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INVENTORY OF RESEARCH ON AUTOMATION AND MANPOWER PROBLEMS IN CALIFORNIA

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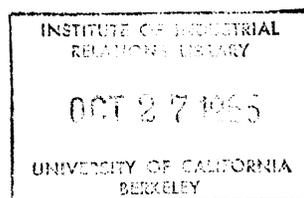


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Introduction

In September 1964 the Institute of Industrial Relations agreed to undertake, for the California Commission on Manpower, Automation, and Technology, the preparation of an annotated inventory of current research on the impact of automation and other technological changes on governmental, academic, and business activities in the State of California. The work on this project has been carried out by Lewis Perl, Graduate Research Assistant, under the supervision of Margaret S. Gordon, Associate Director of the Institute.

In order to assemble information on research activities in the state, a questionnaire (Appendix II) was prepared and mailed to a sizable mailing list of organizations and individuals who might be expected to be engaged in such research. In the covering letter which was mailed with the questionnaire (Appendix I), the following types of research were mentioned as falling within the general scope of the inquiry:

- (1) Studies which attempt to evaluate the nature and direction of the technological changes which are or will be taking place within the various industries and localities of the state.
- (2) Research which attempts to project the growth in California's labor force, in terms of the total labor force, and/or by occupational, industrial, or geographic characteristics.
- (3) Research which attempts to assess the impact of specific technological changes, or automation in general, on the employment prospects of particular groups of workers or workers in various occupations and industries.
- (4) Studies which deal with the impact of these changes in technology on the educational or training needs of California's industries and labor force.
- (5) Studies evaluating the impact of these changes on the competitive position and probable product mix of industries in the state.
- (6) Studies which describe or evaluate the impact of technological changes on labor-management relations in particular areas or industries.
- (7) Finally, studies which attempt to evaluate the efforts of governmental agencies, academic institutions, business concerns, and unions in dealing with any or all of the above problem areas.

Included among the groups to which the questionnaire was mailed were federal and state government agencies in California, employee organizations,

industrial firms, banks, universities, and private research organizations. In the case of industrial firms, it was assumed that only relatively large corporations would have the staff and resources required for any significant research programs. Accordingly we selected from among the largest 500 companies in the United States all those employing 1,000 or more persons in California or with a headquarters office in the state. The number of firms in these categories was 161. The California State Chamber of Commerce assisted us by supplying a list of the names of presidents of these firms. In the academic sector, we developed a list of research institutes, social science departments, and individuals -- using university and college directories, the mailing list of the Institute of Industrial Relations, and personal knowledge in compiling the list. In preparing lists of research directors of labor unions, management consultants, and private research organizations, we benefitted from the valuable assistance of Don Vial, Chairman of the Institute's Center for Labor Research and Education, and Jack Hislop, the Institute's Coordinator of Management Programs.

A summary of the number surveyed and the number of respondents in each category is included in Appendix III. The names of respondents are listed in Appendix IV. Follow-up postcards were mailed to those who had not responded to the questionnaire after a certain interval of time, and in some cases personal interviews were conducted with respondents when it appeared that their research activities could not be adequately described in the questionnaire. As indicated in Appendix III, nearly half (150) of all those (311) to whom the questionnaire was mailed responded. As mailed questionnaire surveys go, this is a reasonably satisfactory rate of response.

Of the 150 respondents, 24 indicated that they were conducting relevant research. Some of these organizations reported more than one relevant research project. All in all, this report includes information on 38 research projects conducted by our respondents. Finally, we have included information on 34 publications or research projects of our own Institute of Industrial Relations in the general subject matter area of employment and unemployment problems. Since most of these Institute studies are not specifically concerned with California problems and, in many cases, deal rather broadly with employment policies and various aspects of the national unemployment problem, rather than with the impact of automation or technological change per se, we have not attempted to describe the studies or publications, but have merely listed them under appropriate headings.

In presenting the summaries of research projects conducted elsewhere, an attempt has been made to use the language of the researchers themselves. The categories in which the research projects are classified were developed on the basis of the actual replies to our survey, rather than on the basis of any preconceived classification. Many of the studies could have been conveniently placed in more than one category; in these cases we attempted to include the project in the category which most closely reflected the central objective of the authors.

I. Studies of Changes in Labor Supply and Demand in the Face of Technological Change

1. Daniel W. Johnson and Associates, The Impact of Technological Change in the California Lumber Industry (proposed study to be conducted for the lumber industry). In an attempt to secure data on technological change in the lumber industry, a questionnaire will be circulated among lumber-producing firms and the employee representatives in this industry. This questionnaire survey is designed to obtain information about the nature of technological change in the industry. On the basis of this information, the research group will make recommendations to the parties to the collective bargaining agreement on dealing with technological change in the industry as required by the present contract. The survey specifically requests information on the nature of changes in plant and equipment construction and projections of changes in man hours required to produce the present output subsequent to these technological changes.

