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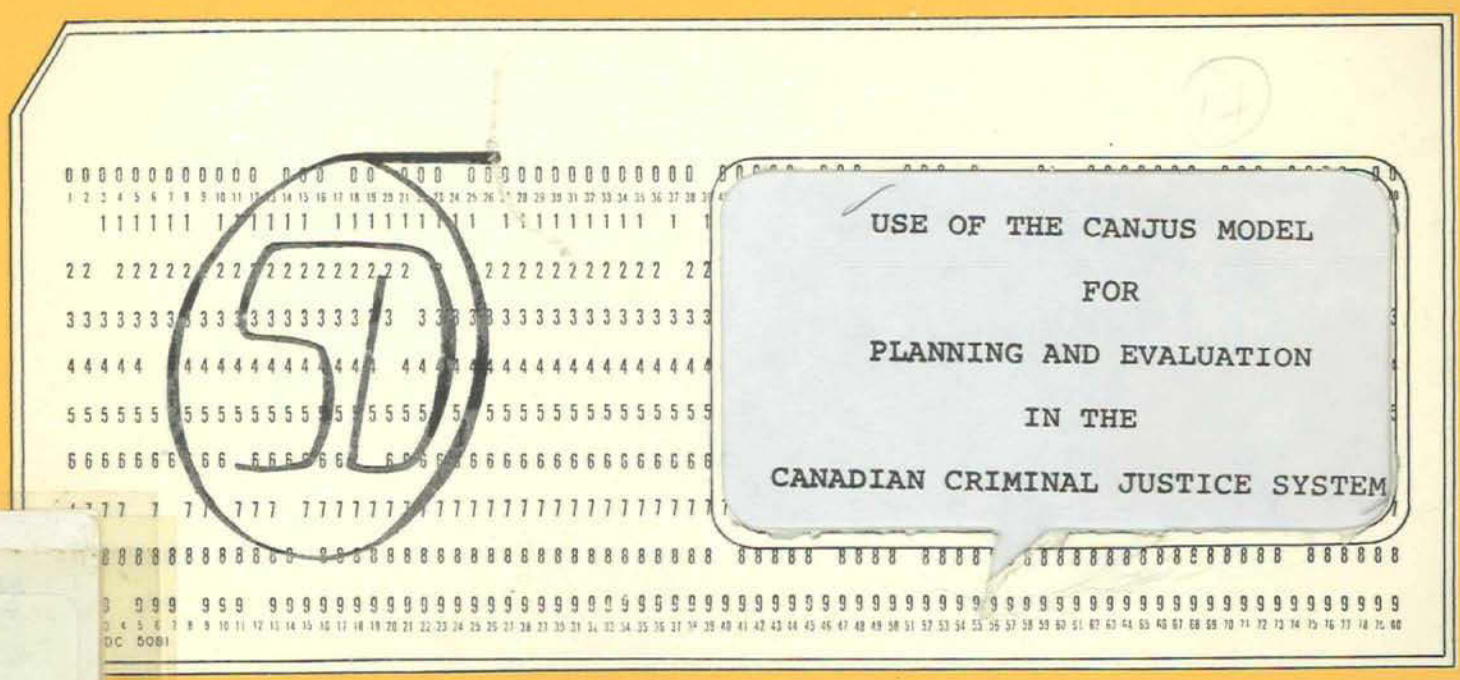

STATISTICS DIVISION

Report #5/73

MINISTRY OF THE SOLICITOR GENERAL

and

SECRETARIAT OF TREASURY BOARD

December, 1973

A CANJUS PROJECT REPORT

#2

USE OF THE CANJUS MODEL FOR PLANNING AND EVALUATION IN THE CANADIAN CRIMINAL JUSTICE SYSTEM

by

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with

CANJUS Project Team

CANJUS PROJECT

The CANJUS project is a project being undertaken by the Statistics Division of the Ministry of the Solicitor General with the assistance of the Planning Branch of the Treasury Board Secretariat. The objective of the project is to develop a comprehensive simulation model of the Canadian Criminal Justice system to 1) develop a basic quantitative description of that system, 2) assist in the planning of policy and program changes by agencies involved in the administration of that system, and 3) serve as the foundation for future analyses and research on the system. The project team at the present time consists of (alphabetically) Neil Carroll, Gordon Cassidy, Elizabeth Cole, Carolyn Fuller, George Hopkinson, Brian Johnson, Lynda Peach, and John Townesend. Not all persons have been committed to the project full-time, but all have made a contribution, without which, some of the many CANJUS publications would not have been possible.

