CORPORATE PLANNING SYSTEMS SIMULATION: THE PORTLAND GENERAL ELECTRIC (PGE) EXPERIENCE

Wynn A. Abranovic
Lee A. Barney
Charles A. Lusky
Warren H. Winter

ABSTRACT

As utilities struggle to do business in a volatile regulatory climate, a number of uncertainties about costs and revenues make the task of corporate planning a difficult one. A multitude of planning models are used by PGE; they transform data into information at the operating level and they produce some byproduct information that is used as input to more aggregate planning models such as the financial model. Running these models has become an integral part of the organizational planning activities; nevertheless, problems occur in maintaining accurate and timely data files. The problem has been further aggravated by the absence of a repository for planning data that is common to the needs of several departments within divisions. A Data Base Management System (DBMS) is presented as a systematic approach to help alleviate some of the planning difficulties on the technical side; the concept of a coordinating committee is introduced as an integral part of the system but the human system receives little attention in this paper. The emphasis is on a simple and flexible approach that does not burden the user with technical details.

An idea central to a DBMS is that of isolating the definition of the data structure and the user programs. Thus, the need for format specifications in user programs is eliminated for variables appearing in the data base. We have defined a few functions that enable the program users to access the data base in a simple way. The data Manipulation Language (DML) embedded in these functions is invisible to most users; however, Planning Systems is expected to be knowledgeable in both the DML and the Data Base Description Language (DBDL). The DBDL is used to define the structure of the data base, and it requires cooperation between Planning Systems and user departments. The initial data structure is specified in this paper, but the eventual structure is expected to evolve slowly over time; and, as it does, more advanced features of the DBMS may be utilized. An important aspect of this approach is that the system of planning models may undergo evolutionary changes without completely starting from scratch each time and rebuilding the entire system. As a result, less time and energy are expended on the technical system, while more of the needed emphasis can be allocated to the human system.

INTRODUCTION

Increased scrutiny by the public and the government has forced electric utilities to plan carefully for the future and to expect their performance to be closely monitored by utility commissions. To make matters worse, the industry is plagued with increased uncertainty in estimating costs and revenues. As more players (sources of regulatory initiatives) get into the act, the messages to the utilities become ambiguous and often prove to be confounding. In the midst of this scene emerges the need for comprehensive and coordinated planning. The theory is that planned and actual outcomes can be compared; hence, adequate controls can be maintained for surveillance. But, practice often dictates careful plans and a rational defense of the planning assumptions. Seldom is the environment stable enough to actually compare the planned and actual outcomes; nor is there time to look back very far. Within PGE, the need arose to consolidate the planning functions, to improve coordination, and to ensure timely and accurate responses to questions that may be asked in the future. The types of questions include: what is the effect of an X-percent curtailment in load; what should PGE's reaction and stance be to a mandatory curtailment; what effect would curtailment have on resources, finances, capital requirements, and construction plans; when should PGE be building peaking plants versus base loading plants; and how would time-of-day pricing affect PGE's operations?

These questions and others like them are not easy to answer. Yet, the answers are vital to the future of the organization and to the consumers of the Company's services. The necessity to seek these answers has spawned the development of better planning systems. Such improvements include the recognition of the interdependence of the human and technical systems. As Hofstede (1976, page 11) pointed out, planning systems do need good techniques, however, do not guarantee an effective planning system. Poorly chosen or poorly administered techniques guarantee the failure of a system. It appears that trouble is more often in the social rather than the technical processes. Although this situation is recognized, we intend to direct most of this discussion toward the technical system. Some interconnections shall be explored, but not many. In the utility industry the technical system is substantial in itself; PGE has a large number of complicated models for many facets of the business. Some examples are: the monthly energy model, the 20-year demand model, the dwelling type model, the production cost model, the energy reserve planning model, and the Northwest Energy Project Policy model. Without these computerized models, planning would be more difficult, if not impossible. Emphasis will be placed upon the overall multicomponent structure and the evolved need for system reorganization that makes use of data base management concepts.

Currently, PGE has the capability to answer many, but not all, of the above questions. The Corporate Planning Division and the operational departments have a variety of tools that can do much of the necessary analysis, but the need for more timely and accurate results provides motivation to reach beyond current capabilities. To correct this deficiency, a more refined organization of the models and of the data is needed. The proposed system is the Coordinated Planning Information System. The system is designed to utilize a common informational data base, accept coordinated management input, and complete corporate simulation studies faster than the previous, more cumbersome approach.

