USERS' GUIDE TO ECONOMIC FORECASTING SYSTEMS FOR

STATE POLICY DEVELOPMENT

W. R. Maki, R. J. Dorf and R. W. Lichty
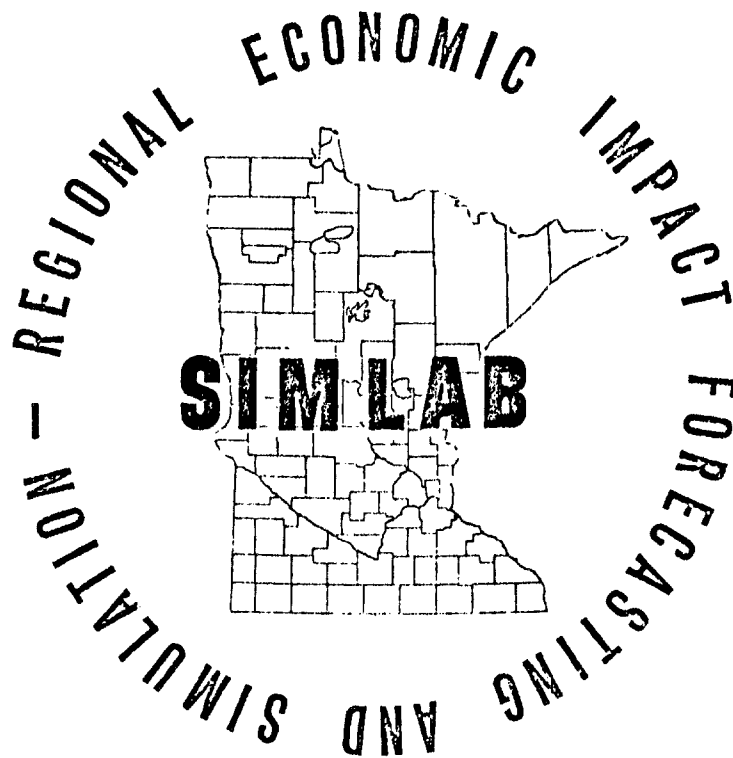
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FOR STATE POLICY DEVELOPMENT [1]

W. R. Maki, R. J. Dorf and R. W. Lichty [2]

Over the past 20 years, regional scientists in government and the univer-

sities have participated in the development of an increasing number of state-

level and state-wide forecasting and policy evaluation studies. The list of

articles and books published on the results of these undertakings is in the

hundreds and growing by the score each year.[3] Activity in this area has

increased to the point where the most prestigious of the private economic

forecasters, including Chase Econometrics and Data Resources, now actively

seek clients for an expanding range of state and substate economic forecasting

services. Active competition now exists among university researchers, govern-

mental staffs and private forecasting firms for the dollars spent for state

policy impact analysis and forecasting services. This competition has greatly

increased the options available to state officials when seeking such services,

but the complexities of the selection process have also increased.

Critical decisions are involved in selecting among the competing systems.

The needed information must be specified, its relative worth must be determined, and a set of performance criteria for evaluating the information must be acquired. However, the development of a reasonable set of performance standards for choosing between forcasting systems has proved an exceedingly complex, if not confusing, issue for most decision makers. Technical arguments concerning accuracy, validity, reliability, and consistency of alternative forecast series are difficult to evaluate. This is further complicated by the lack of literature on the operational nature of different forecasting systems.

The use of information in decision making is a prime consideration in selecting a regional forecasting system. A state finance department, for example, depends on accurate quarterly forecasts of state revenues and cash flows and balances. A detailed industry accounting of gross state product is unnecessary and, indeed, counter-productive in providing the needed revenue forecasts. On the other hand, assessment of the regional economic impacts of extensive mining development or expansion of agriculture and related activities requires a detailed accounting of changes in industry output, employment and income associated with assumed or projected investment and production. The importance of the information in meeting resource management objectives and responsibilities thus influences the selection of the forecasting system.

This paper is an attempt to piece together the current status of operational state-level and state-wide, i.e., regional, forecasting systems in the United States and Canada. The focus is on the operational use and design of ongoing state and regional forecasting systems and how they are developing. A Minnesota economic forecasting system is presented, finally, to highlight issues in the use of such a system for economic impact analysis and forecasting.

Regional Forecasting Systems

Regional forecasting systems are available in a majority of the states

and provinces of the United States and Canada (table 1). The development

and maintenance of these systems occurs generally within academic institutions.

Several of the systems were developed and housed in state agencies. Most of

the users of operational systems are in state government.

