

NATO CONFERENCE ON MANPOWER PLANNING MODELS

CAMBRIDGE, SEPTEMBER 1971.

Under the aegis of the NATO Science Committee, the NATO Advisory Panel on Operational Research have sponsored annual meetings on manpower economics. In 1970, an advanced study institute was held at the Civil Service College, Sunningdale, England. The main aim of the 1971 conference was to achieve an exchange of opinions and information on the problems of analysis and model building, and the application of models to case studies in the field of manpower planning. In the main, the attendees were experts in the field of operational research; but other disciplines such as statistics, econometrics, psychology, political science and organizational theory were also represented.

In general, the conference dealt with theory, and most of the case studies presented were little more than the confirmation of proposed models using historical data and statistics. Few of such models are being used "on-line" yet.

While most countries of the Alliance were represented at the Conference, most of the lively discussion took place between members of the British, American and Canadian civil service. Many of these persons were well known to each other from earlier NATO and other conferences, which contributed to spirited dialogue and interchange throughout the week of the conference.

The conference opened with welcoming remarks from Sir Alan H. Cottrell, Chief Scientific Advisor, Cabinet Office, Whitehall, and Dr. B. Bayraktar of NATO Scientific Affairs who described the structure of the NATO Science Committee. The Director of the

conference was Professor D. J. Clough, Department of Management Sciences, University of Waterloo, Ontario, who presented the introductory address.

In his remarks, Dr. Clough suggested a number of criteria, in the form of questions, that ought to be applied to any manpower model in order to understand fully its utility and purpose. These are:

1. Who is the model for and what purpose does it serve?
2. What are the goals of the decision makers for whom the model is intended?
3. What theories underlie the model?
4. Does the model have an implied production function inherent in it - are there not trade-offs in the real world?
5. What is the legislative context of the model - what constraints have been set by law? Such constraints could vary from country to country, and so is the model applicable generally, or are there assumptions implied by the laws of the country?
6. What are the data requirements of the model?
7. Does the "law of large data banks" apply? That is, unless data is being used, it is useless; and all data banks need persons involved who are devoted and motivated to maintain the quality of the data stored in them.
8. What are the mechanisms for communicating the results of the model?

9. What are the costs of the model - manpower, computers and other resources?

Throughout the conference, most of the presentations and discussion centered around one or more of the above questions.

A conference schedule, summary of abstracts and a complete set of papers accompanies this report. Furthermore, the conference will be published as a book early in 1972 by the English Universities Press, edited by D. J. Clough, C. G. Lewis and A. L. Oliver (the conference organizers). Thus it would be redundant to reproduce summaries of all of the papers here.

Since the writer presented a paper in Session 7, Educational Manpower Systems Analysis, (chaired by Dean A. N. Sherbourne, Faculty of Engineering, University of Waterloo, Ontario), it may be of interest to describe this session in more detail. The general opening remarks of the writer are attached as Appendix A. This paper was one of two papers, treated as a pair - the other was presented by Dr. Colin S. Leicester of Cambridge University (Christ College) on "A Simulation Test of Alternative Educational Planning Models for the U.K.". Discussion of the two papers took place after both were presented, but centered mainly on the Ontario study. Two lengthy responses emanated from the Civil Service College and the University of Nottingham where similar studies are underway on certain aspects of engineering education in the U.K. Dr. Ciceley Watson of OISE was in the audience (on sabbatical in the U.K.) and gave a long-winded expansion of our manpower work. The discussion became quite spirited and a number of workers in the U.K. and U.S.A. have requested copies of the Ontario study which have been sent since. The chairman had to terminate, but the banter continued into the coffee break that followed.

The second half of the session dealt with the supply and demand of university teachers in Germany, and primary and secondary school teachers in Canada. Again Dr. Watson dominated the discussion and drew out some very cogent points concerning demographic projections and the impact on teacher demand.

At such a conference, where there is intensive concentration on a single field for an entire week, one cannot help but gain new ideas and insights about many related aspects of the subject under consideration. Nevertheless, there is often one dominant idea or concept that emerges which can alter one's basic orientation, and create new avenues of thought and argument. Such was the case in Cambridge.

