INFORMATION IN URBAN PLANNING: THE FAILURE AND THE PROMISE OF INFORMATION SYSTEMS

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Measured against the lofty expectations from the side of planners and the seducing promises from the side of information technologists, information systems can be considered a failure—a failure, however, within a series of trials and errors, when looked at as a vast and hopefully ongoing experiment on an international scale to transfer information technology to the field of planning, which, by its very nature, is an information-transforming activity: from information inputs about the state and nature of the real world to information outputs about the conceivable and feasible changes.

This paper aims at lowering the ceiling of expectations and simultaneously at the improvement of information technology within the field of planning. Within this context, I will first try to find out why information systems have been of little use to the planner up to now. From this, I will set out to find where in this process of information-transforming—called "planning"—information systems will continue to be of little use, and where they can be put to a better and more intensive use. This, however, will require some changes in the concept of information systems, as well as of planning which shall be put forward as proposals.
Let me first delineate the area of my concern: I will restrict myself to the realm of public administration; look at information systems only through the "looking glass" of the planner; concentrate only on the major task in urban planning, though some of the ideas put forward here might hold for other fields of planning as well; confine myself to project planning, a one-directional, result-oriented activity: master plans, urban renewal projects, allocation of activities, etc.

At the outset, the situation shall be illustrated by an example: an information system for the ongoing operations within a city's administration has been developed, and the planning department has been promised access to the vast bulk of permanently updated data within this system. After some time of operation, one can learn "that the planning department is not making as extensive use as might be expected."¹ The technologists, plagued by the bad conscience of a not-fulfilled promise, concluded rightly that data generated by administrative processes are frequently hard to process and to relate to planning issues, and are almost never in the form which the planning agency would like to have. Access to the files turns out to be technically difficult because of the way they are maintained for administrative purposes.²

In order to lure planners toward greater usage of the system, they proposed the establishment of special files with parcel-and-block data, more suitable to the planner's needs.
At this phase, technologists usually experienced their second disappointment: when asked which data ought to be included in these parcel or block files, planners either continued to shrug their shoulders, or they claimed "Everything you can manage—we will see later how we use it." The results of such intensive cooperation were parcel or block files within an urban information system of which, consequently, little use was made—some odd cross tabulations per year for vaguely defined purposes.

Since the creation of such files is rather on the expensive side, two questions have to be raised: "Why could planners not use data from information systems?" In order to be able to answer these questions, I first have to outline the concept of information system:

1. From Administrative to Project-Oriented Information Systems

An information system "is an auxiliary system for a larger system (e.g., an administration) containing components for collecting, storing, communicating, processing and displaying information." Such definitions abound and they hid as elegantly the problems associated with information systems as they covered the multitude of different approaches and purposes for which information systems have been set up. Three such approaches shall be picked out here and sketched broadly:
- the administrative information system approach, deeply imbedded in the ongoing routine activities of administration;

- the discipline-oriented approach of the data banks originating from Patrick Geddes imperative "Survey Before Plan," and geared to answer physical planners' questions relating to the environment of their activities;

- the project-oriented information system approach, evolving from concepts within the fields of operations research, regional science, and traffic science, related to large-scale planning projects--such as transportation studies.

1.1. Administrative Information Systems

The core of information systems are "data" representing alphanumerically coded properties of units of reference: the properties are defined and named through variables, e.g., a building is the unit of reference; the height of the building is defined and named through the variable "height" and the datum is "21 feet." Data thus can be looked at as "formalized information," as opposed to the "informal information" of statements made about a unit of reference or a situation: e.g. "the building is not very high." The advent of large-scale computers and their successful application within the fields of engineering and warfare opened up new ways for rationalization of the public administration, where they could be employed as tools for easier and more expedient management of the vast day-to-day data manipulations, which have become part of administrative operations.
With rapidly increasing volume they took up more and more man-hours for collection, storage, retrieval, and processing—and particularly updating. The first step of computer-aided rationalization concentrated on the creation of machine-processable data files within single agencies. Apart from the creation of the files, operation systems had to be devised comprising all necessary computer programs for handling and manipulating the data.

The generator as well as the user of the data was usually identical, and files could be created without interference from other agencies. Because of the enormous costs involved, the guiding rule for the creation of these information systems had to be efficiency in the meaning of best fit to the agency's requirements: only those units of reference as well as those variables could be included which fully corresponded with either legal requirements or well-established patterns of data usage, built upon precise knowledge of the conceptual frame within which each variable had become meaningful. Furthermore, the files had to be organized in such a way that they best suited the requirements of the agency with regard to the order in which units of reference were kept, the updating routines, and the kind of storage used. The operating system was comprised of only those computer programs which were required for the ongoing operations of each single agency.
The introduction of such computerized information systems was justified by the savings in man-hours and the more expedient operations of the agencies. In order to achieve this, operations have to be highly prestructured and routinized, and data have to be accessible in a random fashion and in a "real time" mode; data are used as "individual data," i.e., information on one unit of reference from which conclusions can be drawn and simple decisions of a programmed type be made (as in the case of applications or assessments). The usage of individual data needs little if any processing. Where processing is necessary, it is as well patterned in a preprogramed way. New units of reference are recorded whenever they come into reach of an agency; whenever changes occur with the data of a unit of reference they are entered into the records, the old data being rather scratched, than transferred to historic files.

By their very set-up, these individualized information systems were difficult to use by other agencies, provided they wanted to. In a limited sense, statistical information could be compiled at predetermined intervals for regular reporting to other "using" agencies. The compilation, however, required major efforts since it involved comprehensive searching and sorting routines which proved to be time-consuming, and were an extra burden placed on the agency running the information system. The calling of statistical information outside a predetermined frame, proved to
be even more complicated, once special computer programs had to be written first. Whenever statistical information had to be compiled from different agencies problems became almost insurmountable: the individual set-up of different information systems did not usually allow any direct and coordinated way of aggregating and merging data.

Therefore, the second step of rationalization took place when the idea evolved that there might be some virtue in shared files of several—or all, if possible—agencies within one administration. It was hoped that by this, duplication of efforts could be avoided and a unified data base and operation system could further reduce cost and increase effectiveness. The concept of the "information center" evolved where all data were centrally stored and manipulated: all agencies within the administration, without regard to their generating or using character, could be attached to the information center by telecommunication. Together with this, the idea of standardization of units of reference and variables was introduced, i.e., unified definitions and the unified collection of data, whenever they were common to more than one generating agency.

