams in secondary education, and to enlarge the proportion of the college-age cohort that goes to university. In the United States over 40% enter institutions of higher education, but a number of European countries are approaching or have passed the 20% mark.

This expansion is related to two objectives: (a) to supply trained manpower in response to the increasing need for educated talent in present-day economies, and (b) to increase equality of opportunity and ultimately to increase social equality as such. These two goals appeared to be mutually supportive for much of the period. More education supposedly meant both more well-trained people and greater opportunity for the under-privileged.

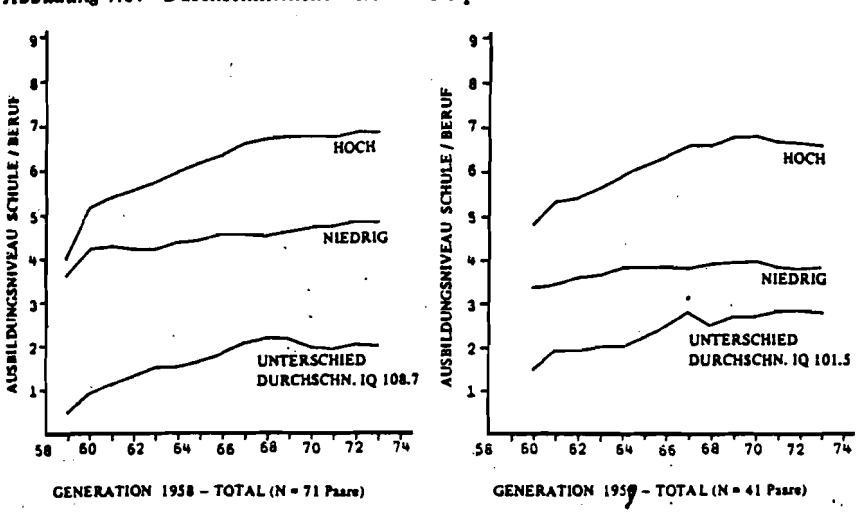
Yet as results of sociological investigation in different countries began to come in during the 1960s it became apparent that the rapid growth in educational attainment did not necessarily reduce the correlations between priviledged family background and social achievement. Parental socioeconomic status continued to be a major determinant both of educational achievement and socio-economic achievement of children. In the Western world this applied to socialist as well as to non-socialist countries.

Looking at the research data and the ideas with regard to relationships available, Boudon constructed a theory to explain the paradox. The theory could not be constructed in such a way that it resembled a scientific law. Relationships were not reliable and precise enough to be "lawlike". Boudon therefore decided to build a model as an approximation of the regularities in social reality he was dealing with. He constructed a cohort model that could be used

to simulate what went on in social reality. A large number of sociologists has tested hypotheses that have been derived from the Boudon-model, the Boudon theory and similar constructs. I summarize some results of research executed by Peschar (1979) in The Netherlands. Figure 2 gives an overview.

Figure 2. Matched pairs of children from high and low socioeconomic backgrounds (ex post facto experiment)

a. generation 1958-total b. generation 1959-total

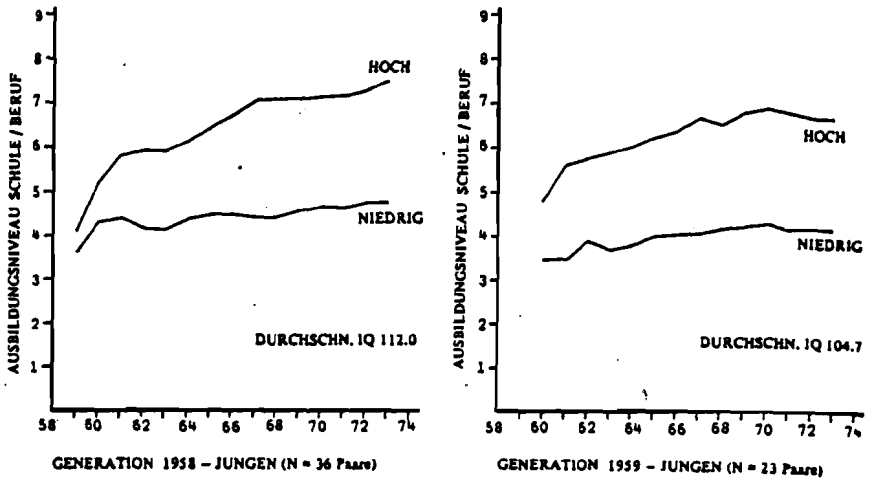


Note: Peschar took children from the same age and intelligence, but coming from either a high or a low socioeconomic background. He matched the children and then followed them during a period of 15 years (school-period and period of first jobs).