It came out of the discussion following Professor Mensch's paper on "Personnel Stratification: The Interface of Formal Grouping and Changing Organization" in Session 1. The subject was the goals of government bureaucracies, and the decision makers involved in their organization. Conventional wisdom suggests that "efficiency" is a basic value close to the heart of any organizational structure. Mr. Harry L. Clark, Bureau of Policies and Standards, U.S. Civil Service Commission, pointed out that efficiency has been drifting to a rather low place on the value tree. Instead, "predictability" has moved to a dominant position and could be considered as one of the most important goals in the U.S. Civil Service. Concurrent with this goal, Mr. Clark also pointed out that employment maximization within congressional budgetary constraints is another important goal (perhaps understandable from his vantage point). The notion of predictability as a fundamental objective, while it has always been an important goal, has been placed

traditionally below efficiency in priority as a basic value. One can conceive a number of alterations to present beaurocratic structures that would emerge if predictability were granted higher priority.than efficiency (e.g. programs and organization of many Canadian government agencies).

In conclusion, the state of the art in manpower planning models is reaching the stage now where large models have been constructed (U.S. Navy, U.S. Air Force, U.K. Civil Service, Canadian Armed Forces, etc) and proven by off-line historical and real-time data. Such systems will come into on-line service use within the next several years as planning tools, and as key components in decision making. Unquestionably, Canada has and will continue to make important contributions to this field, and there is much to be gained by participating in future NATO manpower meetings.

Philip A. Lapp.
October 5, 1971.

APPENDIX ASUPPLY AND DEMAND FOR ENGINEERING MANPOWER RELATED
TO THE UNIVERSITY SYSTEM IN ONTARIOOpening Remarks

The motivation for this work arose from the need to rationalize the growth of the 14 universities now in Ontario, and to consolidate each university's posture on an individual discipline by discipline basis. Engineering was an excellent discipline to start with because essentially it is a closed-form type of curriculum, and the objectives of engineering education are more readily identifiable than many of the other disciplines. Furthermore, the size and costs of engineering faculties have grown immensely over the past 20 years with virtually no central planning, nine of the present eleven engineering schools having been created during this period. Finally, engineering graduate studies in Ontario have grown disproportionately faster than most other disciplines.

Such uncontrolled growth created a situation by the late 1960's where the newer schools applied pressures to expand even further and the Ontario government refused to authorize further expansion until a study of this type was conducted. The Ontario universities receive capital and operating grants through formula financing based upon a weighted student head-count system - but the right is reserved by the government to count students in new programs only after such programs have been approved by the government.

The collective autonomy of the Ontario universities is represented by the Council of Ontario Universities (then the

Committee of Presidents). The study was conducted on behalf of the Council, not the government. The principle being that if the universities can exhibit the ability to rationalize and consolidate themselves, then they will avoid the situation where the government would step in and do it for them.

The study started in October 1969 and the final report to the universities was published in mid-January 1971. It recommends a master plan for the present decade, and covers student flows, curricula, research, staff, facilities and costs. Thus, the manpower aspects represent only a portion of the whole work, but nevertheless it is a very important element of the plan. Manpower considerations entered in two ways - student flows based on social selection of transitions, and the demand for engineers. These arise from what we considered to be the principal purpose of engineering education - to serve both the individual and the profession. The profession is served by providing adequate numbers of engineers to meet the demands; the individual is served by assuring that the supply is such that he will be able to get a job (not on excessive over-supply or curricular adjustment to assure flexibility on the job market).

We did not really develop a mathematical model, as such, for either the supply or demand study. The whole study had to be completed in one year, for one thing, but also there was just not sufficient data to use any kind of model that might have any degree of sophistication. Most significantly, however, we could not see any way of introducing qualitative elements into a mathematical model that could be used for educational planning. Although I believe it was Lord Rayleigh (whose picture hangs in the Great Hall at Trinity) who said "if you can't measure it, don't treasure it"; Presidents, Deans and Department Heads

and other academics (even those who are engineers) become most skeptical about policy recommendations based entirely on quantitative considerations.

The content of the paper was covered by the two authors using slides.

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