2. Albert Shapero and Richard Howell, Stanford Research Institute, The Structure and Dynamics of the Research and Development Industry: Research on the Management of Technological Change (a continuing study carried on for the Department of Defense, the National Aeronautics and Space Agency, and others. A preliminary aspect of the research, "An Exploratory Study of the Structure and Dynamics of the Research and Development Industry," 144 pp., was published in June, 1964, by Stanford Research Institute). This research seeks to develop a body of knowledge about the structure, organization, and dynamics of the R. & D. industry in the United States as an aid in the planning and conduct of actions in which the management of technological change plays a part.

A large body of data has been compiled from application forms and payroll sources covering about 35,000 scientists and engineers in the aero-space industry. Another body of data has been compiled regarding the purchasing pattern of a number of research and development companies. Additional information has been generated regarding the interplay between high technology industry, the university community, and other environmental factors. While only a limited aspect of this research has been completed, some conclusions have been drawn which may give the reader some idea of the direction of this study. A large defense-oriented research and development company, moving into an area that does not contain other such companies, will import two-thirds of its salaried work force for at least ten years. The high geographic concentration of this industry has persisted for a decade, despite a number of forces, including actions of the Department of Defense, to disperse it. Simply awarding large defense research contracts to organizations in a community, even over a period of several years, is not sufficient to generate the development of a research and development complex. Two regions -- the West Coast and the North East -- account for two-thirds of the material procurement dollars spent by all prime contractors on defense research. The presence of a local university with graduate facilities or extensive university research programs is not an important factor in attracting salaried workers to a local research and development firm. On the other hand, the existence of these companies has a positive effect on the development of institutions of higher learning.

3. Hugh Morris, Retail Clerks Union, Local 770, Age and Sex Distribution of Supermarket Employees (informal research conducted by the union). A study of the membership records of this union indicates that there has been a gradual reduction in the age level and an increase in the number of men among persons employed in supermarkets. From a 50-50 split between men and women in this industry ten years ago, the ratio of men to women today has grown to two to one.

4. Kenneth L. Maxwell, California State Department of Employment, Research and Statistics Section, Forecast of Employment in Selected Construction Occupations (Sacramento, Department of Employment; expected date of completion, May, 1965). This study will attempt to develop an estimate of employment in selected occupations in the construction industry by 1970. The estimate is based on projections of the value of construction necessary to serve the forecasted population in 1970. Establishing an estimate of total employment in this manner, employment in each of a number of occupational categories is estimated on the basis of historical trends and various estimates of the nature of technological change in this industry.

5. L. D. Matthews, Jr., Pres Lancaster, Ray Delrich, Pacific Coast Marine Firemen, Oilers, Watertenders and Wipers Association (to some extent this study is being conducted jointly with Pacific Maritime Association), Trends in Employment, Technology, Productivity, Work Force, Market for Services, Profits, Capital-Labor Mix, and Government Assistance; U.S. Maritime Industry (ongoing study conducted by the above, unpublished). Bigger, faster ships, faster turnarounds, etc., have for some years reduced the demand for labor in this industry. The nature of the commodities carried, competition with other forms of transport, foreign flag competition, etc., have all combined to produce what these authors regard as a crisis situation for the U.S. Maritime Industry.

In this environment, the parties are now attempting to reach an adjustment to a technological reduction in manning requirements. This particular study seeks to measure the depth of the problems which will be caused by this reduction and to appraise a number of proposed solutions. It is noted that employers and the government maintain that a cut in manning of up to 40 per cent is technologically possible, economically desirable, and realistically bargainable. National attrition in the labor pool is expected to be about 8 per cent (per annum).

6. Clive Knowles, California State Council of Carpenters, Impact of Technological Change on Employment in Construction (California State Council of Carpenters, date of completion indefinite). Using pension fund data and case studies of individual changes in technology, Mr. Knowles will seek to project the trend in construction employment with particular reference to the employment prospects for carpenters. The author notes an urgent need for better data on the breakdown of employment among various crafts in the construction trades.

7. Dr. Joseph E. Haring, Southern California Research Council, Occidental College, Jobs for the Future--Southern California (Southern California Research Council, Report #10, 1962). This study represents an attempt to project the number of workers, employment opportunities, skills

demanded, labor imbalances, educational level of employees, and earnings in Southern California in 1975. The study was based on a questionnaire survey of a number of companies. The author concludes that inadequate information exists among employers on labor needs in the future.

