DISTRICT OFFICE NETWORK SIMULATOR

COMPUTER SIMULATION OF THE CHARACTERISTICS OF THE SOCIAL SECURITY ADMINISTRATION'S DISTRICT OFFICE OPERATIONS

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Introduction

The Social Security Administration administers three types of insurance programs--Retirement and Survivors Insurance, Disability Insurance, and Health Insurance. It is the responsibility of the Social Security Administration to assure that everyone eligible by law to receive benefits does so in the shortest time after filing, in the right amount, and with least cost to the public. The organizational instrument that deals with the public, both in assigning account numbers to new workers and in accepting claims from those individuals applying for benefits, is the local SSA district office. Currently, there are over 800 district offices throughout the continental United States, Hawaii, and Puerto Rico. The management of this network of offices from the SSA Central Office in Baltimore has presented unique situations that should benefit from the application of OR/MS techniques. It has also been desirable to study the District Office Network, since it is the initial work input node for the entire Administration. Of the over 50,000 employees in the Social Security Administration, approximately half are located in the District Office Network. The District Office Network Simulator is designed to predict the result of changes in district office policy, impending legislation, and/or work processing procedures over the entire network of district offices. The simulator is composed of several submodels designed to utilize the results of operations of single representative offices as a basis for network prediction. The submodels generate environmental and staffing conditions of the district offices and impose workloads upon these offices based on observations made in a selected set of offices. Then, utilizing a technique recently developed, the simulator predicts the results of proposed changes in policy or procedure. This technique is described in a paper entitled "Use of a Factor Analysis Technique to Identify Influential Demographic and Office Characteristics that Affect Operations to Select a Representative Sample of Offices that Will be Used to Predict Results of Change in a Multi-Office National Social Insurance System," written by Barbara Haskins.

Structure of the Simulation

The District Office Network Simulator is designed to run on the IBM 360/65 computer. The present version of the model is composed of three sequentially executed subprograms: the Input Control Program, the District Office Simulation Model, and the Output Control Program.

The Input Control Program generates a report summarizing the service area and personnel characteristics and computes workload for each district office to be used in a particular simulation run. This subprogram is written in Common Business Oriented Language (COBOL). Input to this program is in files called QCARDS and CARDIP. CARDIP consists of title, objective and modification cards. After all cards have been read into core storage of the computer, it is determined from the objective card which district offices are to be simulated. The characteristics for these offices are obtained from the QCARDS file. Any modifications to be made are then performed. The program then manipulates the modified QCARDS information to produce a printed report of district office characteristics (SIMRPT) as well as a set of initialization data for each office (DINPUT) which makes up the input file for the District Office Simulation Model.

The Input Control Program uses predictors to generate the different workload items. The predictors are linear estimators of an average level of the workload items. A normal random number generator aids in producing workloads that are in the range of the means of the workload items. The model includes predictors for such workload items as claims, inquiries, telephone calls and beneficiary notices to name a few. Daily workload figures are generated since the District Office Simulation Model is run for a day at a time. The Input Control Program then transforms the input from external sources into quantities and forms that can be used by the District Office Simulation Program.

The Output Control Program, also written in COBOL, generates a report describing the simulations of the individual offices and how the network of district offices would act if all offices were similarly simulated. The Output Control Program accomplishes this by reading a tape generated automatically by the GPSS system after all the offices are simulated and then, using the coefficients determined by the technique described earlier, computes network output.

The District Office Simulation Model simulates the operations of a district office. It is the largest of the subprograms and is written in the

General Purpose Simulation System (GPSS). In this model transactions representing people arrive in the system, wait in line for service, are interviewed, and leave the district office. The claims or actions generated by them are tallied and folder controlled, adjudicated, reviewed, and are finally cleared from the office. This model operates on these transactions as if it were performing a list of services for a particular claimant. For each claimant, there is a list of processes to be carried out before the claim or action leaves the office. Therefore, facilities, GPSS entities representing people performing services or carrying out these processes, are identified by the services or duties they perform. The main activities of the office personnel or facilities include interviewing, receiving and documenting evidence, and performing clerical functions. All types of personnel talk on the telephone, take breaks, eat lunch and attend training sessions.

The policy and procedures represented by the simulator are consistent with the Social Security Laws regulating the administration of its insurance programs. Actions are carried out in proper sequence according to claims processing rules.

Functioning of the Simulator

The model is based on the time unit of one minute. The operation of the district office is duplicated as far as productive work is concerned. No administrative personnel are represented. However, administrative actions are made based on stored decision tables. Arrivals are generated at the beginning of each fifteen minute period and are staggered throughout the interval to give the appearance of randomness. The number of arrivals generated is a function of the workload and an arrival distribution function which gives the percent of arrivals that will come into the office during a particular fifteen minute interval. This arrival distribution is in the form of a function definition card and is itself a function of the time of day. The arrivals enter the office when it opens for the day.