c. generation 1958-boys

d. generation 1959 boys

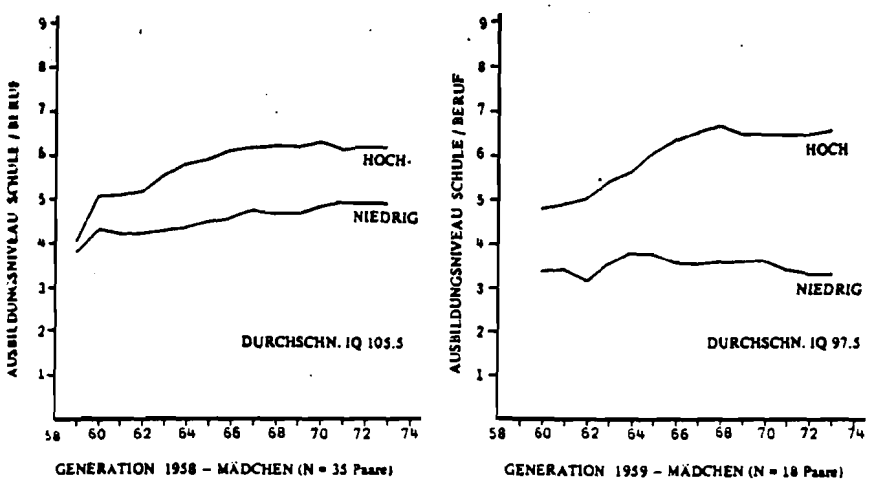
Abbildung 7.2: Durchschnittliche Niveauwerte per Jahr – Jungen



e. generation 1958-girls

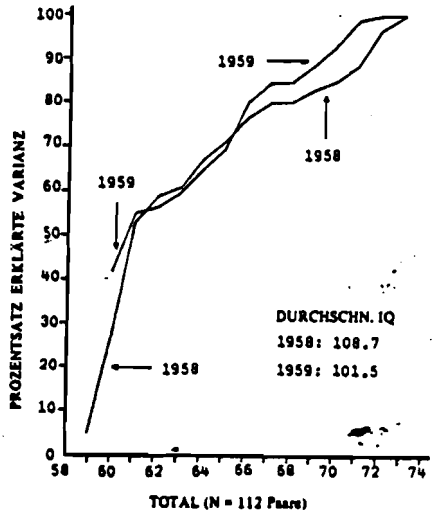
f. generation 1959- girls

Abbildung 7.3: Durchschnittliche Niveauwerte per Jahr – Mädchen



g. cumulative percentage of explained variance

Abbildung 7.4: Kumulativer Prozentsatz erklärte Varianz im Endniveauwert 1973 – total



The theory could be summarized as follows: an increase in educational opportunities does not lead to lower class children becoming middle class or upper class adults. The increase in educational opportunities is primarily taken advantage of by middle class children (lower and upper middle class) to advance beyond the socioeconomic status of their parents.

In this part of sociology criteria like (a) systematic observation, (b) systematic prediction and (c) construction and use of theories can be met to quite an extent. Why? The phenomena involved are present in very large numbers, they are comparable to quite an extent, and data can be gathered without much trouble (government statistics, large surveys, etc.). As soon as the sociologist analyzes the data, they show considerable regularities.

My second example is taken from the study of collective social phenomena. In the comparative study of organizations Blau and Schoenherr (1971) have contributed important new theories and data.

As independent variables, Blau and Schoenherr took size and complexity of organizations, separately and in combination. As dependent variables they took for instance the proportion of managerial manpower. They gathered data in the fifty-three employment security agencies in the United States, their 387 headquarters divisions, and their 1,201 local branches (excluding the smallest and simplest). The outcome that intested me most was "consistently, the economies of scale exceed the costs of complexity, so that large organizations, despite their greater structural complexity, require proportionally less management manpower than small ones."