8. Orville F. Polland, Institute of Governmental Studies, University of California, Berkeley (Berkeley, Institute of Governmental Studies, 1964). This study examines the growth of public employment in California from 1947 to 1960, to determine the major sources of changes in the number of public employees and to project future employment by government in California to 1970. Dr. Polland concludes that the major factor in the growth of public employment has been the growth of educational services. This explains the close association observed between changes in public employment and changes in population.

9. Marjorie S. Turner, Department of Economics, San Diego State College, The Brain Drain from the California State College at San Diego: A College Faculty as a Model Labor Market with Entry and Exit (to be completed June, 1965; available on personal request from the author). The paper presents an analysis of job offers made to professors at San Diego State College during the period 1964-65. The author attempts to classify the acceptance or rejection of these offers by the department and rank of the position offered, present job satisfaction, and related topics. The source of the net outflow of quality teachers as measured by the ratio of permanent to temporary faculty members is sought. In addition, the paper attempts to develop a model which might be used to obviate this deterioration of the quality of instruction offered at a state college.

10. R. S. Farnsworth, Matson Research Corp., California Brewing Industry Workforce Analysis (California Brewers Association, April, 1964, unpublished). A study of the historic trends in work opportunity available in the industry and its relation to workforce size. In particular, the author sought to measure the level of work opportunity in the industry, the loss of earnings which has occurred as a result of changes in that level, and the probable costs of wage supplementation schemes. Data were collected to evaluate the productivity trends in the industry and to measure the effect which this has had on the existing workforce.

11. J. H. Conley, Mason Research Corp., Implications of the 7-Hour Longshore Shift (Matson Navigation Company, November, 1964, unpublished). The study estimates the cost and earnings opportunities resulting from changing the length of the work shift. Cost analysis includes both direct labor payments and fringe benefits as well as a measure of the cost of investment. A shorter work day, allowing for additional full shift of work, can be accomplished in the industry with no increase in total cost, offering some increase in earnings, provided that a redistribution of shift differentials can be accomplished.

12. Arthur A. Brown, Arthur D. Little, Inc., A Study to Develop a Segment of an Early Warning System (U.S. Department of Labor, Office of Manpower, Automation, and Training; to be completed May 31, 1965). This

is a pilot project intended to establish a system for analysis of the impact of major and minor technological change upon employment. There are types of activities, or unit operations, such as mixing or cutting, for example, which are substantially the same in many industries. In this project, pertinent unit operations in two industries will be studied, and two unit operations will be studied in all industries in which they occur. These studies are expected to help determine the kinds of information that will be needed to implement an early warning system for predicting automation and technological change. The implications of these changes for manpower utilization in the areas under investigation will also be considered.

The concept of a unit operation is not well established, and a major function of this paper is to test the validity and relevance of this concept in an operational sense. The study proceeds by analyzing industrial processes and breaking them down into component unit operations; the automation potential of each unit operation is determined independently of the industry in which it occurs. Specific industry factors are then taken into account. A key element in the project is the application of information theory to determine the amount of data needed for the control of the unit operation.

13. Don Mayall, Employment Trends in California's Canning and Preserving Industry, 1950-1961 (Department of Employment, San Francisco, mimeographed, 102 pp.). Analyzing past employment trends in the canning and preserving industry, this study finds: 1) an increased level of production unmatched by any increase in employment; 2) a decline in production workers as a proportion of total employment in this industry; 3) a reduction in the seasonal character of this industry. The research was based on collation and analysis of published and unpublished data from the State Departments of Employment, Industrial Relations, and Agriculture, as well as the U.S. Department of Labor and the Cannery League of California.

14. Institute of Industrial Relations, University of California, Berkeley.

William G. Bowen (Princeton University), A Study of Underemployment in the U.S. Economy; Concepts, Measures, and Causes. A partial report on this study may be found in the chapter by Bowen and T. A. Finegan, "Labor Force Participation and Unemployment," in Arthur M. Ross, editor, Employment Policy and the Labor Market (Berkeley and Los Angeles: University of California Press, 1965).

Margaret S. Gordon, Long Swings in the Growth of the Labor Force and Their Implications in Relation to Changing Unemployment Rates.

R. A. Gordon, Twenty Years of Industrial Change, Institute Reprint No. 222 (1964).

R. A. Gordon, editor, Long-Term Manpower Projections, Proceedings of a Conference conducted by the Research Program on Unemployment and the American Economy, University of California, Berkeley, Washington, D.C. June 25-26, 1964. (Copies available from the Institute.)