In operational terms, the forecasting systems are grouped into two general

classes -- econometric and input-output (table 2). This classification is in

terms of core models and it is not exclusive in that some operational fore-

casting systems use a composite of both types of models. The econometric

models that are operational at the state level are used primarily for revenue

and expenditure forecasting. The input-output models are used to evaluate

overall economic response to development or major policy changes. Econometric

models which were developed initially to deal with overall economic response

to policy changes have been abandoned or reformulated into input-output type

systems. Segregation of forecasting responsibilities between the two systems

stems from their operational characteristics.

The main operational differences between the two types of core models

result from differing abilities to deal with time and a wide variety of econo-

mic issues and problems. The econometric models deal readily with discrete

time intervals of short duration while input-output models are not time sensi-

tive. In tax revenue and expenditure management, the need is for forecasts

that are time specific, e.g., quarterly or yearly, or which make the econometric-

type model the predominant choice. For large-scale growth and development

questions, the many-faceted input-output systems have proved more flexible,

especially in dealing with resource problems phrased in non-monetary terms.

Development of a fully operational regional forecasting system is an

evolutionary process (fig. 1). State agency staff or university researchers

typically start in a more or less random fashion, seldom from a preconceived

Table 1. Development and Use Status and Selected Attributes of Regional Forecasting Systems, U.S. and Canada, 1976 (preliminary).

State or Province	Forecasting System — Available Now	Planned	Provider Author	Institution Academic	Other	Operational (in system)	User Academic	Other	Core Model — Econometric Revenue	Other	Input-Output Single Region	Multi-Region	Region State	Sub-State	Modular Construction	Data base Primary	Secondary
Alabama	No	?				-											
Alaska	Yes		Haring 1/			No		X									
Arizona	Yes				X	Yes		X			X		X	X	Yes	X	X
	Yes		Martin 1/	X		No	X				X		X		No	X	X
Arkansas	No	Yes	Tu 1/			No			X				X				X
California	Yes		Lofting	X	X	Yes	X	X	X	X	X	X	X	X	Yes	X	X
	Yes		Hall 2/	X		No	X			X				X	No		X
	Yes		Martin 2/	X		No											
Colorado	Yes		Miernyk	X		No	X				X			X	No	X	
Connecticut	No	?				-											
Delaware	No	?				-											
Florida	No	Yes				-											
Georgia	Yes		Shaffer	X	X	Yes	X	X			X		X	X	Yes	X	X
	Yes		Ratajczak	X	X	Yes	X	X	X	X	X		X		No		X
Hawaii	Yes		Artle 1/	X		Yes							X			X	
Idaho	Yes		Peterson 1/	X		No	X										
Illinois	No	?			X	-				•	X		X		No	X	X
Indiana	No	?				-											
Iowa	Yes		Barnard 1/	X		Yes	X	X				X	X		No		X
	Yes		Barnard	X		Yes		X	X				X				
Kansas	Yes		Emerson 1/	X		Yes	X	X					X	X	Yes	X	X
	No			X		No				X			X		No		
Kentucky	Yes		Charlesworth 1/	X		No	X		/			X	X		No		X
Louisiana	No	?				-											
Maine	No	?				-											
Maryland	Yes		Harris	X		No	X				X		X		No		X
Massachusetts	Yes		Bell	X		No	X			X			X		No		X
Michigan	Yes			X		No				X			X		No		
Minnesota	Yes		Maki	X		Yes	X	X				X	X	X	Yes		X
	No	Yes	Post 1/		X	-		X	X				X		No		X
	No		Hoppe 1/	X		-	X				X			X	No	X	X
	Yes		Hughes	X		No	X				X			X	No	X	
Mississippi	Yes		Tyner	X		No	X				X		X				
Missouri	Yes		Harmeston	X		No	X				X		X		No		X
	Yes		Markland 2/	X		Yes	X			X	X			X	No		X
Montana	Yes		Hoff 1/	X		No	X			X	X		X		No	X	X
Nebraska	Yes		Lamphear	X		Yes	X				X		X		No	X	
Nevada	No	?				-											
New Hampshire	No	?				-											
New Jersey	Yes		James 2/	X		Yes				X			X		No		
New Mexico	Yes		Blumenfeld 1/	X		No	X						X		No		
New York	Yes		1/			Yes		X	X						No		
North Carolina	No	?				-											
North Dakota	Yes		Hertagaard	X		Yes	X				X			X	No		
Ohio	Yes		L'Esperance	X	X	Yes		X	X				X		No		
Oklahoma	Yes		Dockson	X		Yes	X				X			X	Yes	X	X
Oregon	Yes		Youmens 2/	X	X	?	X	X			X			X	No	X	
Pennsylvania	Yes		Isard	X		Yes	X				X			X	No		X
	Yes		Glickman	X		Yes	X			X				X	No		X
	Yes		Gamble	X		No	X				X			X	No	X	
Rhode Island	No	?				-											
South Carolina	Yes		Laurent	X		Yes					X			X	No		X
South Dakota	No	Yes	Thompson	X		No						X	X		Yes		
Tennessee	Yes		Moore 2/	X		Yes	X				X		X		No	X	
Texas	Yes		Grubb		X	Yes		X			X	X	X	X	Yes	X	
	No	Yes	Halloway		X	No		X			X	X	X	X	Yes	X	
	Yes		Adams	X		Yes		X			X			X	No	X	
	Yes		Fritsch 2/	X		Yes		X			X			X	No	X	
	Yes		George 2/	X		Yes		X			X			X	No	X	
	Yes		Hawkins	X		Yes		X			X			X	No	X	
	Yes		Murrell 2/	X		Yes		X			X			X	No	X	
	Yes		Osborn 2/	X		Yes		X			X			X	No	X	
	Yes		Stern	X		Yes		X			X			X	No	X	
Utah	Yes		Bradley	X		No											
Vermont	No	?				-											
Virginia	No	?				-											
Washington	Yes		Borque	X	X	Yes	X	X			X			X	No	X	
West Virginia	Yes		Miernyk	X		Yes	X				X			X	Yes	X	
Wisconsin	Yes		DNR		X	No		X			X			X	No	X	
	Yes		DRE 1/		X	No		X	X						No		X
Wyoming	Yes		Matson	X		Yes	X			X				X	No		
Puerto Rico	No	?				-											
Northeast U.S.	Yes		Crow	X		Yes	X			X							
Alberta	No	?				-											
British Columbia	Yes																
Manitoba	Yes			X	X	No	X	X			X		X		No	X	
	Yes		MacMillan	X		Yes	X				X			X	Yes	X	
	Yes		Tung	X		Yes	X				X			X	Yes	X	
Nova Scotia	Yes		Czamanski	X		Yes	X							X	No	X	
Ontario	No	?				-											
Quebec	No	?				-											
Saskatchewan	Yes		Pinota	X		No					X		X		No		