The theory developed in this research project was tested against empirical data in another project. Hypotheses derived from the theory led to predictions that were tested against characteristics of the major finance departments of 416 state and local governments in the United States. The large majority of these finance departments are not agencies of state government, as employment security agencies are, but of municipal (246) or county (128) governments, with only a minority (42) being state finance departments. The findings replicate those observed in employment security agencies.

Both examples are taken from fields within sociology that show a research program: a large number of projects that show some kind of coordination or cohesion (6). A research program in a discipline like sociology has to consist of (a) projects aiming at theories that are confirmed by empirical data, (b) empirical studies on a relatively low level of abstraction (policy research), (c) trend reports, (d) reports on methods etc., (e) essays, for instance on the borderline between sociology and political philosophy. It would be unwise to judge a field within sociology by looking at the essays only!

The two fields of sociology dealt with (research into the relationship between education and socioeconomic inequality; research into the structure of organizations) show a relatively high level of scientific sophistication. Many other fields are still less developed.

4. APPLIED SYSTEMS ANALYSIS AND SOCIOLOGY.

Next I want to deal with some developments in applied systems analysis and with the prospects of a closer cooperation between applied systems analysis and sociology. I shall take some recent personal experiences as an example.

Water resource systems and hydraulic projects like artificial lakes have been studied for a long time with regard to their physical aspects. For instance the proceedings of an IIASA workshop held in 1976 and edited by Wood in Real-Time Forecasting/Control of Water Resource Systems provide an overview of "the state of the art" in analyzing this kind of phenomena. River basins have been shut off by dams, and artificial lakes have been created by the dozens all over the world. Evaluation of these projects has drawn our attention to consequences of innovations like these. Economic, ecological and social consequences have to be taken into consideration before, during and after the actual building of a dam, the rise of the water in the artificial lake and the production of electricity and of water for irrigation.

Small countries, especially if they belong to the developing countries, do not have enough scientific manpower to assimilate the experiences gained with hydraulic projects all over the world prior to building a new artificial lake themselves. This situation led the European Investment Bank at Luxemburg to ask the OECD to draft and test a manual on preparing and executing "multi-purpose hydraulic projects". By "multipurpose" the European Investment Bank means: not only flood control, production of electricity and water supply but also innovation of economic, ecological and social structures in the area surrounding the new artificial lake. A team of experts from a number of countries was given the task of designing and testing the manual. A dozen countries and a number of international organizations decided to participate in the project by providing experiences and by applying the manual in a preliminary version. I have the privilege to be one of the sociologists in the team of experts. In this project a system like a river basin is studied not only with regard to its physical aspects but also with regard to economic, ecological and social aspects. How do we have to prepare the project by ex ante evaluations? How do we inform the inhabitants of the area to be flooded about the plans?

How do we give them a chance to participate in decision making? Which developments are to be expected with regard to farming, industry, the environment, the labour market etc.? During the execution of the project the communication with the inhabitants of the area demands a lot of attention. The results of the ex ante evaluation have to be revised constantly. Resettlement of migrants sometimes has to be arranged for 40,000 persons or more. Rounding off the project after the building has been finished may demand five to ten years of activities in the economic, ecological and social field.

The communication in the team of experts is not without difficulties. The economists speak the language of quantitative applied systems analysis fluently. The ecologists are understood without much difficulties. The sociologists have to explain their terms, methods and theories over and over again. Fortunately the members of the team have enough experience and patience to continue their cooperation in good harmony.

The communication with the members of the committee representing the potential users of the manual shows a similar picture. All the members involved are convinced that social aspects have to be taken into consideration too. But they too need a lot of time and patience to come to grips with the terminology, the approach and the results of sociology and other social sciences.

Both in the team of experts and in the committee of representatives of the potential users I have been invited to give a short lecture on "sociology". My explanatory exposé in both cases closely resembled the present paper. I described the subject matter and I described the activities of sociologists. In both cases my audience was willing to think a bit like sociologists, and an adequate basis for cooperation was provided. Difficulties in terminology and approach could be bridged later on, taking the initial understanding as common ground.