Ideal as this concept first appeared, it met with severe criticism from larger cities and could only be established successfully in relatively unified units of administration.
An administration cannot be considered as a machine: the up to then relatively independent agencies feared insight into their operations—which were often suspected to be in need of reshaping—through usage of their files. Electronic locks had to safeguard misuse through other agencies. Control over the usage of one's agency's files became more complicated. The efforts to settle upon a consensus with regard to standardized data files were great, and in the whole not too successful since it meant distortion of the underlying concepts of each unit of reference and every single variable, as held by the different agencies—thus, making standardized data useful for no agency, really. What was gained through standardization had to be spent on individual amendments and special provisions, which were required to continue operations.

Furthermore, the volume of data in centralized files became so large that it turned out to be very difficult to safeguard random "real time" access for each generator and each user. Such disadvantages made agencies look back to individualized information systems—especially generating agencies, upon which the high burden for the introduction of coordinating codes was placed—to codes which would allow free usage of data by other agencies.

In addition to all these problems, it turned out that by no means all participants in the system wanted really to use the
data of every other single generating agency. Rather, priority patterns could be made out between some agencies which would use some of the data of a limited number of other agencies. The concept of information-centres provided more choices than were really required; the enormous effort of total compatibility could not be justified.

In larger units of government and administration, therefore, the idea of "information-networks" was introduced, which allows for a fairly independent but well coordinated establishment of a series of individual information systems. A larger computer is only assigned the central function of documentation, directing and retrieving. The advantages of such a system are:

- direct control over files by each generating agency;
- the burden of compiling one's own files and the retrieving of other agencies' data is placed solely upon the using agency;
- the effort to introduce coordinating codes and standardized variables is left to the using agencies and depends upon the intensity of interaction with generating agencies;
- existing information systems, already well operating, can easily be hooked into the network, wherever it is desirable to do so;
- the network can be developed incrementally and still is fully operational from the time a single information system is beginning its operations.

1.2. Project-Oriented Information Systems

Planners of different backgrounds have been generators as well as users of data; urban planners, in particular, have been collecting
data about the environment of planning projects since the times of Patrick Geddes. The effort to collect, process, and display these data has always been a large, tedious job, and usually used up a handsome portion of the available budget. Updating of such data was neither feasible nor was it necessary. The projects were mainly one-strike ventures, and so were the data collections—they served their purpose and soon ran into obsolescence. New surveys had to be made whenever a new project was begun. No wonder that planners, as soon as they acquired knowledge of administrative information systems with their vast "treasures" of data started looking for useful tapping of such reservoirs, since the promise was that there they might hit a majority of those data that up until now have been collected in the field. These data could always be updated, and ready for use whenever a new project would come in.

There was the name "information system" and the multitude of technical gadgets connected with them—such as "real time" random access, and optical display—and the myth of the computer as a "thinking machine," were items carefully fostered by clever salesmen of such information systems, who every now and then allowed the computer laymen, being less sophisticated in these matters, a glimpse into his sample bag. All this could easily lead to the belief that real information would be delivered to the planner—not only data—and the planner who was always trying hard, and in vain, to understand the real world would in the end be "better informed." A handful of splendid slogans made the planner
aware that he had serious troubles to face professionally: the "information avalanche" was painted colorfully on the wall and the computer was declared to be the only weapon; "only on the basis of better information can better decisions be made," was taken over from a completely different context and as a good distortion of facts it became a good selling phase. It touched upon the planner's pride and professional aspirations. However, the phrase might be more accurately rendered, "one better makes decisions on the basis of better information," and up to now, nobody knows whether "better" refers to a higher quantity or higher quality of information. At least, more data could mean more information, and more is better than less. In addition to these phrases, the planner was made to believe that instead of referring to a multitude of information channels--which are often difficult to tap, and little coordinated--he would only have one point of reference: the information-system.

All this happened at about the same time that planners became increasingly aware of the complexity of their environment of activity, where not only the physical appearance had to be considered, but rather the social, economic, and political implications hidden underneath the surface of physical form and hard to uncover.

The outcome of trials given to this kind of tapping the administrative data reservoirs, was the "planning data bank," where data collected in the field were supplemented with data from the administrative information systems. The data in the data bank would be updated at regular intervals, using the stock of data
in the administration's information systems. The planning data bank had, however, to face three problems which would not easily be overcome, and finally led to the termination of this effort:

- **the major problem was the need to determine in advance** the content of the data bank: the units of reference, as well as the variables considered to be relevant for urban planning. In the field of planning it is, however, no easy task to tell in advance which information one is likely to use during the course of a project. The general idea to solve this problem turned out to be camouflaged helplessness: "to create the files as general as possible such that they can be used for a multitude of purposes." The natural outcome was little usage of the data bank as expressed in this statement, "the usage is probably less than might be at first expected, but not less if one considers the nature of planning in a city like Alexandria."

- **the creation of the operation-system:** data had to be gathered from a multiplicity of often uncoordinated sources, and had to be aggregated from individual units of reference to higher statistical levels of reference; e.g., from parcels to blocks. This meant comprehensive operations in terms of computation, search and matching. Furthermore, computer programs were necessary to manipulate and edit data in a readable form. The necessity, however, to create an operation-system was usually recognized only when the data bank was already well under way and neither budget nor time was sufficiently allocated to this proportion of a data bank. As a natural result, the output of such data banks tended to be always late, or consisted only of very simple tabulations—a not too clever instrument of analysis.

- **the problem of updating was never solved:** the initial assumption was to update the data regularly through the files of the operating agencies. This involved cost, as well as additional trouble with the operating agencies, since the burden of creating and updating a data bank was placed upon them. They, in return, did not draw much benefit from these endeavors, and it is no wonder that the initial willingness of generating agencies slowly faded away, and the idea of updating could not be realized over a longer period of time! Since the rumour that the data
bank was not intensively used spread quickly, the 
planner could not make a very strong point in pressing 
the updating forward at a higher level of responsibility 
over resources.

In the meantime, almost all of the "famous" data banks have been 
doomed to obsolescence. With their fading away, the high ex-
pectations of many urban planners in information systems started 
to crumble.

1.3. Project-Oriented Information Systems

In contrast to the general planning data bank, which was 
supposed to answer all questions—-and could answer no question 
really—-another concept was introduced at about the same time: the 
project-oriented information system. It originated in the new 
and quickly-developing field of economic planning, operations 
research and traffic engineering, and was designed to answer 
comprehensively questions arising in large-scale planning 
projects. These information systems were set up relatively 
independently and usually centered upon the modeling activities 
of these studies. A new element was introduced into the set-up 
of the systems: the "model-base," containing all the models which 
were the result of the modeling activities. These information-
systems had to be quite specific in the determination of the 
content of the data base, and it took much trial and error to do so. 
They extensively used data from different sources: administrative
information systems, statistical records and specially collected data which could be fed into the models and the output would allow the analyst insight into the present and future states, as well as the nature of the "real world system" under consideration. These information systems, therefore, did not only supply data but were rather designed to supply information.