1/ Documentation not available.

2/ Multiple authors.

Table 2. Comparison of Selected Attributes of Econometric and Input-Output Models in Regional Forecasting Systems.

Econometric Model	Input-Output Model
1. Derived from Keynesian model	1. Derived from Walrasian model
2. Exogenous variables obtained from national income and product accounts	2. Exogenous variables obtained from national income and product accounts and/or national input-output accounts.
3. Endogenous variables form regional income and product accounts	3. Endogenous variables form regional input-output accounts; derived variables form regional income and product accounts.
4. "Basic" economic sectors intervene between exogenous (national) variables and total (regional) income and product to "drive" regional economy.	4. Final demand sectors (including exports) "drive" production system to yield industry gross outputs.
5. Aggregate economic (e.g., total employment) variables are related economically to form regional model for deriving endogenous variables	5. Disaggregated economic (i.e., industry gross input) varialbes are related technologically to form tables of technical coefficients and output "multipliers" for deriving total effects of given demand changes.
6. Regression analysis is used to derive coefficients for forecasting model	6. Mathematical solution (matrix inversion) is used to derive output "multipliers" for impact analysis
7. Statistical approach is best for short-term forecasting and business cycle analysis	7. Mathematical approach is best for simulating economy-wide effects of projected (or assumed) changes in specified ecogenous variables
8. Estimation of model parameters and confidence intervals requires extended time series or cross-sectional data (either discrete or continuous series)	8. Model parameters are derived from other studies; tests of statistical reliability are not available directly from computational procedures.
9. Spatial variables are typically excluded; if included, however, they may significantly affect results, i.e., results may be sensitive to spatial to spatial consideration	9. Spatial differentiation of industry demands and gross output variables is feasible in a multi-region representation of inter-industry relationships
10. Non-economic aaccounts are difficult to incorporate into model	10. Non-economic accounts readily interface input-output accounts in overall forecasting system
11. Constrained optimization is not readily incorporated into model	11. Constrained optimization procedures readily interface input-output procedures in overall forecasting system
12. Time and effort involved in model implementation is slight for simple model, large for complex model	12. Input-output tables based on primary data are costly to prepare; use of secondary data sources greatly reduces set-up costs, but, also reduces perceived reliability of model for impact analysis and forecasting
13. Model construction is highly technical but requires minimal understanding of regional economic structure and activity	13. Model construction (and use) reveals important technical and economic linkages and develops understanding of regional economic structure and activity
14. An operational econometric model, including exogenous variables, represents a complete regional forecasting system	14. An operational input-output model, including exogenous variables, represents a static economy and, hence, is only part of a regional forcasting system
15. Add-on features require re-computation of econometric model	15. Add-on features (i.e., additional modules) readily interface an input-output model

INTERACTIVE COMPUTER CONTROL PROGRAM (SIM LAB)