The basic planning areas are: loads, resources, and finances. Each of these areas contains a subset of interacting modeling activities. For example, within loads there are submodels that involve econometrics, load shape, billing forecasts and calendar forecasts. Submodels also exist within resources and finances. Data sets are passed within and between the three main divisions of the system. Both time series and cross-sectional data exist, and a dynamic quality is introduced as various plans are proposed by management. As a result of these complexities, a new management function has emerged where the management of corporate planning models is integrated with management of the Company.

This paper emphasizes the control and maintenance of the corporate planning model within the framework of Company operations. The evolutionary learning process is recognized as playing a vital role in determining the future model structure. An account will be given of the existing situation and how it relates to future plans.

BACKGROUND

The concept of a Coordinated Planning Information System is central to the thrust of a Corporate Planning Division, which is under the direction of the Vice President for Corporate Planning. This division consists of five departments: Economic and Strategic Planning, Operations Planning and Control, Load Planning, Resource Planning, and Planning Systems. As an integrated group, they strive to achieve objectives while undertaking the following three general processes: (1) the identification of the strategic choices available to the Company and the emphasis on the characterization of alternatives through effective analysis and communication; (2) the management and the development of the budgetary processes to focus attention on the Company's near-term choices for the effective use of resources; and (3) the efficent utilization of technical subsystems that support corporate activities such as licensing, rate cases, and financial analysis. For these processes to function well, cooperation among the departments is absolutely essential.

The Planning Systems Department is charged with a difficult task of developing a coordinated planning information system. The accomplishment of this purpose is no easy matter because the department must play dual roles. In one role, the department must fence off certain technical problems and expend considerable energy reserves solely within their own territory; but too much activity of this sort is a danger because others outside this domain are not drawn into the process of coordinating and planning. And, it is the process that is important. The second role, on the other hand, uses resources available at various centers of gravity, such as other departments. As such, one cuts across department lines in a project team effort and has a strong dependency upon the coordinated effort of others. Too much emphasis on the latter role, however, may not solve the technical problems. Thus, a nearly balanced effort is required with emphasis on coordination; the planning process requires involvement.

From a system perspective, the major planning information sources are classified as loads, resources, and finances. Respectively, they involve actual and forecasted (1) demand and usage of electrical energy, (2) plant configurations and generating capacities, and (3) financial implications of various scenarios. Illustration 1 shows the five departments, the three planning information sources, and the specific departments that have the major responsibilities for maintaining the information sources. Also indicated is the flow of qualitative and quantitative information to and from the Planning Systems Department and the major role of each department.

Of particular importance is the coordination of model building activities and of information flows within the Corporate Planning Division; their results depend upon the cooperation of other units within the Company. Essential planning information results from the data manipulation that is performed by a number of computer programs. Some programs are quite massive and may contain as many as 20,000 lines of FORTRAN code. To manipulate financial data, for example, there are

ILLUSTRATION 1

Planning Systems Department In Relation To Other Departments and Loads, Resources and Finances

AREA OF PLANNING CONCERN	DEPARTMENTS: Economic & Strategic Planning	Operations Planning & Control	Load Planning	Resource Planning	Planning Systems
LOADS			X*		Coordination
RESOURCES				X	and consoli-
FINANCES	X				dation function
DEPARTMENT'S MAJOR ROLE	Identify strategic questions and establish priorities for expenditures	Short-term operations planning and budgeting	Demand and revenue forecasts (short- and long-term)	Identify strategic choices regarding generation, fuel, supply, technology and environment	Coordination of technical services and communications

* The "X" marks the department with the major responsibility for each of the three areas of planning concern that label each row on the left.

approximately 70 programs or subroutines. For corporate level planning, the Planning Systems Department develops, monitors and maintains custody of their own analytical models and programs. But other divisions and operational units have independently developed models (computer programs) for their own internal use. For example, the Power Operations Department has a production costing model that estimates resource requirements and computes the corresponding purchase power costs, wheeling costs, and other production costs. Some of this information is used by the Power Operations Department, but some is needed for corporate planning. Thus, a network of dependencies exists; corporate planning and departmental information needs occur simultaneously. Corporate planning requires the assistance of these other units, yet it desires to obtain the information without undue manual effort and with the elimination of inconsistent data sets.