DISCLAIMER

The views expressed are those of the authors and do not necessarily represent those of the Ministry of the Solicitor General or the Secretariat of Treasury Board.

ACKNOWLEDGEMENT

This report would not have been possible without the full co-operation of the Judicial Division of Statistics Canada and many of the agencies, federal, provincial and local, involved in the administration of criminal justice in Canada. In particular, Ms. Francine Bertrand, Ms Jane Angus, Ms Sharon Card, and Mr. Marvin Ross of Statistics Canada, and their staff were most helpful in explaining tables and obtaining extra information where necessary. Responsibility for the manuscript, including any errors or omissions, must, however, remain with the authors.

I. INTRODUCTION

The administration of the criminal justice system in Canada is divided among at least three levels of government, federal, provincial and municipal. Not only is the administration divided among these levels of government, but in addition, different agencies in the different levels of government are responsible for different subsystems or components of the criminal justice system. The actual quantitative contribution of the federal government in terms of resources to the administration of justice in Canada is undetermined, but it is known that the total expenditures in the criminal justice system exceed one billion dollars annually in Canada, and that the federal direct contribution of this amount is substantial (see reference (7) for more detail). The contribution by the federal government comes not only in line expenditures and conditional grants but also in unconditional and indirect support of many of the different subsystems of the criminal justice system (the after-care agencies, supported in large part by the Ministry of the Solicitor General is an example here). As Canada has increased in population and society is becoming increasingly complex, more and more dissatisfaction has been expressed, not simply about the level of crime and

criminality in Canada, but also about the administration of justice in Canada, the effectiveness and efficien y of its delivery, as well as the equity of the present process.

Before doing any detailed economic, sociological or more generally analytic studies of the criminal justice system, it is necessary to gain some basic information about the system in terms of how it is being operated, by whom and to whom is it delivering justice. This has been an area in which perennially there has been very little known anywhere in North America, the United States as well as Canada, and it is in this direction that this paper has its emphasis. If there is nothing known about the system itself, except perhaps line budget descriptions of expenditures and independent national reports produced for components of the criminal justice system, it becomes very difficult to do long- or short-range planning of the administration of justice or to make budget allocations based on combinations of need and the resources available to the different parts of the administration of the criminal justice system. What is needed then is an organization of information about the system which will completely quantitatively describe it.

Traditionally, information has been kept about the criminal justice system at different levels and

places and about different parts of the system, but the information is rarely aggregated or cross-tabulated with other information which may be available.

One approach which is currently being used to organize information about such systems is the "system analytic" approach. Essentially, this consists of identifying the stages in a process, the resources which are being dedicated to these stages, and developing an organized description of these resources and the process itself. Although this might be thought of as solely the responsibility of those line departments which would administer the service, too often the line departments are involved in a form of crisis management where they really have little time or resources for further in-depth analysis and planning of the service itself. However, this is indeed changing in some line departments, such as the Ministry of the Solicitor General, perhaps primarily because of the increasing importance of careful distribution of resources available in these departments. In addition, this lack of such analysis in line agencies has meant that Statistics Canada has not been able to up-date their information because of both a lack of resources and the importance of other priorities. Consequently, our knowledge in terms of

a quantitative description of the criminal justice system at this point is very limited compared to what it could be.