D

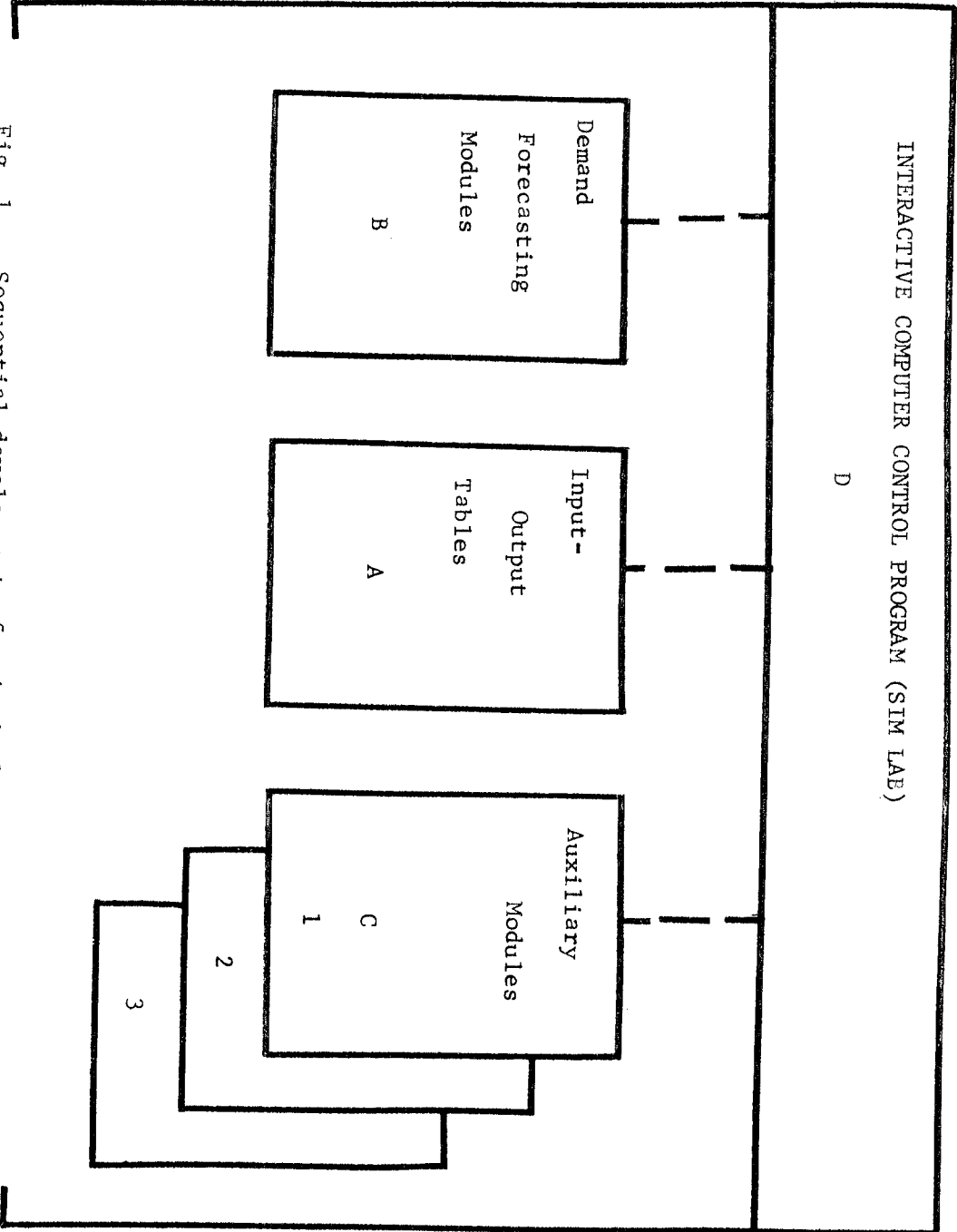| Demand Forecasting Modules | Input- Output Tables | Auxiliary Modules |
| B | A | C 1 2 3 |

Fig. 1.   Sequential development of principal components of an economic forecasting system for state policy development.

total system plan. Nontheless, the development process usually is sequential
in that the input-output model is developed first, followed by the forecast-
ing modules, a series of auxiliary modules and, most important for operational
use, an interactive computer control module. This process implies, of course,
that any input-output model by itself is a low-return investment as an infor-
mation source. Only when the input-output model is used in conjunction with
other models or components, the potential of a truly flexible forecasting and
impact analysis system is achieved. However, the high cost of the core model
and auxiliary modules has deterred development of completely operational input-
output systems, thus resulting in widely varying levels of development and
operation of regional forecasting systems from state to state.