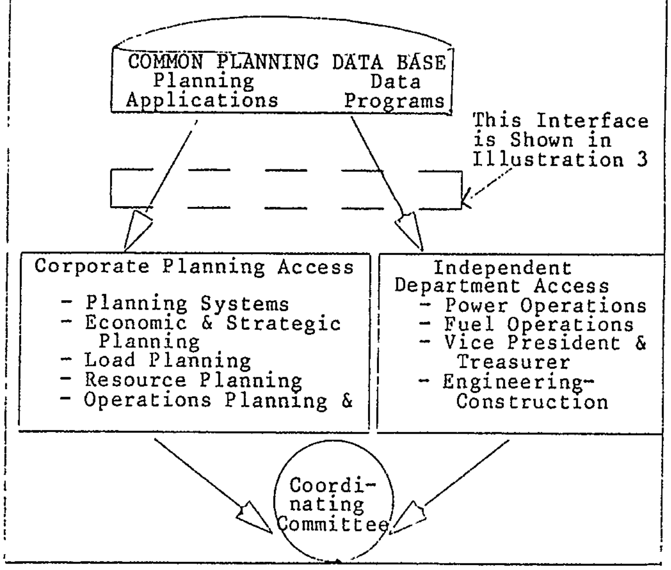
To improve the quality of the information exchange process, it is necessary to specify the flow. This results in the identification of inputs to outputs, a process which can be accomplished best with the systems approach by the individuals involved and the transformation of inputs to outputs. Once this is documented and collected, an overall system flow scheme can be assembled. The visualization of the information flow and the knowledge that some of the data is contained in the computer files (that are shared by a number of application programs) has led us to the consideration of creating a Data Base Management System, DBMS. Although this is not a totally new concept in planning models, this application has some unique aspects that require critical thought and creative designs.

USING A DBMS

We find that a DBMS has an appealing structure, and it guides our thinking about the integration of the corporate planning models. Assume that all relevant planning data that can be quantified are resident on what is called a Common Planning Data Base, CPDB, as shown in Illustration 2.

ILLUSTRATION 2

The Data Base and Its Users



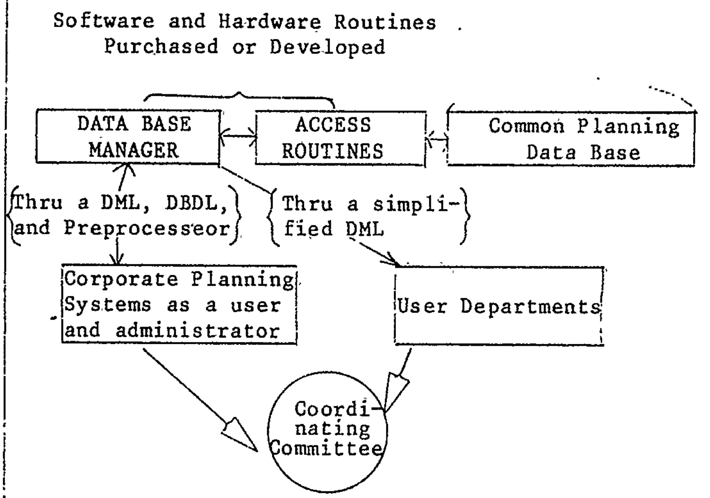
Corporate Planning and other departments have independent access to the data base. They can access both application and planning data; therefore, the system can be used for strategic as well as operational planning, on both a short-term and a long-term basis. Because user groups have the ability to update and change the data, it is essential to monitor and control the activities through a coordinating committee and a technical system. An additional task handled by this group involves file security procedures and controls. A scheme is needed that is evolutionary and that can be improved as the coordinating committee realizes its security function, as well as other specific functions. For example, some effort must be made to strive for the completion of a dictionary of unambiguous names and terms for both programs and variables contained in the data base.