Hydraulic projects have led to a lot of trouble in the past. Riots, protests, disappointments. The countries involved have reacted by broadening the scope from the physical to an interdisciplinary approach. Applied systems analysis has led to interdisciplinary projects in particular cases, and to a synthesis of experiences (the manual). The manual is ready in a preliminary version,

and a number of countries are testing it at the moment. As a next step the final version will be written and published.

The implementation of the manual is stimulated by involving the potential users in designing and testing the manual in a number of versions. The experts of the international team meet with experts in the countries involved. The transfer of information is two-sided: experiences from the countries reach the team of experts, the team of experts provides synthesized experience.

The members of the committee of potential user countries are not policymakers themselves but advisors to policy makers or they are heads of research institutes in governmental departments. This illustrates an important trend in the relationship between applied systems analysis and policy-making. The applied systems analyst more and more acts as an advisor to advisors.

Social scientists have analyzed the relationship between their disciplines and the policy-makers in a number of projects. Interesting results can be found for instance in the report of Caplan to the OECD (1975). Caplan found three categories of theories to explain "non-utilization" of the results of the social sciences:

"(a) Knowledge-Specific Theories. *This set of theories endeavors to explain the nonutilization of social science knowledge as a consequence of the nature of the social science information itself, the research techniques employed, or the behaviors of the social scientists themselves. For example, it is argued that the social scientists conceive complex problems only in the limited terms of their own disciplines; that overreliance on quantitative methods contributes to the limited utility of social science information; that nonutilization is due to theoretical or methodological inadequacies, or both; that social scientists are politically too far to the left and allow their scientific work to be influenced by their political beliefs; and that social science research is focused on understanding and fails to provide a necessary action-framework.*

(b) Two-Communities Theories. This set of theories attempts to explain nonutilization in terms of the relationship of the researcher and the research system to the policy maker and the policy-making system. The argument is similar to that which C.P.Snow makes in The Two Cultures to explain the gap between the humanities and the hard sciences. People who hold this position argue that social scientists and policy makers live and operate in separate worlds with different and often conflicting values, different reward systems, and different languages. The social scientist is concerned with 'pure' science and esoteric issues. By contrast, government policy makers are action oriented, practical persons concerned with obvious and immediate issues. It is argued that the gap between the knowledge producer and the policy maker needs to be bridged through personal relationships involving trust, confidence, and empathy. Others see this gap as something apart from cultural differences. They stress conflict over who determines the end of policy, often seen as an important factor that keeps the social scientists and policy makers apart. Some feel that the spectre of misuse of knowledge by political power tends to widen the gap; and still others, particularly those who argue the need for 'linking' mechanics, see the gap as a communication failure or a lack of organized effort tot systematically introduce social science knowledge in usuable form into the policy-making process at the key points where it will most likely be used.

(c) Policy Maker - Constraint Theories. This third group of theoretical positions encompasses the arguments that nonutilization can best be understood from the standpoint of the constraints under which the policy maker operates. It is argued, for example, that policy makers typically need concise information in a short period of time and that the social scientists simply cannot be helpful under such circumstances. It is also argued that the policy maker can only deal with malleable variables, those open to manipulation and must often premise his actions upon a course that is politically most feasible. Therefore, his capability to apply knowledge is necessarily limited. These theories suggest that if utilization is to be increased either the knowledge-producer will have to tailor his activities to meet the constraints, or the constraints themselves will have to be removed."

Caplan has done research into the nonutilization of social science knowledge in the American government departments on the national level. His research findings are, that the "two-communities theories" explain most of the variance.

If we look again at the book on "Pitfalls of Analysis" edited by Majone and Quade, a lot of reasons given by Caplan for non-utilization of social science knowledge looks familiar. On the road to implementation of their results by policy makers, applied systems analysts and social scientists encounter many of the same pitfalls !

5. SOCIOLOGY AND THE SOCIAL SCIENCES.

So far in this paper I have concentrated my attention on sociology. Not because this discipline is the most important component of the social sciences, but because my personal experience is limited to this branch. In practice a number of social sciences are as important as sociology when a closer cooperation with applied systems analysis is taken into consideration.