The systems model presented here is clearly only a first step in a beginning systems analysis of the Canadian criminal justice system. As we have noted, before improving the operation of the administration of justice, it is necessary to describe the way in which that system at present operates, particularly at a federal level. The CANJUS model is based on the linear systems model JUSSIM developed by Blumstein, Belkin and Glass, at Carnegie-Mellon University (see references (1) and (2)). The model provides not only a description of the flows of persons within the system, but also allows the user to incorporate cost and man-power data for the different stages in the criminal justice system. In concept then, the CANJUS simulation model is quite similar to models of traffic flow in urban areas. In these computer models the analyst uses the computer to simulate cars travelling on streets in an urban network. Thus, the model is basically a device for keeping track of flows within a well defined system. The following is a brief description of the CANJUS simulation model.

The basic inputs to the CANJUS model consist of the following information:

1) A set of crime types, into which the population being processed by the criminal justice system is divided. At the present time, there are twenty-one different crime types which are used in the CANJUS simulation model (see reference (6) for more detail).

2) A definition of stages in the criminal justice system. The stages at present being used for processing persons in the criminal justice system in Canada are at a very aggregate level and include such stages as one for each of the five different types of court (judge and jury, judge without jury, magistrate with consent, magistrate absolute and superior court) stages for charging an individual as well as stages for different types of sentences, institutions and parole. The number of stages in the criminal justice system in the CANJUS model totals approximately thirty-five at the present time. Figure 1 gives a description of the different stages at present found in the CANJUS model.