Though originally designed as ongoing suppliers of information, they usually shared the fate of the data banks. The updating of the often vast bulk of data could not be guaranteed over a longer period of time and the models proved to be not as useful within the context of planning as was expected.16

Such information systems promised to be an easy bypass for the planner, around the fatiguing process of structuring a complex problem of the real world. Someone would do it "objectively" for the planner and then simply communicate the results to him, he was made to believe. Because model building became a big business, and a means to build up an academic career, there was motivation enough to "suggest, that we will ever be able to reduce indefinitely complex entities, such as metropolitan regions, for instance, to finite, manipulatable models" and thus "simply misleading the public."17 The models proved either to be too simple to picture the real world adequately or they proved to be too complicated and, therefore, did not lend themselves to easy communication.18
They involved large amounts of resources for really using them within the context of planning as testing grounds for alternatives; the output was of little help to the planner, if he had not gone into the fatigue of understanding the models. Furthermore, they did not reflect sufficiently the political implications of planning, being the outcome of rather academic research. All of this did not make them very useful tools, and the efforts in this direction have been grossly slowed down and existing studies have been brought more or less to an end; they provided information for one-stroke projects rather than for ongoing planning activities.

2. Evaluation

Seen within the larger context of an ongoing experiment, the creation of information systems in the vicinity of the field of planning allows for a series of valuable insights into the process of technology transfer and into the process of differentiation of the planning function.

2.1. Technology Transfer

The transfer of information technology to the field of planning has been characterized by a deep misunderstanding between the technologists on the one hand, and the planner's on the other. On the technologist's side there was not enough insight into the way
planners use data within the planning process; on the planner's side there was no sufficient understanding of the basic concepts of computers and information technology, and their limitations. Both aspects will be discussed in the subsequent sections.

As a consequence, with respect to the creation of information systems, technologists followed up upon goals vastly different from the goals of planners. Where technologists were looking for perfection of their systems, efficient access and storage of data, geocoding and fully automated documentation, the planner was hoping for a tool which would aid him in structuring problems, gain insight, and help when searching for solutions to problems. Where the technologists could--through their very skill--succeed, and in general, achieve their goals, the planners are still left "hoping." Information systems were, therefore, rather forced upon the planner, were kept outside of the planning process, and were never designed to become an integral part of it. The planner can never consider information systems as technical problems alone, but rather organizational as well as political problems--i.e., first and foremost as problems of content, where quality of the output is the only yardstick. To the planner, information systems remained input-oriented data repositories--though automated ones--and they contributed to the information avalanche rather than helping curb it: only in a few instances could data
from information systems be used as a substitute for data which would otherwise have been collected in the field. But, additional data were made available to him, waiting to be used.

2.2. Differentiation of Functions

Up to the present, the different approaches to information systems reflected a process of differentiation with respect to the planning and decision-making functions. Within the field of urban planning, the first step of differentiation was started in the last century: the decision-maker became differentiated from the planner but it was not until the middle of this century that planners--especially those trained as architects--could admit to this. By this time, a second phase of differentiation was already under way: planners specialized in various denominations--urban design, land use, transportation, infrastructure, etc. A third phase, relatively unnoticed, began about the middle of this century: the differentiation of the roles within the planning process into planners proper--whose task it is: to develop feasible alternatives for recognized problems, and the professional urban analyst--whose task it is to analyze and structure those sections of the real world which make up the environment for planning. This process was not a simple parting of the two functions, but rather one process of the planner's abandoning a function, and another process of taking it over and slipping into it.
This occurred gradually when problems became more complex or were perceived as being more complex, when the idea of comprehensiveness was introduced into the field of planning.

The planning data bank is associated with this abandoning process, where the planner noticed the need for more information but was not able to handle it anymore. The project-oriented information system is on the side of the "taking over process" where the above mentioned analysts noticed a new field of research, but were not able to plough through it such that the planners could reap.

Until this process of differentiation can be satisfactorily integrated into an analysis-planning-decision-making process, there will be not progress related to information systems within the field of planning.

2.3. Lessons

The endeavours of determining the content of the data base up to now have been characterized by the background of those who were responsible: planners on the one side, and analysts on the other side. For the purposes of this paper, the two approaches shall be classified:

- as the "button-box" approach of the data bank, where every conceivable, and even only vaguely usable (within the context of the discipline) item was included, and it was assumed that it might be "somehow" of use later. This
approach is based on the belief that within the field of planning, the information demand is changing from project to project, from situation to situation, and therefore not much can be predicted. Thus, it is best to take what one can get and then update it, so that it will be available whenever need arises. The same actually holds true for the determination of the content of the operating systems, especially for analysis programs.

- as the "nut-and bolt-box" approach of the project-oriented information systems, where ideally only those data were included which could be used in connection with models.

This highly specialized set-up is based on the belief that within the planning process information has to be provided not only for answering general questions but rather very specific questions which go into the full-depth of a problem, and especially upon the belief that information is required during the problem-solving phase of the planning process, where alternatives have to be tested. This, however, meant that the data-base as well as the model-base had to be tailored to problems. A change in problems meant a change in the usage of the data base and model base. Information for other than the specified purposes could not be gained readily, and if the information to be included into the data base could not be predicted, it has to be elaborated upon. Replication, though, for similar projects within one community was never considered, since the projects
were oriented usually to full coverage of the jurisdictional area. Thus, elaboration could not take place in the course of a series of similar projects within the same unit of jurisdiction, but rather only on a national level.

The "nut-and bolt-box" approach offers two valuable lessons, if we want to come closer to the still distant goal of information support for the planning process, and if we do not remain satisfied with the "button-box" concept of large data repositories:

- data have to be collected with reference to specific questions, because of cost and effort involved in creating files and operations systems and because of the very nature of computers which only can emit what has conceptually been prestructured. They are, therefore, out to their best use when their operations are following routinized lines. Thus, where on the basis of gradually accumulated knowledge and experience patterns of data-usage within the planning process have been made out and become routinized. This, however, requires a differentiation of the planning process into distinct phases, as well as a classification and grouping together of projects of similar character.

- to have data does not mean to have information; an information system needs to be supplemented by a body of people who help in structuring problems in such a way that they can be tackled when searching for a solution to them. This means that models should not only be developed but rather, the process of their development should be communicated; furthermore, a non-formalized pattern of information usage needs to be developed within the learning process about the real world.
Both aspects mentioned are closely intertwined and before outlining a framework for changes, it seems to be necessary to look into the usage of information within the planning process more closely and raise again the question: Why could planners not use these information systems?