The political sciences have a tradition in policy analysis that is very worthwhile. A recent example that meets high standards is the book by S.S.Nagel and M.Neef on Policy Analysis in Social Science Research (1979). As an example they take the problem of reducing delay in the legal process. Six models are applied that collectively involve all the processes that are relevant to the problem:

(a) queueing theory which involves deducing how much time will be consumed as a result of increasing or decreasing the rates at which cases arrive and are serviced,
(b) optimum sequencing, which involves the order in which cases are processed in order to optimize or minimize the sum of the waiting and processing time per case,
(c) critical path methods, which emphasize measuring how much time is consumed and ought to be consumed at various stages in the processing of cases,
(d) optimum level analysis, which seeks to arrive at an optimum quantity of time consumed per case through methods which involve predicting costs from time consumed,
(e) optimum choice analysis, which is particularly concerned with understanding and manipulating the causal factors responsible for why decision-makers sometimes make time-lengthening decisions rather than time-saving decisions,
(f) Markov chain analysis, which involves probabilistic considerations related to those involved in statistical inference.

Disciplines like social anthropology and cultural anthropology are engaged in policy analysis, especially in developing countries. Areas of economics

and psychology contribute to the social sciences, although these disciplines do not as a whole fall within the realm of the social sciences.

What is the difference in subject matter between sociology and political sciences, or between sociology and social anthropology? I shall not bother you with these boundaries, because they are vague and diminishing. The boundaries have grown over many decades, and are therefore very dear to some social scientists (7).

All social sciences are dealing with (a) social behavior, (b) collective social phenomena, and (c) the transformation between them. All social sciences have difficulties in finding scientific "laws", quasi-laws and other strong and lasting regularities in their subject matter. Especially in the applied social sciences information related to practical problems is not very lawlike. Even theories are often necessarily limited in scope and precision. In a situation like this it is very important to be able to do empirical research quickly and to get reliable and precise information about the ever-changing practical problem and its environment. Improving research methodology is as important as constructing better theories in a discipline with a subject matter that changes its configuration of relationships between variables ever so often.

As soon as members of different disciplines work together, problems of interdisciplinary projects arise. The pitfalls of interdisciplinarity have been studies in empirical research. An interesting example is provided by Birnbaum in his article on Assessment of Alternative Management Forms in Academic Interdisciplinary Research Projects (1977). The conclusions of this analysis are:

> "Large projects consisting of a stable and highly educated workforce, with a clear division of labor, and centralized policy making were found to be associated with the highest levels of performance. Other types tended not to be significantly different in performance from each other, but were all found to be associated with lower performance than the one higher performing type. Initiating structure or production oriented leader behavior was significantly associated with higher performing groups, no matter what the

form of the research group. Time spent by the project leader in planning the research was not found to be significantly related to either low or high performance in any of the organizational types. Large, unstable projects tended to benefit most from the project leader's assembly of resources. Consideration of leader behaviour supportive of group members tended to be positively associated with higher performance in unstable groups, but to be associated with lower performance in smaller stable groups." (8)

6. CONCLUDING REMARKS.

The idea of a closer cooperation between applied systems analysis on the one hand and the social sciences (including sociology) on the other hand is not new to IIASA. For instance in Juni 1981 an "Ad-hoc-self-appointed-group" of IIASA scientists wrote a memorandum on "the incorporation of non-technical aspects of systems into the work of IIASA". The memorandum states, among other things:

> "The good work done at IIASA might not have a positive effect because it did not include consideration of the political, social, economic and psychological aspects which are present in all applications of systems science to real world problems. IIASA has been urged by many different groups to include these non-technical aspects in its programs but thus far, exept for the recent work on risk, it has not happened."

If a closer cooperation is considered, which "strategies" could be adopted to implement this cooperation?

In the first place it would be necessary to employ a number of social scientists. IIASA has already adopted this policy to a limited extent. In 1981 the social scientists form a small percentage of the IIASA scientists.

In the second place IIASA could provide itself with a task force specialized in social systems analysis. Workshops organized by this task force could provide information that could contribute to adding "social aspects" to applied systems analysis of a technical character.