The rationale for using a DBMS is that it provides a simple and flexible approach that does not burden the user with additional technical details or complexities. Evolutionary changes can occur in the system of planning models that evolve slowly, without the need for major remodeling. In addition, a DBMS is expandable because the data structure is independent of the programs. Application programs no longer describe the structure of the common planning data; this is now done through a Data Base Description Language, DBDL, which most users are not expected to know or to utilize. In function, the DBDL is a more sophisticated version of a DATA DIVISION in COBOL or a FORMAT in FORTRAN. It is outside of the user's program and concern. The user must know who to contact and who to consult for help when structural changes are to be made in the data base. The Planning Systems Department has assumed the function of a data base administrator. Simultaneously, Planning Systems will be a user, and all users will be required to know and employ the Data Manipulation Language, DML, which consists of a few commands that are intended to be embedded in the application programs. Normally, however, the user can store and retrieve data without structurally changing the data base because structures have been specified during the initial construction phase in which the DBDL plays a critical role.

Illustration 3 depicts some of the relationships discussed above.

ILLUSTRATION 3

The DBMS Interface Expanded from Illustration 2



Here the DBMS interface is expanded from Illustration 2 and includes the data base manager and access routines to be purchased or developed in-house. The users communicate through a Data Manipulation Language, DML, embedded in their application programs. Planning Systems acts as a user and an administrator - an administrator with responsibilities for the technical system and the human system. The technical system utilizes both DML and DBDL, along with applications programs. Sensitivity to the human system is formally channeled through the coordinating committee, but informal linkages are necessary and important.

THE INTEGRATION OF DBMS CONCEPTS INTO CORPORATE PLANNING SYSTEMS

Because of the relatively simple structure of the Data Manipulation Language, DML, it is not conceptually difficult to embed the DML in the host language of the applications programs, but the task is long and arduous. It requires tracing through each program and supplying the appropriate commands to store and retrieve data. We foresee a gradual building of the data base to ease the pain of this conversion process; furthermore, a few defined functions, containing most of the DML, may greatly simplify this process.

In contrast, structuring the data base is a complex task because of the huge definitional problem and the difficulty in establishing an adequate defining set of relationships. In order to approach the problem in a comprehensive way, one must face a perplexing problem: What basic level of detail is needed? The system philosophy dictates the answer. We wish to gravitate toward a total data base framework with the realization that its structure may never be completely specified. Boulden (1975, p. 68) suggests a data pyramid that rises from a broad base of billions of characters to a pinnacle of a few hundred thousand characters; at the base are transactions and the operational control system, but at the top are strategic planning systems and top management. In the middle is the management control system. It is rare to have all this data on file. We don't, but our problem has a large data base even for the middle and top levels of the pyramid; perhaps, this is due to the need for flexibility. We wish to consider, simultaneously, broad planning needs and independent department needs. This leads to the classification of data according to certain attributes.

Data classification is the major consideration in data base design, and it is fundamental to the definition of the data base. A planner faces an enormous set of information called a total information space; each piece of data is a point in this space that is specified by its dimensions (sometimes referred to as classifications or attributes). Suppose we have a point, say, in the familiar (X,Y) plane; for example, (5,7) is a point in a two-dimensional space that is five units out the X-axis and seven units up the Y-axis. An analogous situation for the typical planner might involve two more meaningful variables such as income statement item, time; a particular point might be 300,000,000 in sales, 1978. Unfortunately, a planner works in a multidimensional world, and this is one of the things that makes his problem so difficult. Total information space is very large because of the large number of data classifications (attributes), but the computerized planning systems simplify the problem by working with a subset of the total information space which is referred to as a data base.

As an example, Meyer (pages 20-21) considers financial planning models as a collection of vectors and matrices; as above, this is two-dimensional. If we consider an income statement, the names of the items on the income statement specify the rows in a matrix form of a data base; the columns can represent time (years). Thus, an income statement for a particular year is drawn from one column. But, we wish to assemble more than one report, so a natural extension involves assigning the matrix rows to items in the accountant's uniform chart of accounts; then, any report may be created by identifying a particular subset of rows in the appropriate columns. Conceptually, projections can be made into the future by adding more columns.

The above concept of a data base is far too restrictive. This is particularly true in our case because we would be forced to completely rebuild our models if we were to use the data base of this form. And, in fact, a two-dimensional (chart of account item, time) data base is far too simple for our needs. As it is, we will be limiting our data base because we consider only variables that are in our existing models. Many other potential planning variables exist. But, for the variables we do have, some important (but not exhaustive) attributes are considered in the questionnaire in Illustration 4.

ILLUSTRATION 4

Information Gathering Questionnaire
For Coordinating Planning Systems

Department ________________
Representative ________________
Location ______ Phone ________

Purpose: The purpose of this questionnaire is to gather information that is essential in obtaining an overall perspective on the planning systems at PGE. It is a first step in constructing a data dictionary.