3. Information in the Planning Process

Within the context which has been outlined up to this point, I will restrict myself to the major problem concerning predetermination of content of a data base, and five hypothetical answers shall be given to the question:

1. The usage of data within the planning process had, unfortunately, been mistaken with the usage of data within the programmed, routinized decision-making process of administrative operations.

2. Planners do not think in terms of data but rather in terms of conceptual entities of the real world, i.e., data do not necessarily mean information about the real world but rather are information fragments which need to be put together to a conceptual entity. By using data from an information system, the planner might conserve resources to collect data, but he definitely does not save time and efforts to learn about that section of the real world with which he is concerned.

3. Planners use a vast amount of information of which only a minor part can, by its very nature, come through information systems; there is no way of escaping all the other information since just it, represents the planner's daily bread and butter.

4. The information contained within administration information systems needs to be tested for its viability within a given context, before it can be used; this requires experimentation and repetitious usage. It means a major
intellectual effort on the planner's part which can be escaped easily, since the same information can often be obtained through other channels, and then usually is much more apt for ready use: not in the form of data, but rather in the form of general statements, and judgments about a situation.

5. Planners can predetermine--and subsequently use--data only within habitual and routinized contexts, where a long-termed learning process about the real world has taken place already and predetermination is the outcome of former experience.

3.1. The Planning Process Differentiated

The usage of information within the planning process needs to be sharply distinguished from the usage of data within the routinized and programmed process of ongoing, decision-making in administrative operations. With the latter, data and information are not introduced to contribute to a learning process about the outside world, but data about individual units of reference are used in order to find out whether such units correspond to given and predetermined criteria so that a decision can be made about the treatment of the unit of reference: e.g., when applications are concerned, or in the case of tax bills. Whenever this decision is reached, the results may be entered on the record of the unit of reference concerned as a further datum and afterward this unit of reference can fall into oblivion in the mind of the decision-maker, since the data are continued to be kept in the information system's data base. This process can lastly be
referred to the model of information storage within the human mind, where information for quick and repetitive decisions are fed only into the short-term memory and do not necessarily enter the long-term memory, where they would contribute to a learning process. The long-term storage of such information is kept outside of the human mind on appropriate media. This process requires, however, a prestructured pattern of data usage which can be internal or external to the human mind, and which is made up of rules, standards, and previous knowledge about the context in question. "Data" in this context of decision making is identical with "information." Complete information is required on the individual unit of reference. If data are missing, the decision cannot be readily made, and additional data have to be collected. The completeness of information refers, again, only to predetermined rules and criteria which are reflected in a fixed set of data, which has evolved to the point of being sufficient and necessary to make the decision.

The planning process, however, is vastly different insofar as it can be considered to be a learning and problem-solving process about the environment of a project, and information within this context serves a quite different function: it enables learning and problem solving.

For the purposes of this paper, the planning process shall be differentiated into four logical phases which, however, in terms of time are closely intertwined:
- the problem-structuring phase
- the search-for-a-solution phase
- the solution-selling phase
- the implementation-control phase

3.1.1 The Problem-Structuring Phase

Whenever a situation in the outside world is perceived as bearing a problem, either the planner or a political decision-maker will initiate an analysis of such a problem. "Problem" in this context means that goals held by one who perceives or anticipates a problem are affected either by decisions of other parties involved, or by the general change of the outside world and no immediate solution is at hand for the problem.

This analysis is the first phase of the learning process, by which the problem will be perceived and gradually structured and molded in such a way that a conceptual model--called "internal model"--will be formulated in the minds of the persons in charge of the analysis. The internal model can be understood as a conceptual entity, which can be made up of several more or less integrated conceptual components which each refer to particular aspects of the problem--e.g., the physical aspect, the financial aspect, the rehousing aspect of an urban renewal problem. The conceptual models preferably take the form of general statements, if communicated to others; e.g., the area of analysis is densely populated--mainly with people of lower income classes, which means
much more complicated rehousing. The conceptual model of the problem at hand is as much of an outcome of already existing knowledge—acquired by training, cultural background, and former experience—as it is the offspring of ideology, philosophy, and motivations of the people in charge, and of concepts and goals held within the organization.

This process of structuring includes, therefore, evaluation as well as judgment and there is no "objective" analysis of problems, but only "relative objectivity" related to a high degree of consensus about problems within an organization. The concepts always reflect the other inputs, and a choice presented to the planner as to how he wants to interpret the problems: either through the eyes of a political decision-maker, when considering himself as an integral part of the administrative system; or, rather through his own eyes as an independent individual. In this respect it is not uncommon to find "split personalities" in planning agencies.

To a large extent, the way in which problems are molded into conceptual models determines the outcome of the search-for-a-solution phase. The problem-structuring phase is, thus, directly geared to problem solving, a fact which distinguishes the planner from the social scientist. The planner goes through the problem-structuring phase only with the intention of solving a problem, or at least finding a solution to a problem.
When Patrick Geddes stimulated planners to "survey before planning," he had this relation in mind, and wanted to stress the special importance of the problem-structuring phase, which had been very much neglected as long as problems had been perceived as being very simple. To the planner, Patrick Geddes' imperative meant that one had better take a most careful look at the situation and learn about it before making plans. The need to create a reliable basis for comparison, as well as to communicate findings, required that a first, and provisionally gained, conceptual entity in the planner's mind had to be broken down into the smallest possible conceptual elements, i.e., classes of objects and of properties for which data had to be collected.

This breaking down of conceptual entities into the conceptual elements of data meant a major intellectual effort, which at the time when the above-mentioned fourth step of differentiation between planner and analyst had not yet really taken place, was completely left to the planner. He was assisted only by formerly acquired knowledge, and he had to look closely into a given situation and find out ways in which it could be transformed into data, and he then had to develop the categories and definitions for units of reference and variables, set up questionnaires and forms. In a second "round up" he had to go out into the field again and collect the data. After this, the planner had already learned enough about the situation in order to enter the phase of a search for a solution.
The data collected were a byproduct of this problem-structuring process, where all necessary information had entered the long-term memory of the planner's mind and were assembled there in the form of a conceptual model of the situation—not as data.