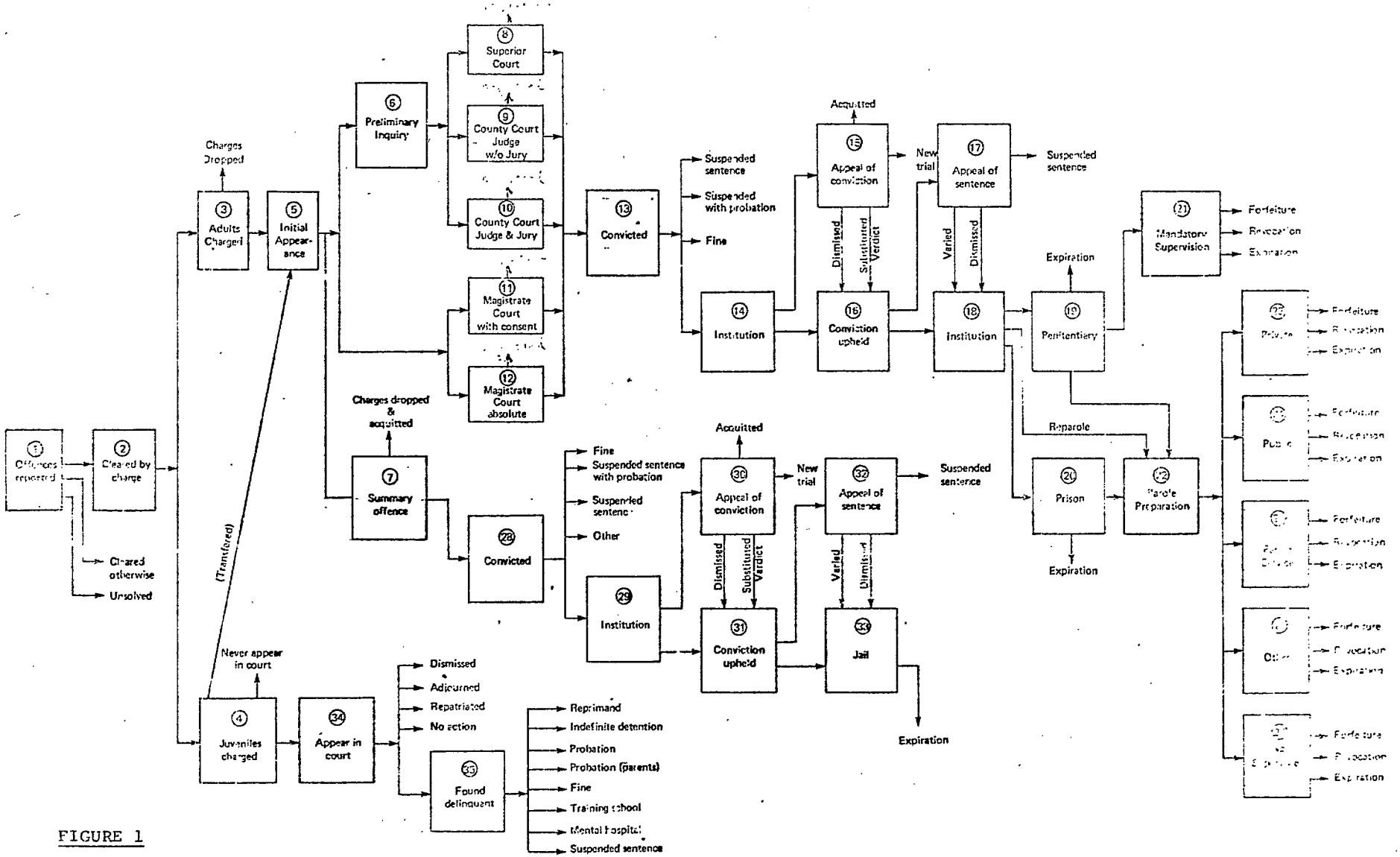


FIGURE 1

Flow diagram: Canadian Criminal Justice System

3) A set of flow rates of persons between the different stages in the system. These flow rates, within any particular crime type, describe, for example, the number of persons who, given that they were charged with an indictable offence, went to the five different types of courts, or of the number of persons convicted, the number who received a suspended sentence, who received suspended probation, who received a fine, and who received an institutional commitment. By using the data on the different subsystems of the C.C.J.S. and making certain assumptions (see (4) for more detail) it is possible to compute the proportion of persons flowing between the different stages shown in Figure 1.

4) A set of resources, including police, judges, prosecuting attorneys, correctional officers and probation officers and a set of costs of these resources per unit time. For an explanation of the problems and assumptions made in obtaining these costs see reference (7).

These resources are then applied to the different stages where they participate in the administration of the criminal justice system (see (6) for more detail).

5) A set of workloads or times to process one person charged with one crime type in the different stages of the system. For example, a homicide might take four judge-hours to process in a judge and jury court. Reference (5) further details the problems encountered and assumptions used in deriving these workloads.

Given these different inputs, the model takes the number of persons coming into a stage, multiplies it by the unit workload for that crime type and multiplies that by the unit resource cost to obtain the total cost for processing that number of persons in that crime type in that stage of the system. The model can then aggregate the total man-hours required over all of the system, or in particular parts of the system. It can also compute the total cost and resources required in parts of the system by crime type or in the total system. Given that the user

changes all or part of these quantities, or the actual crime rate to be processed by the system, the model then computes the changes in:

i) cost,

ii) man-power requirements,

iii) workloads,

which can be disaggregated by stage, crime type, subsystem or in a number of other ways. The set of outputs can vary from very summary information on the flows in the criminal justice system to very detailed information on the criminal justice system. The outputs from the CANJUS model include:

1) flows through each stage in the system,

2) costs at each stage in the system,

3) total resource cost (for example, a police officer may be used in both the charging process as well as the trial. Thus, his total resource commitment must be summed for both of these stages),

4) the resource workloads,

5) the total resources required.

All of these outputs are a function of crime type and can disaggregate that variable if so required.

As we have already mentioned, the present size of the model is approximately thirty-five stages with twenty-one different crime types. The flow information which is being used is for flows in eight of the provinces of Canada and was derived from the 1970 Statistics Canada reports, as well as some special outputs obtained from Statistics Canada. At the present time, we are obtaining the flows for the provinces of Quebec and Alberta in order to make the information more complete in the CANJUS model.

The cost information has been obtained from line agency reports and public accounts for the corrections system as well as parts of the police and court system. More court information is being obtained through provincial reports and public accounts where available, as well as by survey (see (5) and (7) for more detail). The workloads which have been used have primarily been international workloads for other places in North America and Europe. The penitentiary system does, however, have Canadian workloads

(in terms of number of years sentenced within different crime types), and workloads for the police and courts systems are being obtained from those agencies where available and where not, by survey (see reference (5)).