PART I General

(1) How does your department interact with others in planning, with emphasis upon answering requests of other departments?
(2) Who in your department is responsible for responding to informational requests of other departments?
(3) What are the major planning and modeling activities that go on in your department?
(4) When do the major flurries of activity occur in the planning (budgeting) cycle?
(5) What are the basic information groups (classifications) you supply others and who do you supply these to?
(6) What are the basic information groups (classifications) that others supply to you and who supplies these to you?

Each of these attributes defines a dimension and, quite clearly, we are far beyond a two-dimensional space. We may eventually decide that not all these attributes need to be used; hence, we can reduce the size of our problem. Nevertheless, it is important to consider these classifications and more. The reason is that we may be able to take advantage of special capabilities of DBMS in regard to the ability to describe data structures. If not, we may find that we have far less to gain by going the DBMS route than we initially thought. The questionnaire is an important information-gathering tool in an organization that has a great many semi-independent components in their planning system. It is essential in obtaining an overall perspective on the planning systems at PGE, and it is the first step in constructing a data dictionary.

Fry and Sibley (1976, page 10) summarize the normal functions performed by a data dictionary; these include: storage of the definition; response to interrogation; generation of the data definition for the DMBS; maintenance of statistics on use; generation of procedures for data validation; and aid in security enforcement. Some of these features are attractive, particularly in attempting to coordinate planning information and evaluate the DBMS systems offered by various vendors. For example, we would like to have the following capabilities: allow ad hoc users to browse through the definitions (on or off line) to determine correct data names; permit grouping of element names and creating a new data definition; improve the organization of the data base by examining usage statistics and regrouping the data; generate procedures for input editing and other quality checking; regulate security; create an audit trail for the data changes; and initiate back-out procedures to reinstate data that has been incorrectly updated.

In summary, the data dictionary provides the means of broadcasting definitions to the user community; it contains a precise definition of terms through a narrative explanation of variable names. In addition, several other extremely important features exist that enhance the effective use of a DBMS.

Once a precise definition of terms is established, logical structure of the data can be exploited. We wish to build an accurate and useful model for planning and information needs. As such, it is necessary to characterize the data items and the relations among them that are of interest to the users. Information structuring (the selection of entities and the specification of the relationships between them) is a modeling process with little methodology other than common sense and skill in dealing with the internal politics. In addition, Fry and Sibley (1976, page 17) state that the criteria has not yet been established nor likely to be established soon for selecting the "best" way to structure the information.

But, the user is faced with two decisions: Which data model to utilize (i.e., relational, hierarchical, or network), and how to structure the data using the chosen model. The network data model provides more flexibility than a hierarchical one, and it has experienced wider use than the relational approach. In general, the network model appears to be a logical choice for our financial planning purposes. In regard to the decision about the structure of the data, we intend to implement a phased approach in which information needs are determined, the data are structured in fundamental relationships to satisfy the needs, and we expect restructuring to occur as more of the relationships become apparent and improvements become necessary. The description of the CODASYL DEBMS by Taylor and Frank (1976) shall be used as a guide to structure the data base for planning systems.

In order to show the DBMS structure and its intended use at PGE, a unified example is created and viewed in terms of fundamental concepts and definitions. By using several planning models and variables, we intend to define an elementary structure of selected relationships; once this is done, such a structure can be elaborated. The models to be used are:

(1) Capital Costing Program (CAPCOP model). This program is used for creating capital cost comparisons for generating plants. It uses the levelized annual revenue requirement concept in conjunction with the forecasted investment cost;

(2) Revenue Requirements Model (MINACC model). This model determines the levelized annual revenue requirements for capital investments. The total revenues required to pay the costs of capital investments are computed for the purpose of comparing alternatives. This program analyzes plants and property with both unit retirement and disbursed retirement characteristics. The basic financial assumptions of the Company are included in this model on a theoretical basis;

(3) Financial Model. This is a comprehensive model of financial accounting and regulatory processes of the Company. Pro forma financial statements and reports are based upon corporate assumptions, revenue forecasts, expenses, and capital expenditures.