After having coded and displayed the data as maps or charts, he could use them to communicate, for back-reference in order to gain further or lost detail, or for additional structuring of the problem while in the problem-solving phase, by looking for "structure." Again, here the data displayed were not used as data but as broad patterns of spatial distribution: generalized concepts were attributed to them and expressed in vague statements—the horror or more scientifically minded researchers. This kind of a learning process was perfectly in order at a time when planning operated in a simple environment, or in an environment which was perceived as being simple, and the much lamented fact that planners did not use much of the data they had collected cannot give rise to ridicule. In fact, planners were not trained or used to assembling large and often incoherent sets of data into conceptual entities. Occasionally data were used to supplement already evolved conceptual entities insofar as they were transformed into general statements about a situation.

As soon as problems were perceived to be more complex, more aspects had to be considered and the learning process began to take up more time, and therefore had to rely increasingly upon
data which were already available. These data then had to be reduced in volume and assembled into meaningful concepts regarding the problem at hand by means of methods which would allow comprehensive and reliable treatment of data. The outcome would then be highly generalized and abstract, formulated in "external," mathematical models. Statistical and operations research methods were incorporated and, of course, the information system.

The process of differentiation which was explained above was gradually extended toward specialists of subject matters on the one hand—land use, infrastructure, housing, etc.—and professional analysts on the other. The planner, when embarking upon the data bank concept, hoped thus to dispense of the time-consuming toil of collecting data, and would rather use the data already available. He mistook the byproduct of former data collection for the main product of this collecting activity, and by doing so he very elegantly cut himself off from the learning process. He found himself in almost a vast and little structured pile of data, which was the product of many and diverse intellectual processes of breaking down various conceptual entities into data. With only little chance, some of these data could just about coincide conceptually with the conceptual entity the planner was after. No wonder that he was not able to right away reassemble these usually non-cohesive sets of data into meaningful concepts
of his own concern: he had to take such data as a virtue in itself. Collecting data from various existing sources became more and more of a ritual in the planning process—they were processed in much the same way as in former times: displayed as maps and charts in order to find "structure."

The planner in this situation was not in the position to determine which data he would like to use because he conceived of each project as a unique one and because he just could not enter the learning process right at the beginning. Whereas formerly there was a first look into the area, there was now a pile of data, the conceptual basis of which he did not understand and being in default of theories about the context and methods to deal with them he had to leave this to someone else who would do it for him. This meant more or less withdrawing from the problem-structuring phase.

The professional analyst took over with his surgery kit of quantitative methods, and would use the available data as statistical aggregates, treating them statistically and squeezing them into models of the outside world, often a procrustean job. From the data, he—within the frame of his theories—could learn about the present and likely future states of the system under consideration, as well as gain insight into the nature of the system.
But the professional analyst probably did not fully understand what the frame of work of the planner was, and subsequently structured the problem in a way which did not coincide with the way the planner could use it. He followed his theories and went into undesired depth, included aspects which were of little or no relevance to the planner, and left others out. By using techniques and methods which were outside the planner's educational horizon, he left little or no ground for communication with the planner.

The analyst, usually taken under contract from the outside, presented only a final result of his findings to the planner. This was complex in itself, and drawn up in a way which excluded the planner from insight into the problem as the professional analyst saw it—using formulas, regression diagrams, correlation coefficients, and partial differentials rather than general statements, or familiar maps. A single summation sign could mean a stumblingstone to understanding. The planner was first and foremost excluded from the model-building process, of which the final report was only the outcome. Only in most recent times, has this learning function been pushed into the foreground of model-building efforts. Up until then, it was the final report which was aimed at.
Even if the planner vaguely understood the problem structured, he could hardly follow it to its depth, and attack the basic assumptions of such studies. Consequently, he either had to reject the whole works, or become completely reliant upon the professional analyst—who, as a consequence, did not limit himself to the problem-structuring phase but rather could enter into the problem-solving phase and preselect solutions to a problem which, in turn, the planner had to live with.

One point deserves particular mention here, which will be treated more fully in a following section: to the professional analyst, the source of information was mainly the information system, and other available data. To the planner, on the other hand, there are additional sources of information open: from gossip to opinions uttered by concerned people, and insight into the political process which altogether the planner formerly used to include in the learning process and which, after the professional analyst took over, became the main source of information (apart from visual impressions of the problem under consideration). This meant that the professional analysts used a source of information which was different from the source that the planner used in order to structure a problem. No wonder that their approaches—and results—had little in common!
3.1.2 The Phase of Search for a Solution

The search for a solution has to be considered as another phase of the learning process, with a different stress of priorities. The more one works toward a solution, gradually refining and detailing the feasible solutions, the more one learns about the environment of planning. I stress here the word "feasible" since I maintain that millions of solutions are conceivable, of which only a limited number, however, are feasible: technically, economically, and politically, all of them lying in a confined search space, the result of the preceding learning process and of established goals and rules.28

The process of searching for a solution within this search space is characterized by assembling conceptual units into varying combinations according to rules. The conceptual units are either given through rules or have been evolved by professional tradition or can be newly invented. To the architect-planner, such conceptual units are, e.g., buildings and access elements which according to local statutes and professional ethics have to be fitted together to an overall layout. To the land-use planner the conceptual units can be categories of land use which will be attached to areas or clearly defined activities which are assembled to a comprehensive strategy.
Depending upon the rigidness of the rules, and the degree of routine involved--i.e., whether the problem is seen as a new and unique one or rather a repetitious one--it takes the planner more or less time to arrive at one or more conceivable solutions. Each solution represents an "anticipation of future action" or a future state of the system under consideration: it is information presented and communicated in appropriate symbols. The process of assembly is broken down into several steps and in general, begins very broadly, becoming more and more detailed. Each step is comprised of four distinct phases: a proposition is made; the outcome of this proposition is stated such that it can be compared to a set of criteria; the outcome is then compared to the more or less vaguely formulated criteria, representing goals or objectives which again can be incorporated in rules, held by a profession and more often held by the administrative unit or the political system; the proposition is either rejected, if it does not meet the criteria, and another proposition is made--or, if it meets the criteria, it is accepted and the next more refining proposition is made. This process is carried on in many "loops" until finally one or more alternatives are reached which can be considered to represent feasible solutions to the problem.

The process can be carried into the political arena where a first sketchy outline of the solution is presented to the final decision-makers, who then--from the evaluation of it according to their own set of criteria--either accept or reject it.
Also, the process can be carried into other agencies where the solution reached is discussed and coordinated with other activities—i.e., enriched, evaluated, and modified again. In all cases mentioned, the process is iterative and has a high learning effect upon the planner, who either gains some different views regarding the problem once new aspects are introduced, or who learns about the political goals which are affected. These goals may often only come to the surface as soon as they are confronted with a proposition of some kind. Thus, a feasible solution finally is evolved.