Forecast Information Users

Using the State of Minnesota as an example, certain information users
in the public sector are identified and their management functions are listed
(table 3). The listing of management functions serves as a partial surrogate
for a listing of information needs.[4]

Economic forecasts of one type or another are prepared and used in pro-
jects of each one of the 16 specified State departments and agencies. The
functional areas in which the projects are located range from central fiscal
and administrative services to general support activities. However, a large
number of the projects are concentrated in several specific areas: for example,
almost nine percent deal with natural resource management. In each of these

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[4] Management functions are given in each edition of the "functional analy-
sis" prepared by the Bureau of Program Management and Budget Coordination
in the Minnesota Department of Administration.

Table 3. Number of programs of selected state departments and agencies in specified functional areas, Minnesota, 1972-75. 1/

Functional Areas	Administration	Agriculture	Commerce	Econ. Development	Education	Energy Agency	Envir. Qual. Coun.	Employment Serv.	Finance	Health	Natural Resources	Pollution Con. Agency	Public Welfare	Revenue	State Plan. Agency	Transportation 2/	Water Res. Board	Other	Total
Central Fiscal & Administra. Serv.																			
1. Personnel management	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	29	31
2. Revenue administration	0	0	1	0	0	0	0	0	0	0	0	0	0	28	0	0	0	4	33
3. Financial management	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	6	11
4. State planning	5	0	0	0	0	0	0	0	2	0	0	0	0	0	9	0	0	3	19
·State policy develop. & plan.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	1	9
·State govern. plan. & oper.	4	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	4	10
5. State property services	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	25
6. Communication services	13	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	17
7. Services to local government	2	0	1	0	0	0	0	0	0	0	0	0	0	1	11	4	0	7	26
Protection of Persons & Property																			
8. Safety programs	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	28	31
9. Protective services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	30
10. Services to local governments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	9
Transportation																			
11. Transportation planning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0	3	10
12. System construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	6	9
13. System operation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	8
14. Services to local government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	4
Individual Social Development																			
15. Equal opportunity for indiv.	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	17	19
16. Legal administration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12
17. Financial assistance prog.	0	0	0	0	2	0	0	1	0	0	0	0	4	0	0	0	0	26	33
18. Comm. based rehabilitation	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	6	18
19. Institutional care	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	12	18
20. Program plan. develop. &assist.	0	0	0	0	0	0	0	0	0	0	0	0	26	0	2	0	0	16	44
Environmental Management																			
21. Natural resources management	1	0	0	0	0	7	4	0	0	0	53	15	0	0	4	0	1	4	89
·Energy studies and analysis	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7
·Land use studies and analysis	1	0	0	0	0	0	0	0	0	0	0	10	0	0	1	0	0	1	13
·Environ. qual. studies & anal.	0	0	0	0	0	0	4	0	0	0	8	5	0	0	3	0	0	1	21
22. Fish & wildlife management	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	16
23. Services to local government	1	1	0	0	0	0	0	0	0	0	0	9	2	0	0	2	0	1	18
Health Services																			
24. Medical treat. services	0	0	0	0	0	0	0	0	0	22	0	0	1	0	2	0	0	3	28
25. Health information serv.	0	0	0	0	0	0	0	0	0	8	0	0	0	0	1	0	0	1	10
·Health plan. & research	0	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	5
·Health statist. & pub. info.	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	1	5
26. Health standards	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	18	32
27. Services to local government	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
Business and Industry																			
28. Promotion of bus. & indus.	0	4	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	4	20
29. Protection of bus. & indus.	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	31
30. Business & indust. inform.	0	2	1	10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	14
·Info. about bus. & industry	0	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
·Info. & assist. for bus. & ind.	0	2	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	7
31. Services to local government	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
Educational Opportunities																			
32. Pre-school, prim. & sec. educ.	0	0	0	0	18	0	0	0	0	0	0	0	0	4	0	0	0	4	26
33. Post secondary education	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	50	51
34. Public interest educ. prog.	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	28	32
Consumer Protection																			
35. Inst. & finan. organ. & reg.	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
36. Regulat. of prod. & standards	1	9	7	0	0	0	0	0	0	0	0	0	1	1	1	0	0	22	42
37. Busi. & industry regulations	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	17
38. Services to local government	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Manpower Develop. & Admin.																			
39. Provision of vocat. skills	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	10	28
40. Employment information	0	0	0	0	2	0	0	9	0	0	0	0	0	0	0	0	0	6	17
·Manpower plan. & info. serv.	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	0	0	2	7
41. Labor relations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
General Support	2	4	6	1	5	0	0	1	1	9	6	2	12	1	1	1	0	69	121
Total	46	33	33	26	51	7	4	17	10	58	90	20	69	41	31	14	2	435	1,014

1/ 3rd Functional Analysis. The Analysis and Description of the Activities Representing the Primary Purposes for Which the Executive Branch of State Government is Working. Compiled by the Department of Administration, Bureau of Program Management and Budget Coordination, State of Minnesota, 1976.

areas, forecasts are keyed (as in the national forecasting systems) to population and labor force projections which, in Minnesota, are prepared in the Office of the State Demographer.[5/]

A focus on information use draws attention to the need for a forecasting system which relates data to decisions. Data lacks value as information without an intervening capability for analysis and interpretation. An information system includes the three related entities -- the data system, the forecasting system, and the information user.