These programs are independent of one another when actually executed on the computer; but, they do share some common variables. For example, the Revenue Requirements model and the Financial model both use the AFDC, Allowance for Funds During Construction, and Cash Flows for projects under construction. Furthermore, total cash flows are used as input to the Capital Costing program along with the LARR, Levelized Annual Revenue Requirements percentage; the LARR percentage is an output of the Revenue Requirements model and becomes an input to the Capital Costing program. The Capital Costing program multiplies the LARR percentage times the total Cash Flow, resulting in an LARR in dollar terms.

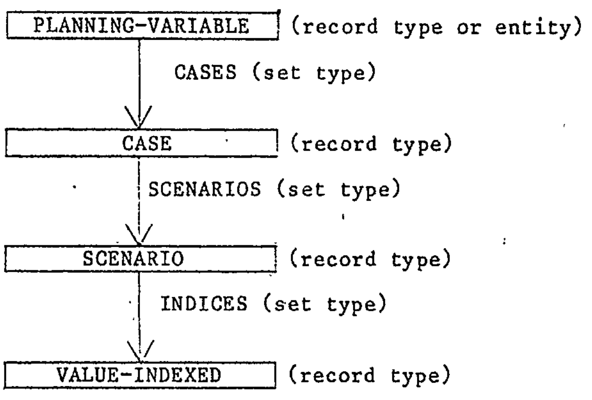
Because of these types of interrelationships, which exist on a much larger scale for the corporate portfolio of models, it has become necessary to structure these relationships in a coordinated and consistent way. It is necessary to have an agreed-upon starting point, a base, and an agreed-upon way to handle and keep track of changes over time. A DBMS has some attractive features that may be vital in organizing some of the informational flow. Most importantly, a DBMS concept forces us to look at our problems in an orderly way.

Application programs may "CALL" or "PUT" data through an embedded DML. The schema, as depicted in Illustration 5, defines the data base; and Planning Systems have the task of informing the system of the information structures through the DBDL. Thus, a crude DBMS can be constructed for Corporate Planning at PGE and short-run improvements can be made in the technical system.

As we look further ahead, the data base design process appears to be evolutionary. The problem of identifying all relevant attributes still remains. What we have discussed is merely a building block. Many real problems exist; for example, different users may have different names for the same attribute. Simultaneously, different views of the attributes exist. Resolution of these types of problems require relentless attention, and it is a human activity. Hopefully, the coordinating committee concept will be of great value in this regard. Nevertheless, a good data dictionary can catalogue various characteristics and produce useful statistics. The name, length, type, the data source, and the date of use, and so forth are maintained in most data dictionaries.

ILLUSTRATION 5

A Basic Hierarchical Data Structure Diagram For A Planning Schema



*These names will be shortened to a maximum of six characters.

A data-structured diagram in Illustration 6 is an extension of the one in Illustration 5, and it illustrates some issues to be resolved in future more sophisticated data base structures for planning models. These structures will be specified with the DBDL.

The hierarchy in Illustration 5 exemplifies a one-to-many relationship but Illustration 6 includes a many-to-many relationship in regard to MANAGEMENT-REPORT. A subset of planning variables is used in a particular management report and each report contains several variables. When the latter condition arises, the CODASYL rules of unique ownership are violated, Taylor and Frank (1976, page 72); a solution to the problem requires the creation of a new record type, say, LINE-NUMBER, which is used to link PLANNING-VARIABLE and MANAGEMENT-REPORT. The items within these three record types, as a collection, form a unique identification for each piece of data and satisfy the unique ownership requirement. Another addition shown in Illustration 6 is DEFINITIONS. A result of these elaborations is a richer data structure; this generates ideas for future improvements in the DBMS for corporate planning. Record types can contain additional items to indicate such things as the department the report goes to, who is responsible, or what variables are considered under the control of a particular manager. These and other possibilities should be entertained. The rationale is that a more elaborate data structure enables the user to take advantage of the DBMS ancillary facilities such as Data Dictionary or Report Writer systems.

THE PLANNING DATA BASE SPECIFICATIONS IN THE DATA BASE DESCRIPTION LANGUAGE (DBDL)

In this section, we shall outline the general requirements to be specified in the DBDL; the overall structure is captured in the PLANNING schema. Although access to the data base is accomplished through a sub-schema that controls user access to a subset of the data base, a sub-schema is designed here, initially, to permit user access to the whole data base. There are four major sections in the schema: (1) an introductory clause, (2) one or more AREA clauses, (3) one or more RECORD clauses, and (4) one or more SET clauses.