In the next section we will outline the different uses which might be made of the CANJUS model itself and in the last section propose further developments of the model, both in general and in specific sub-parts.

II. USE OF CANJUS MODEL

It is important to remember that the CANJUS model is not a 'black box', but simply one method or perspective for looking at the criminal justice system in Canada. The model itself is relatively unsophisticated. It makes computations based on the information fed in about flows, costs and workloads on the Canadian criminal justice system on the different stages of the system by crime type. There is no question that the model will be an important tool for planning and evaluation and as a source of general information on the Canadian criminal justice system. However, an important component in the use of the CANJUS model is the actual process of the development of the model itself.

The process of development of the model is essentially that process wherein the structure of the model is determined (number of stages, crime types, detail of inforamtion on various parts of the criminal justice system) and better information about the criminal justice system is provided. There are a number of areas where the actual process of development of the model may be very useful:

1) It assists in further definition of problem areas which were extremely nebulous to begin with, but as more and more information is gathered, become more and more concrete, at least quantitatively. This is, for example, true in the area of private agency participation in the administration of justice in Canada. The private policing, as well as private after-care agencies are significant components of expenditures of criminal justice in Canada. This then has stimulated further quantitative investigation in these areas, with possible addition of this information at some time to a general CANJUS description.

2) The process begins to describe areas where present information is inadequate or incompatible as it is prepared by the different agencies administering or supplying information to or about the Canadian criminal justice system. This has generated reports on costs, workloads and flows in the Canadian criminal justice system and some

suggestions as to ways these might be made more compatible and more complete in the future. (See references (4), (5) and (7) for more detail.)

3) The CANJUS model provides in its development a first pass at describing many of the parts of the Canadian criminal justice system. By beginning this quantitative description, it is the first step to a further description and analysis of these particular subsystems of the Canadian criminal justice system.

4) The model, in using such comprehensive information on the criminal justice system, not only from different levels of government but also from different agencies, provides an initial organization of this information so that it can be used for other modelling as well as for analysis of planning and policy decisions. The input system then for the CANJUS model becomes a major component of its output in terms of other modelling or

analysis activities which may take place on the Canadian criminal justice system. (See reference (8) for further information.)

It is important to realize that the model as it exists simply makes computations based on the changes which the user may put to the system. In the operation of a CANJUS run the user's role is to create a test case to compare with the base case already stored (presently using 1970 data). The user, sitting at a terminal, is asked a sequence of questions about what changes he wants to make. Each of these questions is an entry gate to a phase of the model itself.

A separate phase is provided for changing each of the following parameters:

1) branching ratios,
2) absolute flows,
3) unit workloads,
4) annual resource availability,
5) resource unit cost.

In another phase the user specifies the output tables to be displayed. The output tables present

calculated results on flows, costs, workloads and resource requirements for the base case, the test case and absolute and percentage changes in going to the test case. Thus, by making changes of the basic parameters of the model, the user enables the model to compute total costs, manpower and workload impact of these changes on the total criminal justice system.

By using the model at a very macro level (which is its present level) the activity in the Canadian criminal justice system, both of persons flowing through the system as well as administration of the process itself, can be monitored. The model can, using the interactive phase described above, be used to explore at least the direction of expected change, given that certain policy or program changes are hypothesized by the user. For example, an increased crime rate can be input to the model and the impact throughout the total system can be examined.

As the model is further developed, it becomes clear that areas in the model are weaker than others, either in terms of data which is available or the quality of the information which is being used. At this point, better information can be obtained about these stages, or, sub-models can be developed using either the JUSSIM methodology of Blumstein or other modelling methodologies. Thus, the

CANJUS model serves in these cases as a base point for further analysis of parts of the criminal justice system. As more detailed analyses are required for policy or planning decisions, the CANJUS model can be used as the beginning step for developments of causal analyses of various parts of the system (for example, relating conviction rates to change in crime rate). It can also be used as the first step in the development of indicators for measuring efficiency or effectiveness for different subsystems of the criminal justice system.