The forecasting system, like the data system, starts with concept building. Most forecast data systems are based on statistical series built from business reports. The initial concept for these data systems originated from, or is related to, legislation, not economic theory. In the forecasting system, its development relates to both the data system --imperfect as it is-- and the information user. A forecasting model -- statistical and/or mathematical -- is built to operationalize the forecast concept. The model then is fitted and tested as a forecasting tool. Only after these steps are completed is the system operational in the sense that it provides reliable forecast output for the information user.

Along with a functional analysis of government, an input-output based forecasting system has been developed in Minnesota. The two independent, but related, efforts are brought together in an examination of specific information needs in state government and the use of the Minnesota regional

5/   Minnesota Population Projections: 1975-2000, November 1975 and
     Minnesota Labor Force Projections, July 1976; State Planning Agency
     Division of Development Planning, 101 Capitol Square Bldg., St. Paul,
     MN 53701.

economic impact forecasting system in meeting the perceived information needs (table 4).

The Minnesota forecasting system is composed of all four operational elements described earlier (table 5). The computer interactive control module in this sytem is represented by the Minnesota Regional Development Simulation Laboratory -- in short, SIMLAB. A two-region matrix of 95 sectors each is used as the core input-output module. A multi-sector demand forecasting module is linked to the two region input-output tables and other operational modules -- a total of nine core and auxiliary modules. These nine modules are listed with the key operational variables used in each module. It is these modules that provide the primary economic impact forecast series for use in operational and developmental decisions within state agencies.

Detailed analysis of selected projects shows considerable expenditures for basic information acquisition and utilization. A major portion of the total expenditures was for operational, rather than developmental, data and forecasts.

Most agencies have some forecasting needs that are short and time-specific while others operate in a long-term perspective. Those agencies that have the short-term horizon are almost totally concerned with decisions affecting ongoing programs while those that deal with policy development have a non-specific time horizon. While these are not mutually exclusive conditions, one system could not meet all forecasting needs of all departments or agencies. Nor does the level of agency activity mean that an economic impact analysis and forecasting is or is not justified. The listing of the modules in SIMLAB in relation to perceived project information needs and the relation of each project to forecasting system development is presented, therefore, as a guide to potential interaction between forecasting system and information user in certain functional areas of state government, as illustrated by the

Table 4. Listing of selected department and agency projects in specified functional areas, by estimated actual cost and possible relation to socio-economic information system, Minnesota, 1972-75.