The office is made up of six storage units, one for each type of personnel. The capacity of any storage is determined by the number of that type of personnel the office has on its staff. Each storage then has the same number of facilities as its capacity. The transactions travel from storage to storage depending on the type of service needed.

Each transaction has a set of characteristics which are reflected in parameters. The parameters contain such information as type of action, the number of the facility to which this particular transaction has been assigned, creation date, evidence required and the date that each piece of evidence is due.

As it is in the district office, certain activities have priority in the simulator. Activities that contribute only to the development of a case have lowest priority and consequently transactions that are in the development stage on claims can only seize a facility. Interviews have to be taken as they arrive; therefore, transactions representing interviews are allowed to preempt with a low priority. Telephones must be answered; therefore, transactions representing telephone calls are priority preempts. Parallel to the systems of transactions representing workload items is the system of transactions representing activities such as breaks, lunch, training sessions. These transactions at special times are allowed to preempt the other activities or set logic switches which allow the other transactions to bypass unavailable facilities.

The service times are generated by function definition statements. There is a function definition statement for each activity that is a service. The amount of time needed for breaks, lunch and training is set by a save-value initialization card at the beginning of the simulation for any particular office. These save-value initialization cards are a part of the file DINPUT. Therefore, the District Office Simulation Model is a representation of the operations of a district office. In fact, any particular district office can be simulated. This model is designed so that those characteristics which can vary from one office to another office are left as variables. The values for these variables are passed from the input control program to the District Office Simulation Model and the variables keep these values throughout the running of that model.

Obtaining Required Data For The Simulator

The capability of determining which characteristics vary from office to office is the result of research and analysis of district office data collected. One data collection was conducted in a sample study of offices and the other collected data from all the offices in the network. Both of these experiments will be discussed in detail.

The first data collection was conducted in 44 district offices and two types of data were collected--data collected on forms and 44 study representative reports. The form data included such information as:

1. Start and stop times for interviews and work processing;
2. Type of interviews and claims filed;
3. Types and sources of evidence brought in;
4. Paths of work in district offices;
5. Types and sources of telephone calls;
6. Information on out-of-office work;
7. Length of time work remains in the office.

Each of the study representative reports contained a description of the workflow as it existed in that office during the study. From these descriptions, the workflow of items going through the office was mapped out. The data was analyzed and estimates of service times, arrival curves and workload distributions were determined.

All the analyses proceed in a similar manner. Observations for one item are examined to see if the differences from office to office are significant, or if the differences can be explained. If the differences are due to randomness, the least squares estimates of the means and standard deviations are used.

The second data collection which was conducted in all the offices of the network gathered information on a questionnaire. The questionnaire was divided into two parts. The first part requested information concerning work policy, procedures to alleviate

queueing problems and general information about work groups and assignments. The second part requested demographic information including population figures, literacy rates, and the economic posture of the service area and information about the personnel such as grade, experience, education and turnover rates. This information was to serve three purposes. First, this data was used in the analysis of the data of the first study in trying to explain differences from office to office. Such an analysis of the number of claims filed in a district revealed that certain service area characteristics accounted for differences in observations. Using a multivariate technique, usually multiple regression, predictors such as linear estimators were developed and coded directly into the computer program. These predictors are of the type that generates workload in the Input Control Program.

Secondly, the information was put on a basic data file which would be accessed by the simulator. Therefore, when any group of district offices is simulated, the Input Control Program will read from the basic data file all the characteristics for each office needed to compute workload, set all the decision gates, and determine the staffing of the office.

Third, the questionnaire data will be used in the development of the technique which will allow the simulator to compute network results from individual office outputs. The essence of this technique is to determine from the output variables, like queue statistics, processing time, and other indicators of district service, another set of variables which are uncorrelated, and which are linear combinations of the original set. Given the new set of variables, an attempt will be made to select offices which will be representative of all the offices when we are dealing with these particular output variables. To do this, of course, it is necessary to examine the characteristics of all the offices. This will be done by looking at certain characteristics on the basic data file.

Summary

There is a continuous effort to refine the predictors and mathematical models in the simulator. Although the models began as mean value models, research has made it possible to replace these models with predictors dependant on office characteristics or with distributions that more realistically replicate district office phenomena. At present, arrival data is being compared with exponential distributions and interview times are being compared to the gamma distribution. Also a function generating reneges based on queue length is being developed. At the present, the function seems to be parobolic in nature. The research in this area will probably continue until the extra effort doesn't improve the accuracy of the model.

At the present time the model is in the testing stage. Specifically, tests are being performed on the District Office Simulator Model to determine the stability of the model. The testing procedures include changing random number seeds to determine the ranges of output and changing characteristics that are known to affect output so that it can be determined if variance is independent of the level of the output. The results of the testing to some extent will determine the operational procedures of this model.

A test case is being designed to be presented to the ultimate users of the simulator. Since the project has been in existence for three years, a run showing the capability of this test should convince management of the district office network of the simulator's applicability. The detailed report, one of the features of the simulator, should go a long way in selling the simulator to management.