In the third place IIASA could initiate one or more projects that explicitly combine technical and non-technical aspects. It would be wise to start with medium-seized projects. Projects in this category ought to deal with a "real-life problem" and they ought to enable a number of "technical" staff members to acquire some feeling for and knowledge about the social sciences.

A project like that might deal with the assessment of the social and technological consequences of some kind of technological innovation. (Compare Finster-

busch and Wolf, 1977). As an example I mention the impact of micro-electronics (a) on telecommunications, and (b) on both employment and on procedures in work. Further narrowing down of the subject would be necessary, of course.

An interdisciplinary project like this should keep the results of the research by Birnbaum in mind. Communication with policy makers and their advisors could decrease the chance that the results remain unapplied, avoiding the pitfalls Caplan pointed out.

More cooperation between natural scientists, mathematicians and social scientists would not imply that one of the parties involved loses its identity. Understanding each other, willingness to cooperate and mutual appreciation are enough. I hope that my paper will contribute a bit to future "joint ventures" in applied systems analysis.

NOTES

Comments by Dr.A.Lee and Dr.I.Ståhl on an earlier version of this paper are gratefully acknowledged.

(o) the author studied sociology at Leyden University, received his Ph.D. from the Rotterdam School of Economics (now Erasmus University) in 1968; since 1968 professor in sociology, in particular in the methodology of social research, at the University of Utrecht; member of the Department of Planning and Policy Studies at Utrecht University.

(1) see also page 5/6: "In this volume, systems analysis and policy analysis are used as essentially synonymous terms for the same activity: research that attempts to bring modern science and technology to bear on society's problems, seeking ameliorative solutions. These analyses search for feasible courses of action, generating information and marshalling evidence about the benefits, costs, and other consequences that would follow their adoption and implementation, in order that the most advantageous action may be chosen."

(2) in the natural sciences we find (a) theories, (b) scientific laws, and (c) statements on an operational level (Protokollsätze);

in the social sciences we find (a) global, overall theories, (b) more restricted theories: (i) theories (partially) confirmed in empirical research, (ii) prescriptive theories, (iii) formal theories, and (c) statements on an operational level;

in the social sciences predictions are derived from hypotheses; they are confronted with empirical data; statements about future events are called forecasts, results from future studies etc.. (a.o. Becker, 1972).

(3) not all applied disciplines are empirical disciplines: for instance applied mathematics; not all empirical disciplines are applied: for instance archaeology;

an applied discipline, or applied research, undertakes original investigation in order to gain new scientific or technical knowledge, directed primarily towards a specific practical aim or objective. The results of an applied discipline or of applied research lead to an enhancement of the "body of knowledge" of the discipline involved.

policy research leads to results primarely intended to be valid for a single or limited number of products, operations, methods and systems.

This implies that I partially disagree with the OECD "Frascati Manual", Paris 1971.

(4) in participant observation the scientist plays a "normal" role in the social system under observation, as a rule unknown to the members of the system involved; in hidden observation the scientist is no part of the social system under observation (for instance observing through a one-way mirror, or by candid camera); laboratory observation produces data under experimental conditions (for instance in man-simulation of communication processes); information by informants employs members of the system involved to gather data (Becker, 1972; Becker and van den Bos, 1979)

(5) the example is taken from Boudon (1980); his "La logique du social" or Die Logik des gesellschaftlichen Handelns is an excellent modern introduction to sociology;

(6) the concept of "research programs" was formulated by Lacatos; see a.o. Losee, J., A Historical Introduction to the Philosophy of Science, Oxford 1980.

(7) political scientists study social behavior, collective social phenomena and their transformation in political systems and in governmental systems; sociologists studying the same phenomena call themselves "political sociologists"; in general the political sciences are a little bit more oriented towards empirical research and towards empirically based theories than sociology, but this difference is decreasing; cultural anthropology

studies social behavior, collective social phenomena in developing countries, but for instance metropolitan social systems in developing countries are studied in about the same way as in developed countries; a number of cultural anthropologists are doing research in developed countries like The Netherlands, for instance looking at the social integration of immigrant workers and their families;

(8) More informative on "the state of the art" in policy sciences: Dahl and Tufte, 1974; Finsterbusch and Motz, 1980; Jenkins, 1978; Lindblom and Cohen, 1979; Weiss and Bucuralas, 1980.

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