No.	Project [1] Title	Department of Agency [2]	Actual Costs (in $1000)	Demand Forecasting Modules — Module Construction — Regional: In-put	Exp. mkt.	In-vest	Other	In-come	Em-ploy.	Auxiliary Modules: Lab. For.	Pop-ula-se hold	Hou-se hold	Fis-cal	Eco-log.	Inter-active Con-cept Pro-gram Dev.	Fore-cast Analysis and Inter-pret.	Fore-cast Out-put
4.01	Planning Information Base	SPA	133				U	U	U	U	U	U	U			P	U
4.02	State/Local/Regional Policy Development	SPA	334	U	U	U	U	U	U	U	U	U	U	U	U	P	U
4.03	Issue Analysis	SPA	348	U	U	U	U	U	U	U	U	U	U	U	U	P	U
4.04	State Development Planning	SPA	200	U	U	U	U	U	U	U	U	U	U	U	U	P	U
4.05	Human Resources Planning	SPA	172 [4]	U		U	U	U	U	U	U	U	U	U	U	P	U
4.06	Commission on Minnesota's Future	Other	144 [4]	U		U	U	U	P	U	U	U	U	U	U	P	U
4.07	Population Forecasting	SPA	89 [5]	U		U	U	U	U	U	U	U	U	U	U	P	U
4.08	Rural Development Council	SPA	92	U		U	U	U	U	U	U	U	U	U	U	P,U	U
4.09	Constitution Study Commission	SPA															U
4.10	Financial Research and Development	Adm.	25 [4]	U													U
6.01	State/University Computer Projects	Fin.	795 [4]														U
6.02	Minn. Analysis and Planning System (MAPS)	Adm.	604		P		P	P	P	P				P			U
6.03	Minnesota Educ. Computing Consortium (MAPS)	Adm.	89 [4]														U
7.01	Intergovernmental Services	Educ.	2,494 [4]														U
7.02	Technical Assistance	Adm.	718														U
11.01	Transportation Systems Planning	SPA	587														U
11.02	Information and Education	Trans.	295	U		P,U	P,U	U	U	U	U	U	P,U	P	P		U
21.01	Forecasting Future Energy Supplies,	DNR	3,108 [4]	P,U		U	U	P	P	U			P,U	P	P	P,U	U
21.02	Dev. & Main. of Cur. Stat. on Energy Flows	Energy	267 [4]	P,U		U	U	P	P	U				P	P	P	U
21.03	Demand, Need, and Analyzing Impacts	Energy	87 [5]	P,U	P,U	U	U	P	P	U	U	U	U	P,U	P	P,U	U
21.04	Prep. & Updating of Energy Cons. & Alloc. Plan	Energy	185 [5]	U	U	U	U	P	P	U	U	U	U	P	P	P	U
21.05	Research into Alt. Sources of Fuel	Energy	3 [5]	U	U	U	U	P	P	U	U	U	U	P	P	P	U
21.06	Criteria of Need for New Energy Facilities	Energy	471 [5]	U	U	U	U	U	U	U	U	U	U	P	P	P	U
21.07	State Land Use Planning	SPA	336	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.08	Land Use Planning	DNR	343	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.09	Water and Related Land Res. Planning	DNR	1,058 [6]	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.10	Forest Inventory Surveys and Studies	DNR	343	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.11	Pollution Studies and Investigations	DNR	105 [6]	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.12	Planning & Environmental Services	DNR	413	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.13	Planning and Research	PCA	578 [6]	U	U	U	U	U	U	U	U	U	U	P,U	P	P	U
21.14	Copper-Nickel Study	SPA	94	U	P,U	U	U	U	U	U	U	U	U	P,U	P	P,U	U
21.15	Environmental Systems Planning	SPA	462	U		U	U	U	U	U	U	U	U	P	P	P	U
21.16	Special Environmental Studies	SPA	389 [6]	U		U	U	U	U	U	U	U	U	P	P	P	U
21.17	Critical Areas Planning	EQC	72	U		U	U	U	U	U	U	U	U	P	P	P	U
21.18	Environmental Quality Council Adm.	EQC	225	U		U	U	U	U	U	U	U	U	P,U	P	P	U
21.19	Power Plant Studies	EQC	447	U		U	U	U	U	U	U	U	U	P,U	P	P	U
23.01	Solid Waste Resource Recovery	PCA	2,879	U		U	U	U	U	U	U	U	U	P,U	P	P	U
23.02	Comprehensive Envir. Cons. & Dev. Plans	Other	84 [6]	U		U	U	U	P	U	U	P	P,U	P,U	P	P,U	U
23.03	Minneapolis Library Envir./Info. Center	Adm.	100														U
25.01	Comprehensive Health Planning	SPA	925			U	U	U	U	U	P	U					U
25.02	Statistical Services	Health	464								P						U
25.03	Vital Record Services	Health	627								P						U
30.01	Econ. Anal. of Govt. Dept./Agencies	Econ. Dev.	40	U	U	U	U	U	U	U			U	U	U	P,U	U
30.02	Programs and Proposals	Econ. Dev.	50	U		U	U	U	U	U				U	U		U
30.03	Econ. & Soc. Data for Mass Media and Public	Econ. Dev.	23	U	U	U	U	U	U	U			U	U	U	P,U	U
30.04	Ind., Libr., Stud., Travel, & Pub.	Econ. Dev.	185	P,U	P,U	U	U	U	U	U			U	U	U		U
30.05	Econ. Data & Anal. for State Exec. & Legis.	Econ. Dev.	191	P,U	P,U	P,U	U	U	U	U			U	U	U		U
30.06	Branches and Congr. Delegations	SPA	22	U		U	U	U	U	U			U	U	U		U
30.07	Community & Industry Profiling	Agr.	196	P	P	P	P	P	P	P			P	P	P		U
30.08	Econ. & Market Data for Mfg. Interests	Agr.	42	P	P	P	P	P	P	P			P	P	P		U
30.09	Grain Transit Study	Econ. Dev.	246	U	U	U	U	U	U	U			U	U	U		U
31.01	Community Econ. Dev. Counseling	Econ. Dev.					P									P	U

[1] First two digits of numbering system correspond with functional area listing in table 3.

[2] Actual cost reported for 1972-73 and 1974-75 periods.

[3] Elements of economic forecasting system are identified in table 5. Letters refer to provider (P) and user (U) of specified data, concept, or element.

[4] Activity began in FY1974.

[5] No fiscal history available prior to FY1974-75.

Table 5. Sequence of Module Development in Minnesota Regional Economic
          Impact Forecasting System.