Information plays a major role in this process, although the usage is much different than in the problem-structuring phase. Data about the outside world are required in order to determine how, and to what extent a proposition made affects certain variables and elements of reference—e.g., in an urban renewal project, how many dwellings will be torn down and how many families will have to be replaced if a certain action is proposed. Individual data are necessary rather than statistical aggregates, and calculations have to be made on these data. The process is iterative and the same data and calculations are used over and over again. However, when new propositions are added, new aspects need to be considered, and additional data and procedures of calculation are required.
The data as well as the calculating routines have to be closely specified in order to reach those results which allow evaluation. The selection of data and calculations depends largely upon the objectives and goals which are pursued. Some of the goals are known in advance from rules and consensus internal to the administration, and data associated with such goals can be specified in advance. But, there is still the vast array of objectives and goals which are only learned about as being relevant to the project during the planning process, as mentioned above.

Again, the planner will not be in the position to predetermine a consistent set of data with respect to such hidden goals unless those are at least in part uncovered by anticipation, based upon experience with former projects. Much of this process was done without data, but rather in an informal way through vague statements and estimates of outcome which were derived from the accumulated knowledge of the problem-structuring phase. Mapped data were, however, used during this phase in order to find out how an individual unit of reference would be affected by a proposition.

Since the calculation procedures were tedious and time consuming, they were usually done only at large intervals—mainly after a comprehensive solution had been reached. Even if the outcome was not quite as desired, the solution was carried forward rather than modified and another iterative "loop" was taken. In this phase
of the search for a solution, computer aided design methods can be of help since they allow permanent evaluation of each single step—but only within the frame of those criteria, and subsequently data, which could have been determined in advance.

3.1.3 The Phase of Selling a Solution

Whenever a feasible solution has been reached—provisionally or finally—it has to be "sold," sometimes first within the administrative hierarchy but then definitely within the political arena of decision-making. This means that particular outcomes of a solution, and likely consequences bearing on other fields of responsibility and interest, have to be either stated expressively and attached to the solution as a kind of selling label, or have to be kept out of the discussion. For this particular purpose, "backup" information is required. This helps to push into the foreground of debate particular aspects of a solution and make the solution palatable to others, and state its feasibility if this is in question.

This power game regarding a solution requires "intelligence work" beforehand in order to establish how other parties feel about the direction the solution might take, how they think about the problem under consideration, and what goals they are in general following up; in short: how their conceptual models of a situation will be affected.
From this, it can be established which back-up information is required, and in which way it has to be put forward to accompany the solution.

This information can be the outcome of analytical work during the search for a solution, or very often it might be necessary to compile the information only after the solution has been accepted internally by the sponsoring agency. Data from an information system can be used if they meet the requirements and tell what is desired. Their usage is, however, again different from the usage in the former phases of the planning process—individual as well as statistically-aggregated data are required which have to be manipulated, often in a distorting way, and which then have to be displayed and interpreted such that they can be most easily understood—i.e., be fed into the conceptual models of others shaping them in the desired direction.

Data are used to support the interpretation attached to them. Data become weapons, and a whole armory of them is required! Not all of them are shot off at a time, but rather used strategically.

Sometimes a traditionally-held concept of a situation needs to be torn down simply by a different interpretation or different treatment given to the same data; Michael Harrington's book on the "Other America" is an example of this. Quick access to further information is required, and the existence of suitable programs for expedient treatment is a prerequisite. Data of such high specification can only seldom be predetermined, and the planner again is in a difficult situation if asked to do so.
3.1.4 The Phase of Implementation Control

Whenever a solution has been decided upon finally and is carried forward into implementation, the planner very often still has the obligation of following up upon the implementation phase, which might require changes, modifications and updating whenever it either does not have the intended effect or when outside effects act as disturbances. In order to find out about the state of progress information is required, especially about the deviations from any given benchmarks which have to be attained; e.g., in an urban renewal project the decision has been made to build apartment houses for low- and middle-income families and after some time it is found that due to an economic crisis the units will not suffice, and more low income units ought to be built. New decisions have to be made in this context which will draw upon the cooperation of the planner.

This, however, requires that indicators as measures of performance have to be determined which allow such assessment of deviations. This kind of information will be reported at regular intervals, and action will be taken only when some serious deviations from the benchmarks occur. Such indicators do not play a part within the learning process proper, but they do, though, allow the planner an insight into the effects of his activity and thus contribute to a long-range learning process.
The determination of which data can be used as indicators depends upon the objectives which have been followed up on, and the evolution of a theory about the nature of the system under consideration. This means valid indicators cannot be set up in one stroke, but rather are the outcome of a process of trial and error, of experimenting with a set of data and testing them for their viability within a given context. Data from an information system lend themselves technically to this purpose since they are updated and can easily be compiled in a routine fashion for regular reporting. From the conceptual point of view, however, they require strict selection and testing in order to adequately reflect a given situation. By the technical availability of regularly-reported indicators, the phase of implementation—much neglected by planners until now, can become very important. Before the advent of information systems, the planner had no way to "cheaply" acquire such indicators, and he could only get the information by looking in the field to see how progress was coming along. Special replication surveys were not feasible for financial reasons. The idea of feedback is coming into reach and will very likely change the whole approach of planning in due course. The same indicators could well be used for detecting problems which arise out of implemented solutions and thus start the whole planning process all over again—provided such indicators have been tested for their validity and their correspondence to predetermined concepts about the state of the system under consideration.
4. Sources of Information to the Planner

Two different aspects of the sources open to the planner need to be discussed here:

- the multi-channel aspect, and
- the escape aspect with respect to information systems.

4.1. The Multi-Channel Aspect

The planner satisfies his very diversified information needs by using various channels, but only a minor part of the information needed can, by its very nature, be contained within an information system. The promise of having only one point of reference turns out to be only a lure. To make this point clear, I will differentiate information according to the aspects it describes:

- "system-internal information" about the administration regarding the relations and the processes going on within;
- "system-external information" concerning the world outside of the administration, about the state and the nature of it under a multiplicity of aspects.

The differentiation between formalized and informal information has already been made. Within the field of interest to the planner are the following types of information:

- system-external, formalized information; it can be contained within an information system as data, describing objects and properties thereof. With reference to "administrative information systems," however, demand and supply within this category certainly do not meet: the information systems contain only part of the formalized information the planner needs or could use within a given context; all data which are
not the concern of administrative operations are not contained, and of the ones contained many are not accessible for safety and security reasons: e.g., in general terms, land-use data, income data, tax data, etc.

