



## Management Science

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## Announcements of Publications

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WHITMAN, EDMUND S. & SCHMIDT, W. JAMES. *Plant relocation: a case history of a move*. New York: American Management Association, 1966, \$7.50, 158 pp.

ZANNETOS, ZENON S. *The theory of oil tank ship rates*. Cambridge, Massachusetts: The M.I.T. Press, 1966, \$10.00, 336 pp.

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## ANNOUNCEMENTS OF PUBLICATIONS

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### **Graduate Student Directory**

A directory of present graduate students, with areas of specialization and career interests, is available from

Operations Research Center  
Massachusetts Institute of Technology  
Room 24-215  
Cambridge, Massachusetts 02139

### **Bibliography on Public Administration**

The National Institute of Public Administration, Karachi has prepared a Selected Bibliography on Public Administration in Pakistan. This bibliography has been prepared to meet the needs of researchers and practitioners—both within and without the country who are interested in the study of Public Administration in Pakistan.

The bibliography on Public Administration attempts to assemble the literature available in Pakistan on the subject. It includes books, monographs, government publications, articles published in Pakistani journals, and some unpublished researches conducted at universities and other educational and research institutions. Almost all the major aspects of public administration in Pakistan such as: governmental organization, local government, basic democracies, personnel administration, financial administration, organization and method, planning and evaluation, economic development, labour management and others are covered in this work. A special feature is that it has a chapter pertaining to bibliographies available and useful for studies on the subject.

(At the time this notice was received by your Editor, the plan was to print only a limited number of copies and the estimated cost was 50 cents (U.S.) per copy.)

For more information about the bibliography write: Aslam Niaz, National Institute of Public Administration, 3 Modern Cooperative Housing Society, Drigh Road, Karachi, Pakistan.

The National Institute of Public Administration, Karachi, also publishes a quarterly journal. *NIPA Journal* attempts to make available to readers, modern techniques and approaches to public administration. The September 1966 issue ran to about 70 pages and contained nine papers. Annual subscription rate is \$2.00 (U.S.) and the cost of a single copy is 50 cents. Back issues are also

available. For more information about the *NIPA Journal* write Madhi Hasan, CSP., Director, or Muhammad Munir, Publications Officer, National Institute of Public Administration, at the address given just above.

### **International Customs Journals**

A new series of permanent reference copies of the International Customs Journals can be purchased by United States exporters from the Clearinghouse, U.S. Department of Commerce. The Journals consist of translations of the Customs Laws of various countries, as well as other official pronouncements bearing on their customs system.

Published by the International Customs Tariffs Bureau in Brussels, the Journals until recently had been available from the Department only on a loan basis because the ICTB restricted distribution to member governments.

For more information write: the Clearinghouse, U.S. Department of Commerce, Springfield, Va. 22151.

### **ADP in Municipal Government**

Cities in the U. S. are moving gradually toward the adoption of automated data processing for many functional operations, but have not yet exploited the full potential of computer technology for the development of comprehensive, citywide management-information systems, according to a new report issued by Public Administration Service.

The report, *Automated Data Processing in Municipal Government: Status, Problems, and Prospects*, was developed in collaboration with the International City Managers' Association, and presents both an analysis of current municipal computer use and a set of guidelines to aid public management in planning for new installations and improving existing operations.

Detailed are the steps cities should take to assure the soundest possible ADP operations. Chapters deal with conducting feasibility and systems studies, organizing and assigning administrative responsibilities, selecting equipment, and solving personnel problems.

A discussion of municipal ADP applications finds that most cities using computers perform routine operations faster and more intelligently and some have initiated imaginative applications for the solution of major urban problems.

But, it concludes, few recognize the capabilities of ADP as the "core of a comprehensive planning and management-information system . . . for focusing managerial and policy attention on available alternatives and their implications."

The report is based in part on a survey of more than 700 jurisdictions conducted by ICMA and PAS. Responses were received from 512 cities ranging in size from 25,000 to more than 2,000,000. Of these, 381 were analyzed in depth.

Findings showed that nearly half (47.3 per cent) the cities use ADP, either their own installation or that of a service bureau. Nearly that many (43.6 per cent) neither use ADP nor have plans to do so before 1970. Plans for installations by that date were reported by 7.3 per cent, while 1.8 per cent not pres-

ently using ADP in any form “may possibly” install. The larger cities tend to show more installations and concern for ADP than do smaller cities.

An introductory section of the report outlines the evolution of automated data processing in business and government, and describes the operation of computers.

*Automated Data Processing in Municipal Government* is the third in the publisher's new Public Automated Systems Service publications series. The book can be purchased for \$4.00 from Public Administration Service, 1313 East 60th St., Chicago, Illinois 60637.

### **NAS-NRC Report on Language Analysis by Computer**

Using computers to gain a deeper understanding of the nature of language and finding means to improve human and machine-aided translation are two areas of linguistics which deserve increased Federal research and development support, according to a committee of the National Research Council.

The committee sees, however, little justification at present for massive support of machine translation *per se*, finding it—overall—slower, less accurate, and more costly than that provided by human translators.

These recommendations are contained in *Language and Machines*, Publication 1416 of the National Academy of Sciences—National Research Council. (Available at \$4 from the Printing and Publishing Office, NAS-NRC, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.) The report is of a two-year study of the use of computers in the translation of foreign languages undertaken by the NRC Automatic Language Processing Advisory Committee at the request of the Central Intelligence Agency, Department of Defense, and National Science Foundation. Chairman of the committee is John R. Pierce, Executive Director of Research, Communications Sciences Division, Bell Telephone Laboratories, Inc.