Development Stage	No.	Title

A. Building input-output model

1. Production

   a. Gross output (realized)
   b. Gross output (demand limit)
   c. Gross output (output-increasing capacity limit)
   d. Gross output (pollution abatement capacity limit)
   e. Gross output (employment limit)

B. Building demand forecasting modules

2. Export Market

   a. U.S. Industry gross output
   b. Regional market share
   c. Change in regional market share

3. Investment

   a. Replacement investment, output increasing
   b. Expansion investment, output increasing
   c. Expansion investment, pollution abatement
   d. Output-increasing capital
   e. Pollution abatement capital

4. Demand

   a. Personal consumption expenditures
   b. Gross private capital formation
   c. Net inventory change
   d. Federal government
   e. State and local government

C. Building auxiliary modules

5. Income

   a. Employee compensation, by industry
   b. Indirect taxes, by industry
   c. Capital depreciation, output-increasing
   d. Capital depreciation, pollution abatement
   e. Business income (retained earnings, dividends and direct taxes)
   f. Regional imports

6. Employment

   a. Employment, by industry and occupation

7. Labor Force

   a. Total population, by age and sex
   b. Unemployed labor force, by occupation
   c. In-commuting employment, by occupation
   e. Resident employment, by occupation

8. Population

   a. Total population, by age and sex
   b. Total births, by sex
   c. Total deaths, by age and sex
   d. Total in-migration, by age and sex

9. Households

   a. Total households, by income class
   b. Total personal income, by income class
   c. Total personal income tax, by income class
   d. Total personal taxes, by income class
   e. Total personal savings, by income class

D. Building interactive computer control program

Minnesota experience.

Forecast System Development

Presented at this time as a case study in building and using a regional

forecasting system is the Minnesota system cited earlier. The modular design

of this system provides for systematic reduction of a highly complex regional

economy into a computable model which is, then, tested and fitted to various

data -- time-series, cross-sectional (including survey), and engineering.

Additional modules readily interface existing modules in the total system

concept. System utilization is facilitated by the modular construction and

the user-activated computer programs. The SIMLAB programs make use of cen-

tralized high-speed computer facilities in the creation of alternative regional

futures from any terminal hook-up in the state[6/]

Only a few state forecasting systems make use of modular construction.

In SIMLAB, eight of the nine core modules are completed for several state and

substate (Minnesota) regions. Under construction are the household and the

fiscal modules. An energy system module will be prepared, also, along with

a water industry module. Among the nine core modules, a total of 45 different

sets of variables are used. The additional modules will more than double the

current SIMLAB data base.

Currently, the data base for each module is developed for 1970. Nearly

complete data series exist for selected years, including 1972 and 1974. When

the 1972 U. S. input-output tables are available, the entire SIMLAB data base

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6/ A detailed discussion of SIMLAB operation and use in regional impact
analysis and forecasting is provided in USERS' GUIDE TO SIMLAB II by
W. R. Maki, L. A. Laulainen, Jr., M. Chen, and D. R. Newell, Department
of Agri. and Appl. Econ.

will be updated from 1970 to 1972.

The modular approach to forecast system development facilitates the use of SIMLAB in special purpose studies, e.g., copper-nickel and peat land development in northern Minnesota and irrigated agriculture development in west central Minnesota. In each study, a two-region input-output program (based on an expanded 1970 U.S. input-output table) is used in the preparation of a 95 to 112 sector regional input-output model. The detailed sector breakdown is aggregated to a smaller number of sectors in SIMLAB--35 to 65 sectors--the maximum currently feasible.

Institutionally, the Minnesota regional economic impact forecasting system, of which SIMLAB is a part, is located at the University of Minnesota. Instituiuional coordination between state agencies and the University occurs as special studies are initiated in collaboration with particular state agencies.

For state agencies planning to use the system, funding and staffing problems persist. Neither the level of agency funding nor the timing of its use is favorable for efficient deployment of system capabilities. The time frame for project completion is of such short duration that additional staff cannot be acquired and trained to carry out the proposed project tasks. The agencies which could acquire staff usually lack commitment or funding for proper staff training in system development and use. University training of students in the theoretrical foundations of the system and its operational characteristics has been minimal, hence; few trained persons have been available to state agencies. Attempts to reduce system implementation costs by combining different agencies projects into one also have failed. Different agencies have different planning time frames and different data needs. The controversy between econometric and input-output models also enters the

evaluation process within each agency. Only limited effort has been made, finally, to encourage agencies with similar information needs to work together.

The changing nature of state policy development issues limits and, also, extends the use of SIMLAB. A majority part of state agency information needs, in terms of number of projects and dollar amounts, are in the fiscal and environmental areas. In this framework, the input-output based forecasting system has continued to prove its flexibility. Fiscal modules are now being developed to interface the nine core modules and the ecological modules. Existing user manuals will be expanded to cover these areas in efforts to improve the use of SIMLAB and the related data base for state policy development purposes.

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