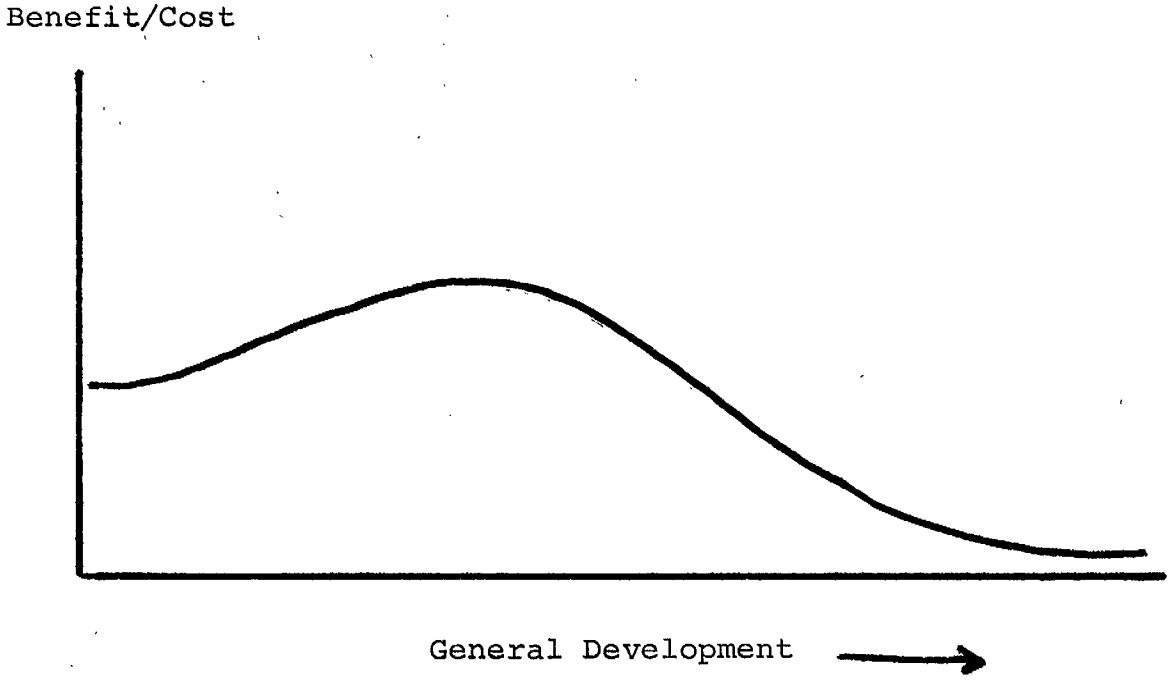
These, then, are some of the uses of the process of development of the model and most importantly of the model in its final form to examine the impact of proposed policy and program changes in various parts of the criminal justice system.

III. FUTURE DEVELOPMENT

It is important to realize that the CANJUS model with its thirty-five stages and twenty-one crime types, as it exists at present, with data on the eight provinces in Canada, is almost too complex for any one user to comprehend. When a user is asked to sit down and make changes he feels might occur or will occur in various parts of the system, he must select not only those stages where he wishes to make those changes in costs, workloads or flows, but also he must select the specific crime types to be changed. In other words, he must select one of approximately (twenty-one times thirty-five times three) twenty-two hundred possibilities for change in the system. As the model is expanded to include more stages or a further break-down of crime types, this simply multiplies the number of cases which must be considered. It is hypothesized, therefore, that in terms of the general development of the CANJUS model, the benefit cost of that development looks like the graph of Figure 2. However, we would hypothesize that we are still to the left of the maximum peak in the graph of Figure 2.

FIGURE 2

FURTHER DISAGGREGATION OF PRESENT CANJUS



Given that the model exists then at the level described in sections I as a description of the Canadian criminal justice system, it is extremely important to keep its input system up-dated and to up-date the information which is included in the model. At the present time, flows are being obtained for the provinces in Canada by examining Statistics Canada as well as other reports which are available. Costs are being obtained for the court sub-systems (costs have already been obtained for police and penitentiary subsystems) and workloads are being obtained for the police and court subsystems, primarily by surveying, in the court subsystem.