Some of these sections of the schema become formalities for this application in its early stages. For example, the introductory clause is used to name the data base and to state certain security requirements; but, the security within Corporate Planning is not a serious problem in regard to the system of planning models. Likewise, an AREA, which corresponds to a file, is expected to be moderately large in this case, but we intend to use just a few files at most. In addition, the strategy of building the data base gradually over time eliminates the design problem of specifying all possible AREAS. Such an implementation procedure allows us to avoid some of the pitfalls described by Ackoff (1967) of management misinformation systems. Even though the introductory clause and AREA clause are expected to be brief, the RECORD and SET clauses are somewhat longer and a preliminary set of instructions for the data structure in Illustration 5 is shown in Illustration 7.

ILLUSTRATION 6

An Elaboration of the Basic Data Structure Diagram for a Planning Schema

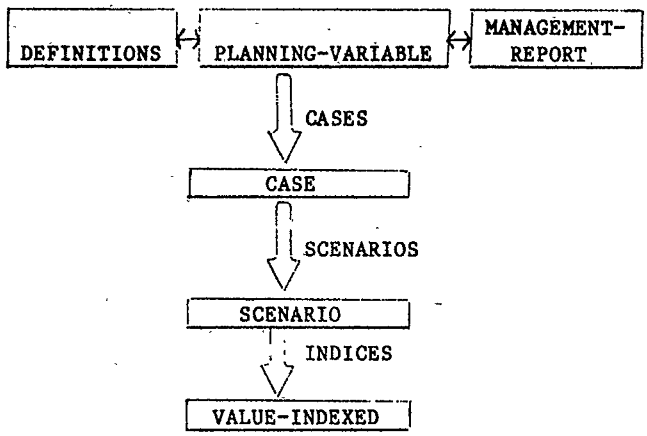


ILLUSTRATION 7

Schema For Seedtest

```
SCHEMA NAME IS SEEDTEST
PRIVACY LOCK IS BLU
AREA NAME IS CPFINAN SIZE IS 10 PAGES

RECORD NAME IS PLNVAR
  LOCATION MODE IS CALC USING VARNAM
     WITHIN CPFINAN
VARNAM TYPE IS CHARACTER 6
NVALS TYPE IS FIXED

.
.
.

SET NAME IS CASES MODE IS CHAIN
  ORDER IS FIRST
  OWNER IS PLNVAR
  MEMBER IS CASE
    SET SELECTION IS LOCATION MODE OF OWNER

.
.
.
```

The DBDL fixes certain structural properties, in addition to those mentioned above, at the time the definitions are made in the schema or sub-schema. This is done prior to the time programs are run in order to improve the execution efficiency. Run-time interpretation generally reduces efficiency; hence record formats and accessing strategies are often specified before processing begins (Taylor and Frank, 1976, page 89). So, in addition to linking records through sets, it is important to state the storage MODE and the selection ORDER. The MODE determines the physical structure between records in a set and, perhaps, the chain mode is the simplest means of creating a linked list. As such, it provides a mechanism for tracing through the data structure hierarchy and choosing the appropriate value for the planning variable that is related to the cases and scenarios. The ORDER is also important because the user can specify whether new occurrences are to be placed first, last, next or prior; order may also be sorted on a data item within the member occurrence.

The LOCATION MODE VIA is of particular importance in our application because it enables us to achieve an efficient record clustering for moving directly down the hierarchy in Illustration 5. One should note, however, that more explicit control over record placement can be attained by using the CALC or DIRECT modes. Because of the initial structure of our design, the VIA MODE will be very useful for planning data. Although the features mentioned above do not make up the complete set that is available in some expensive DBMS systems, they appear to satisfy our needs. By following this path, we maintain flexibility and don't get locked in during the learning phase.