On the other side, only a part of the formalized information contained within the information system can be considered to match sufficiently from a conceptual point of view the data the planner needs within a given context; errors and misinterpretations are prone to arise with incompatible data. This means that the planner and the analyst as well will in general not be able to dispense fully of the toil to collect data from other sources and in the field. In many cases, a decision has to be made either for updated, badly fitting data from the information system, or precisely fitting data, but not updated ones.

- system-external, informal information: it cannot be contained within an information system—only some of this category of information lends itself to formalization whenever it can be broken up into units of reference and properties thereof, but it will always be hard to reassemble a reliable picture afterwards from such data. Examples within this category can be found in the vast bulk of information gained by looking at things and experiencing situations, by talking to people in an area of concern and finding out about their opinions, needs, and goals, by reading newspaper articles regarding to a problem at hand, by attending meetings of participant groups.

- system-internal, formalized information: it is in general of no interest to the planner, since such information refers to the internal operations of an administration—payments, personal records, etc.

- system-internal, informal information: it is the bread and butter of the planner and he cannot dispense of it; it does not lend itself to formalization and therefore cannot be included within an information system (except for the case of documentation systems for reference to literature, proceedings, etc.). This category of information is comprised of gossip, briefings with political decision-makers, memos from the boss, discussions with other agencies, opinions and suppositions uttered about the consequences of a problem on the administration, and finally the vast bulk of rules, codes, and legal prescriptions that the planner has to keep up with and on which he spends a handsome proportion of his time.
By this category of information his attitude of approaching
and perceiving a problem is shaped. Some of the channels through
which this information comes are well established and the
planner has "random real-time access" to them; others are
occasional and information cannot be retrieved in a
systematic way.

4.2. The Escape Aspect

Since the planner conceives problems as conceptual entities
he always reduces a set of data about a problem in such a way that
he arrives again at a conceptual entity, or he feeds data into
already existing conceptual entities, thus confirming, modifying
or restructuring them. He passes judgment on such conceptual
entities and these judgments become part of the conceptual
entities in his mind: e.g., data about the condition of buildings in
an area are condensed to the general statement that "the area is
pretty well run down, except for the northern part."

Because of this reduction of data into general statements the
planner is inclined rather to use sources of information which alleviate
this intellectual process and which supply him with information in a
form which he can use right away—opinions of others, visual
impressions, etc. This means that the planner can easily escape
the formalized information from an information system and rather use
informal information instead—definitely at the cost of precision—
if the data are properly specified in terms of concepts to the needs
of the planner. Since this, however, cannot be guaranteed with
information from information systems, the seeming precision of
data is only a "phony" advantage and rather distracting, adding detail where generality is required.

From this it can be concluded that: information from an information system can only have a supplementary function, to the learning and problem-solving process. This supplementary function however can be improved and strengthened and developed into an information-support function, where the planning process in all phases is supported with the right information at the right time, provided a predetermination of data, data usage, and processing can be made. This is said easier than done, and by no means is it applicable in all cases. Before outlining some proposals toward an information-support system, I have to discuss those cases where it could be introduced.

5. Planning in a Routinized Context

The planning process is the same in basic structure with one problem as with another: it always comprises the four mentioned phases. However, what changes is the subject matter of the planning process—and even this does not always change radically from project to project: not each problem is totally new; there are always classes of similar projects which require similar treatment. They either come up one after another within the jurisdictional area of an administration, e.g., urban renewal projects will come up as soon as financial and political considerations allow their tackling; they will certainly not be
tackled all at a time. Or, projects of similar character occur in different cities, and even there, not all at a time. And, finally, one and the same problem occurs repeatedly in one and the same setting and needs to be planned for repetitiously, e.g., the updating of land-use plans which might require major changes.

This, however, means that a differentiation first has to be made according to projects of similar character: which all are lumped together into one class of problems. Because of the serial character of appearance within each class of problems, the planner concerned with them can build up experience along a series of projects he is engaged in and not only accumulate knowledge about the basic structure of such a class of problems, but at the same time find out about easier ways toward their solution. And, finally, he can increase his knowledge about data requirements and data usage. This means that within a class of problems, a repetitious and routinized approach is aimed at which, however, does not lead to a frozen pattern of treatment: in the course of such repetition, new aspects always enter. Also, the awareness of particular sub-problems increases and changes the scope.

Finally, the rules and objectives change over time, and from project to project. The narrower the class of problems—e.g., not only the class of "urban renewal problems," but rather the class of "low-income, urban renewal projects with predominantly white
population,"--and the more repetitions which have occurred, the easier the predetermination of information needed, and the higher the usage of such predetermined data during the project's various phases. The less a problem resembles other problems and the more it has to be considered as unique, or the more an innovative solution is asked for, the less knowledge and skill are available and the less predetermination of information and data is possible.

This means that each class of projects is opened up as more or less an innovation where much experimentation has to occur and data have to be determined in a hypothetical way. During the learning and problem-solving process, it can be found which data have been of use and which have not; which additional information is required, and which data were not available. Furthermore, it can be discovered which data are required at which phases of the planning process and in which form of treatment--as statistical aggregates or individual data; which data will be used only once, and which ones have to be available for repetitious random access. Whenever this procedure of predetermination is carried into the second and third project of the same class of problems, a pattern of information usage will have evolved which could become the basis of a problem-oriented, information-support system. This, however, is applicable only where repetitious patterns can be made out, and can be established. As long as each problem is treated as innovative and unique, one can never take advantage of this, and
has to rely either further on the button-box concept or on informal information, for structuring a problem and finding a solution. Whether routinized or not, a prerequisite for better usage of data is the improved integration of the professional analyst into the planning process.

6. Information-Support Systems

An information-support system is an agency-oriented information system which is basically made up of a permanent and a changing set of components.

The changing set of components is:

- one or more data bases, each geared to a particular project which has been assigned to a particular class of problems;

- one or more information-support plans, geared to each class of problems;

The permanent set of components comprises:

- the operations system, with all of the computer programs for data handling and analysis;

- the model base, containing models into which data have to be fed according to the information-support plans;

The information-support plan is the logical core of the system and can be understood as a kind of monitoring system, which is associated with one class of problems. Whenever the planning department is
beginning a project which has been classified as belonging to one particular class of problems, the corresponding information-support plan is put into operation; whenever the project terminates, the information-support plan terminates. It accompanies the project at full length and it has a double function: it distributes information and data to the planner in a predetermined fashion, makes the right information available at the right time, and in the right format. It can, in some respect, be compared to a teaching program--making available general information about a situation at the beginning, adding detail as the process goes on. In addition to this, it determines which data have to be collected from various sources and at which time; furthermore, in which form these data have to be processed and made available to the planner according to the phase of the planning process he is engaged with; especially if comprehensive and time-consuming processing is required in order to arrive at a particular information.