Stanley Lebergott (Wesleyan College), A Study of Changes in Employment by Function. (Professor Lebergott will be on leave of absence from Wesleyan in 1965-66 and plans to spend the year in Berkeley.)

Arthur M. Ross, "How Do We Use Our Engineers and Scientists?", Institute Reprint No. 239 (1964).

II. Retraining Problems Resulting from Technological Change

1. K. K. Allen, Manager of Industrial Relations, Southern California Edison Company, Problems Encountered in Retraining Workers to Operate Newly Introduced Automated Equipment (general survey of company's ongoing research efforts in this area). The electric utilities industry is an area in which automation is proceeding at a very rapid pace. In attempting to retrain workers whose jobs have been automated, Southern California Edison has encountered a number of problems. Their industrial relations department in conjunction with other departments concerned has been conducting an ongoing research effort into the best method of handling these problems.

Large plants for the generation of electric power are completely automated, to the point at which one operator with one computer could operate the entire system. In introducing these devices, the company was faced with the problem of retraining men whose skill had been in the area of mechanical repair to become able computer technicians. These workers had to develop the skills to analyze circuitry in order to utilize the computer services to the highest degree. Manual bookkeeping and accounting functions have also been converted to automated equipment, and the company faced a similar problem. In both cases the company found it necessary to convert the combined mental and manual skills necessary to perform the original tasks to those necessary to program and operate automated equipment. In many cases a whole new set of skills had to be acquired, involving a great deal of unlearning; the company found the transfer very difficult in many cases.

Line construction has also undergone radical changes over the past few years. Prefabrication and the introduction of new safety devices have simplified the work of the lineman to a large degree. In order to adapt the workers to this task, new concepts of field engineering and work planning had to be developed and techniques devised to maintain the skill level and competence of existing construction crews.

2. Odessa Dubinsky, California State Department of Employment, Southern Area Office, Hotel-Motel Survey (Santa Ana, Department of Employment, mimeographed). This study is part of a survey of an effort by the California State Department of Employment to identify occupations suitable for training under the Manpower Development and Training Act. A survey of 36 firms in the hotel and motel industry for two counties was used to determine the magnitude of demand for services provided by this industry. The author notes that there is a need for cross-training of individuals in a number of occupations because small establishments cannot utilize an individual specialty on a full-time basis.

3. Don Mayall, California State Department of Employment, Coastal Area Office, Hotel and Restaurant Job Opportunities, San Francisco Bay Area, 1964-66 (San Francisco, Department of Employment, March 1965, mimeographed, 66 pp.). A sample of 296 out of 5,061 hotel and restaurant firms in the five-county Bay Area was surveyed to determine the training needs in this industry. It was estimated that over 3,800 job vacancies will become available for workers in the surveyed occupations over the next two years.

4. John Vanderburgh, California State Department of Employment, Interior Area Office, Skill Survey of Sacramento Labor Market Area (Sacramento, California State Department of Employment, to be completed in May, 1966). This project represents an attempt to identify occupations for which recruitment and training are appropriate in Sacramento, Placer, and Yolo counties. Mailed questionnaires and a series of interviews with a sample of employers representative of economic activity in this area will be used to secure the necessary data.

5. Odessa Dubinsky, Simi Valley Skill Survey (Santa Ana, Department of Employment, 1963, mimeographed, 12 pp.). This survey attempts to determine employment prospects for youth in the Simi Valley area through 1968 and to identify the role of high schools in the vocational training process. All employers in the area were surveyed; the study indicates that planned expansion by local employers will not support the anticipated growth in the labor force.

6. Odessa Dubinsky, Survey of Durable Goods Manufacturing Industries in Northern San Diego and Riverside Counties (two studies) (Santa Ana, Department of Employment, February, August, 1964, mimeographed, 5 pp. and 2 pp.). By estimating the demand for products of the durable goods industries, the training needs of occupations within this industry were projected. The first of these studies was based on a survey of 22 firms and the second on 19 firms in these areas.

7. Odessa Dubinsky, Medical Services Survey, San Diego, San Bernardino-Riverside Counties (two studies) (Santa Ana, Department of Employment, 1963, mimeographed, 3 pp. and 2 pp.). Methodology and purpose of this study are the same as that above, extended to the medical services industry.

8. L. E. Davis, E. R. F. W. Crossman, Human Factors in Technology Research Group, Department of Industrial Engineering, University of California, Berkeley, Pilot Study of Evolving Jobs and Skills and Implications for Training (Washington, U.S. Department of Labor, Office of Manpower, Automation, and Training; to be completed in November, 1965). This project seeks to develop a methodology for estimating skill changes which result from the installation of automated technology. In particular, the authors will investigate the rationale used by management for the installation of automated devices, and will attempt to specify skills which may be replaced by mechanization. The authors will use information theory to develop a quantitative assessment of the human contribution to product or service processing. They expect that this will permit an objective comparison of different stages of technological development among processing operations.