Once the peak in Figure 2 has been reached, it is important to use the CANJUS model as a focus or telescope on the criminal justice system for narrowing in on those areas which require further analysis, either using simualtion or some other quantitative technique. These further analyses can explore the limitations of the CANJUS model and at the same time improve the information on the Canadian criminal justice system, even at the macro CANJUS level, as well as addressing policy relevant questions.

Another possible development of the model is to get a further geographic breakdown, possibly by urban and non-urban areas in Canada.

Two important major structural changes to the CANJUS model are to:

a) include recidivism, since the model in its present form is linear. It is hypothesized this will take three to four man-months at a fairly senior level, not only to input the necessary information but also to re-orient the use and other information in the model to this new development.

b) include a crime generation front-end to the model which allows one to generate virgin crime in Canada as a function of other social and economic characteristics. (This disaggregation does not necessarily continue throughout the total model.)

The proposed developments for the next four month period (December, 1973 - April, 1974) would include (a) and (b) above with responsibility for them lying mainly with the Solicitor General, aided as necessary by the Treasury Board Secretariat.

An additional development by the Treasury Board Secretariat during this period is the study of native offenders using the CANJUS structure as a beginning. This may include disaggregation of the flows along native offenders and other categories as well as other comparative analyses. In addition, the following progress is anticipated:

c) full development of the CANJUS Input Identity System - Statistic Co-ordination Section, Statistics Division, Ministry of the Solicitor General;

d) better workload information with respect to Courts and Police - C.J.S. Management Section, Statistics Division, M.S.G.;

e) better cost information on Police and Courts - joint effort;

f) disaggregation of the model into eight provincial models using provincial costs, flows and workloads - C.J.S. Management Section, Statistics Division, M.S.G;

g) incorporation of data on flows from the provinces of Quebec and Alberta - Statistics Division, Ministry of the Solicitor General.

The result of incorporating this information would not only be three reports dealing with (c), (d), (e) and (f) but also an up-dated preliminary description. Naturally, reports

would also be made on the front end of the model and the recidivism portion. This description may also contain a slightly further disaggregation of data, particularly toward the end of the system. Thus, we hope to have more detailed information of the Corrections Subsystem.

In all of these developments it is extremely important to keep the information closely linked to executives and policy-planners in the different line departments in the administration of the criminal justice system in Canada. Without communicating the content of the model and its possible uses to these people, it becomes a vacuous academic exercise. Thus, it is extremely important to open these lines of communication to the relevent authorities within line agencies at all levels of government so that this approach or method of examining the criminal justice system in Canada can be used as a base point for perhaps more rational policy planning and analysis of the Canadian criminal justice system.

With this in mind, the CANJUS Presentation (using either overhead projector or 35 mm. slides) is continually up-dated. The model has been presented thus far to executive and ministerial groups at both the federal and provincial levels as well as to training schools and academic audiences. It is only by keeping all of these groups involved and obtaining their feedback that we can hope to make the model development of as much benefit as possible.

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LIST OF REPORTS

STATISTICS DIVISION Working Papers	TITLE	CANJUS PROJECT REPORTS
1/73	Organization of the Statistics Division Volume I	
2/73	A Preliminary Description of the Canadian Criminal Justice System Volume I	
3/73	Organization of Quantitative Approaches to the Canadian Criminal	
4/73	A Preliminary Description of the Canadian Criminal Justice System Volume II	#1
5/73	Use of the CANJUS Model for Planning and Evaluation in the Canadian Criminal Justice System	#2
6/73	Data Incompatibilities for Penitentiary Admissions and Parole Violations	#3
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8/73	Prediction of Penitentiary Population Volume I	#5
9/73	Information Systems Report on Workloads in the Canadian Criminal Justice System: Problems, Recommendations and Directions for Future Development	#6
10/73	The CANJUS Input Identity System	#7
11/73	Parole Expenditures and Workloads in Canada	#8