Computational linguistics—studies of parsing, sentence generation, structure, semantics, statistics, and quantitative linguistic matters, including experiments in translation, with machine aids or without—“should be supported as a science,” the committee states, “and should not be judged by an immediate or foreseeable contributions to practical translation.”

The report points out that what was once a life's work in linguistics, such as the compilation of a concordance, can now be accomplished in a few weeks using computers, making possible much more rapid advances in the understanding of languages. Such knowledge speeds progress in endeavors as diverse as foreign language teaching and the development of artificial languages—for example, pilot-to-control-tower language.

The committee viewed computer aids to translation as being of secondary importance, mainly because it found no critical needs for translation beyond that already being provided by the human translation force available in this country. However, it did recommend support in such matters as finding means for speeding up the human translation process, including further development of automatic dictionaries, and evaluation of the cost and quality of different sources of translations.

Studies in both areas “should be aimed at increasing the speed and de-

creasing the cost of translations and at specifying degrees of acceptable quality," the committee said.

#### COMPUTERS A BOON TO LINGUISTS

The computer's contribution to linguistics has come largely in the form of fall-out from primary efforts toward machine translation. Ironically, this fall-out is proving to be of more immediate importance.

Because the data that must be examined to study languages in depth is overwhelming in both quantity and complexity to the unassisted human mind, computers are promising to do for language study what the multibillion-volt accelerator did for particle physics—and at considerably less cost. Pierce says that a total annual expenditure of \$2.5 to \$3 million "seems reasonable" for computer R&D in linguistics.

The committee spelled out two important kinds of linguistic research that need support: 1) development research in computer methods that will serve as tools for the linguistic scientist to use in discovering and stating his generalizations, and as tools to help verify proposed generalizations against data; and 2) developmental research in computer methods that will allow linguistic scientists to state in detail the complex kinds of theories they produce (for example, grammars and theories of meaning), so that the theories can be checked in detail.

#### NO WHOLESALE REPLACEMENT OF HUMAN TRANSLATORS SEEN

The Department of Defense, National Science Foundation, and Central Intelligence Agency have supported projects over the past 10 years in the field of automatic processing of foreign languages, primarily in mechanical translation. To provide for a coordinated Federal R&D program in this area, the three formed the Joint Automatic Language Processing Group, at whose request NAS established ALPAC. JALPG furnished funds for the study.

To gain an appreciation of the needs and capabilities in the field of translation, the committee surveyed the entire practice of translation, from governmental and commercial human translation activities to those of machine translation—in and out of government—in this country, in Germany, and in Luxembourg.

Among ALPAC's findings were:

¶ Annual government and commercial expenditures in translation in the U.S. total approximately \$22 million.

¶ It is easy to overestimate the need for translation in the U.S. if the estimate is based simply on the rapidly growing volume of scientific literature being published throughout the world. This is because English has become the predominant language of science. A 1965 survey conducted by *Physics Today* revealed that 76 per cent of the papers listed in *Physics Abstracts* and 63 percent of the physics abstracts listed in *Referativny Zhurnal* were in English. Russian, the second most important language in current scientific literature, accounted for only 14 percent and 24 percent respectively.

¶ Most U.S. scientists can easily learn enough Russian to identify articles, or portions of articles, they want translated, lessening the need to translate entire technical journals.

¶ The average human translator is a bargain at his price (average yearly salary in Federal Government service in 1964, \$6850). The supply far outstrips

the demand, even in the case of Chinese translators. (The commission, in fact, expressed some concern over a possible excess of both translators and translations performed.)

¶ While there is no emergency in translation, there is room for improvement in quality, speed, and cost.

#### PRESENT MACHINES REQUIRE HUMAN HELP

Although computers promise help to human translators in cutting costs, speeding up work, and improving final quality, thus far it is the machine that needs human assistance. To date there has been no satisfactory machine translation of scientific text, and none is expected soon. One attempt at computer translation of physics material resulted in a product that was 10 percent less accurate, 21 percent slower, and 29 percent more difficult to comprehend than the same material translated by a human. Even after time-consuming and very expensive post-editing (in one case, \$36.18 per 1,000 words of Russian), the output remained 3 percent less accurate, 11 percent slower, and 13 percent harder to understand.

Machine-aided translation is a considerably brighter prospect. One successful example was found at the Federal Armed Forces Translation Agency, Mannheim, Germany.

In the Mannheim system, the human translator reads through the text to be translated and underlines the English words for which he wants the German equivalents. The text is then given to a keypunch operator, who punches the cards for the underlined words and simultaneously performs morphological reduction of the English words (in most cases, simply by omitting the inflectional suffixes). The information on the cards is then put into the computer, which can produce three or four text-related glossaries in 10 minutes.

Members of the Automatic Language Processing Advisory Committee, in addition to Pierce, were John B. Carroll, Harvard University; Eric P. Hamp, University of Chicago; David G. Hays, The RAND Corporation; Charles F. Hockett, Cornell University; Anthony G. Oettinger, Harvard University; and Alan Perlis, Carnegie Institute of Technology.

The study was conducted under the Division of Behavioral Sciences of the National Research Council, the operating agency for the National Academy of Sciences and the National Academy of Engineering. The two academies are private organizations devoted to the furtherance of science and engineering and their use for human welfare. They also serve as official advisers to the Federal Government in science and technology.

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## EDUCATIONAL NEWS

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### ***Operations Research at Bocconi University***

After ten years of intense activity in teaching and research, an advanced school of statistics, probability theory, and actuarial science will be opened in Bocconi University in Milan, Italy. An Operations Research Center of the