The setting up of an information-support plan requires a systematic approach. Instead of asking the head of the department which data he wants to have included the people in the line need to be involved predominantly and not by asking them but by analyzing their activity. The whole course of a project has to be accompanied by an analytic process: all information needed
and all information used has to be precisely recorded and related to the ongoing activity of the planners at various levels of activity. This refers to the kind, time, and format of information required and the kind, time, and format of information used. It relates to data from a provisionally-installed data base as well as to data and informal information from other sources. After the project has been finished it is possible to find out where requirements have been met, where information gaps occurred; which of the supplied data and information has been used and found to be satisfactory and which has not been used or found satisfactory, or was substituted by informal information; when and how often it has been used and in which different contexts. From this it can be found out which data in the provisional data base have to be kept, which need to be changed and where substitutions have to be made or data have to be eliminated as meaningless. It can be determined whether data from a survey in the field can be substituted by data from an administrative information-system and whether gaps between requirements and supply can be filled by informal information rather than data. Furthermore, it can be found to which extent data have to be processed and manipulated at various phases of the planning process and whether data files require updating during the planning process or not.

Whenever this first draft of an information-support plan is used again with another project of the same class of problems, it can already prove to be useful but it still requires careful
analysis in order to improve and modify it: some of the information found useful might not have been so in the following project, other information might be missing the second time and needs to be included.

Setting up an information-support plan requires intensive help from the side of the professional analyst. He is actually the one who has to accompany the planning process as analyst and who will, on the basis of his knowledge and experience, be able to establish the pattern of the information-support plan; he will tell the planner which data can be used for which purposes and how by means of statistical analysis conclusions can be drawn from data or how a conceptual entity can best be broken down into conceptual elements.

This means a joint learning process with distinct roles of contribution: from it the professional analyst will learn how he has to provide the planner with information and how political aspects have to be treated and included. The professional analyst will, however, not only work on the set up of information-support plans but rather try to solve those information problems which can be attributed to the newness of every project, however routinized it is. The planner will learn from it how to use data and models within a given context. It is a process patterned to J. Habermas' "pragmatic model of interaction." The creation of the information-support plan will reflect this learning process.
insofar as it becomes a problem-solving process in itself.

The ideal setting for an information-support system is the information network, of which it can become a part. Depending on the number of problems undertaken at a time by the planning department a corresponding number of information-support plans will be in operation. In addition to this, a number of information-support plans for particular classes of problems in which the planning department is not engaged in at the time might be available, but not in operation.

A data base will be established for every project according to the specifications of the information-support plan; it will be furnished with data from the information network as well as data collected from other sources and in the field. The data base can be made up by a series of files which by no means must be established right at the beginning but rather as need arises according to the information-support plan. Some of the files might be set up only for single usage and can be scratched afterwards, others might—especially during the phase of search for a solution—be used over and over again, if possible with random real-time access to it. Only if the information-support plan requires it, single files will be updated.

For the implementation phase the information-support plan might only require regular reporting which in simple cases might be done without setting up a data base at all. Since the burden to create
files is placed upon the user, he will follow principles of economy. This, however, means he will try to reduce data transactions concerning volume and frequency. In connection with an information-support plan, this is achieved insofar as only those data are called into the data base to which a high probability is attached of getting used; furthermore, only data for the project area are called into the data base rather than data for the whole jurisdictional area of the administration. And, finally, the data are only called into the data base whenever they are needed in connection with a project, rather than having a vast bulk of data carried forward through time which only can hope for being tapped. This approach will make updating of the data base of the information-support system a rather exceptional event.

Priority channels of data usage to other information systems can be made out and established; all necessary coordination—e.g., geo-coding, transfermodes, etc., can be carried on only where it will prove to be useful.37

One particular point needs to be mentioned in connection with the data bases: the creation of historic files. Since data within an administrative information system are permanently kept up to date, all obsolete data will be scratched and the planner has to determine which of those he wants to have saved at which time intervals, and have them stored in historic files. The various information-support plans will collectively allow the
determination of such historic data and the creation of a historic data base which will be regularly "updated with obsolete data": this historic data base will be then useful to all established information-support plans, and can be tapped accordingly, e.g., for projections, time series, or the calibration of models.

The model base of the information-support system will be made up of all models which will be used in connection with the various information-support plans; it is assumed that a number of models will be general enough for application to different classes of problems, e.g., population forecast models. The model base will be elaborated upon over time and multiple usage of the models will enhance understanding of their application as well as allow calibration of models to problems of one class more and more closely and in advance of projects, thus saving time and effort for continually new model design.

The operations system will contain all handling and analysis programs, connected to the various information-support plans; much like the model base, a great number of computer programs will be useful for a number of different information-support plans.

The information-support system can be started very small with the elaboration of only one information-support plan. for a small or the most frequently arising class of problems in a city and can gradually evolve and comprise additional information-support plans for other classes of problems and even ones which are
unique to one but which occur in other cities as well. The problem of not routinized, new projects remains open.

All I have said needs to be elaborated upon: it is at the moment nothing more than the outcome of dissatisfaction with the present philosophy about information systems and data banks, and might turn out to be an additional step in the experiment of information technology transfer to the field of planning. The effort going into information-support systems will only pay off if the experiment has a long-ranging nature. The process of establishing them will be tedious and no immediate success will be in sight, since we have to overcome the most serious gap yet when looking at information technology transfer: the conceptual gap.
Literature

1. Urban and Regional Information-Systems; Support for Planning in Metropolitan Areas, U.S. Department of Housing and Urban Redevelopment, Washington, D. C., 1968; part 4, p. 60

2. Ibid., Part I, p. 27

3. Compare, e.g., Detroit 1967-68 EDP Activities, Detroit City Plan Commission, Research Division; The manuscript shows 5 different tabulations made for the year 1967 to 1968. In Alexandria, about 50 requests were made and served in 1966, mainly, again, tabulations: Urban and Regional Information Systems, op. cit., Part 4, p. 22f.

4. Compare cost figures in Urban and Regional Information Systems; op. cit.


8. Whoever collects the data shall be called the "generator" of data and who uses the information for his purposes shall be called the "user."


26. Ibid. p. 22f.
28 Compare C. Doxiadis: *Emergence and Growth of an Urban Region; Vol. 2: Future Alternatives*, Detroit 1967, p. 135ff., where 49 mil. alternatives are stated as conceivable to a given limited problem.


37. Robert Amsterdam, op. cit.