THE DATA MANIPULATION LANGUAGE (DML) WITHIN THE APPLICATION PROGRAMS

As stated in the introduction to this paper, PGE and others in the utility industry possess a substantial technical system. There a large number of complicated models that are in use. Some examples include: the 20-year demand model, the dwelling type model, the production cost model, the energy reserve planning model, and so forth. Embedding a DML into this multicomponent structure for the purpose of coordinating the common planning data cannot be accomplished in a short time span for a large number of variables. Moreover, it would be practically impossible for Planning Systems to educate and convince all users to go through a conversion process that might require a great many program changes due to the insertion of DML commands in existing programs. As a result, it was decided to offer users a few defined functions that are designed to be available to all FORTRAN users. These functions give the users the ability to "GET", "PUT" and "MODIFY"; they contain the DML commands which most users will not need to know. The availability of these functions and information concerning the data as it becomes available will be disseminated through the coordinating committee, perhaps, as slowly as one variable at a time. This approach, using defined functions was far from obvious. In a very creative way, it did solve an inordinately difficult problem of using the DML effectively and efficiently. A sample function is given in Illustration 8.

CONCLUSIONS

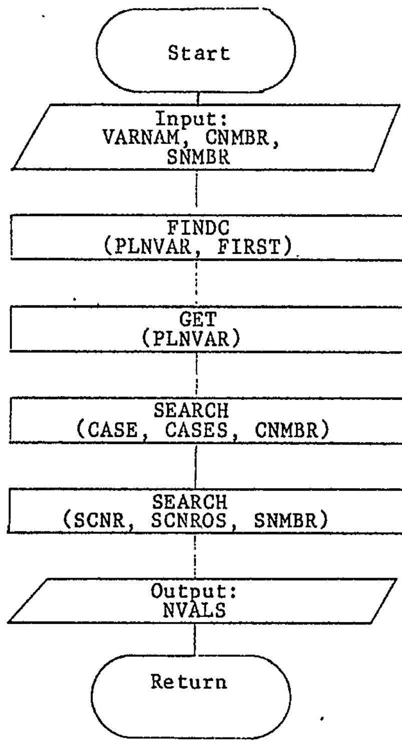
As utilities struggle to do business in a volatile regulatory climate, a number of uncertainties about costs and revenues make the task of corporate planning a difficult one. A multitude of planning models are used by PGE; they transform data to information at the operating level, and they produce some by-product information that is used as input to more aggregate planning models such as the financial model. Running these models has become an integral part of the organizational activities; nevertheless, problems occur in maintaining accurate and timely data files. The problem has been further aggravated by the absence of a repository for planning data that is common to the needs of several departments within divisions. A DBMS has been presented as a systematic approach to help alleviate some of the planning difficulties on the technical side; the concept of a coordinating committee was introduced as an integral part of the system but the human system received little attention in this paper.

An idea central to DBMS is that of isolating the definition of the data structure and the user programs. Thus, the need for format specifications is eliminated for variables appearing in the data base. We have defined a few simple functions that enable the program users to access the data base in a simple way. The DML embedded in these functions is invisible to most users; however, Planning Systems is expected to be knowledgeable in both the DML and the DBDL. The DBDL is used to define the structure of the data base and it requires cooperation between Planning Systems and user departments. The initial data structure is specified in this paper, but the eventual structure is expected to evolve slowly over time; and, as it does, more advanced features of the DBMS may be utilized. An important aspect of this approach is that the system of planning models may undergo evolutionary changes without completely starting from scratch each time and rebuilding the entire system. As a result, less time and energy is expended on the technical system while more of the needed emphasis can be allocated to the human system.

ILLUSTRATION 8

Flowchart for Subroutine

LOCVAR



BIBILIOGRAPHY

1. Ackoff, Russell L. "Management Misinformation Systems," Management Science, Vol. 14, No. 4, Dec. 1967.

2. Barney, Lee and Warren Winter. Corporate Planning Systems, Portland General Electric Company Report, February 15, 1978.

3. Barney, Lee and Warren Winter. Recommendations for a Corporate Planning System, Portland General Electric Company Report, May 1978.

4. Boulden, James B. Computer-Assisted Planning Systems, McGraw-Hill Book Co., New York, 1975.

5. Fry, James P. and Edgar H. Sibley. "Evolution of Data-Base Management Systems," Computing Surveys, Vol. 8, No. 1, March 1976.

6. Hofstede, G. (paper appearing in Quantitative Methods in Budgeting, Tilanus, C. B. editor), Martinus Nigtioff Social Sciences Division, Netherlands, 1976.

7. Meyer, Henry I. Corporate Financial Planning Models, John Wiley and Sons, New York, 1977.

8. Taylor, Robert W. and Randall L. Frank. "CODASYL Data-Base Management Systems," Computing Surveys, Vol. 8, No. 1, March 1976.