9. Sheldon A. Davis and Frank J. Jasinski, Thompson Ramo Wooldridge (TRW) Space Technology Laboratories, Impact of Changes in Technology on Continuing Educational Needs Among Scientists and Engineers (Redondo Beach, California, TRW; to be completed in January, 1966). Rapid scientific development and technological change in the aerospace industry requires a constantly

evolving capability within existing scientific and engineering staffs. Current means of maintaining individual technological capability need to be improved. In this context, the authors will explore several alternative methods for enabling the scientist and engineer to expand his competence.

An interview schedule will be set up to identify alternatives for maintaining scientific and engineering capability in a rapidly changing technological environment. Supplementing this interview study, TRW will conduct internal seminars and conferences to identify further alternatives. Finally, some of these methods will be implemented to gauge their effectiveness in maintaining technical competence of the engineering and scientific staff.

10. Institute of Industrial Relations, University of California, Berkeley.

Margaret S. Gordon, Retraining and Labor Market Adjustment in Western Europe (Washington, D.C.: U.S. Government Printing Office, 1965). Also to be included in the Institute Reprint Series.

Margaret S. Gordon, "Retraining Programs at Home and Abroad," Proceedings of the Seventeenth Annual Meeting, Industrial Relations Research Association. Also to be included in the Institute Reprint Series.

Margaret S. Gordon, "Comparative Experience with Retraining Programs in the United States and Western Europe," to be published in the proceedings of the Conference on Automation and Employment sponsored by the Institute of International Labor Studies, Geneva, Switzerland, July 1964.

George Strauss, A Critical Analysis of Apprenticeship Programs. Partial reports on this study are included in the author's chapter, "Apprenticeship: An Evaluation of the Need," in Arthur M. Ross, editor, Employment Policy and the Labor Market (Berkeley and Los Angeles: University of California Press, 1965); and in "Operational Analysis of Training Programs," paper presented at a conference on Job Training and Industrial Relations, San Francisco, May 26, 1965 (available from the Institute).

William Woodson, Robert Moore, and others, A Research and Evaluation Project: The Oakland Adult Minority Group Employment Program and Several Programs Relating to the Training of Youth. The action programs being evaluated are under the sponsorship of the Oakland Department of Human Resources, which has entered into arrangements with the Institute to undertake responsibility for the research and evaluation project relating to them. The project is being financed through funds made available by the Ford Foundation and the Office of Manpower, Automation, and Training, U.S. Department of Labor.

III. The Nature of Management Decisions to Automate

1. Richard S. Roberts, Jr., Stanford Research Institute, Management Decisions to Automate (Washington, U.S. Department of Labor, Office of Manpower Automation and Training, 1964). Under a grant from the Office of Manpower, Automation, and Training, a research group at the Stanford Research Institute studied eight situations in which firms were considering the introduction of automated machinery. Examined were two banks installing data process equipment, two electronics manufacturing firms installing numerically controlled machinery, and three warehouses installing automatic order picking and conveyers systems. In each of the above cases the firm decided to automate, while in an eighth situation it was decided not to install an automatic order selecting machine. In all of the case studies the researchers followed the decision-making processes of the firms from proposal to introduction of the machinery. Cost reduction at the time of automation appeared to be the major objective when decisions were made to automate. It is primarily through the effect of these devices on labor productivity that cost reduction is achieved.

2. The Diebold Group, Inc., The Business Significance of Information Technology, 1964-1972, and Study of Development in Information Technology and Their Effect on Business (New York, The Diebold Group, Inc., continuing program of research available to clients only). The Diebold Group Research Program, sponsored by some fifty major United States and European computer-using and manufacturing companies (including four California-based firms), seeks to construct a basis on which major corporations can develop plans and programs to utilize the impending advances in information technology both effectively and economically. In addition, it is intended to provide a framework for an integrated management information system in this area. The papers cited above are a part of the ongoing research program conducted by this firm to apply computer technology to business problems. Due to their complexity, no effort is made to summarize their reports; they are cited here as examples of what is being done by management research teams in this area.

3. A. Martenn, St. Regis Paper Company, Corrugator Trim and Schedule (New York, St. Regis Paper Company, unpublished). The company has conducted a series of studies to determine what manufacturing processes can successfully be automated within the corrugator manufacturing process. Initially, the company sought to establish a formula by which paper usage could be optimized using computer analysis for solving maximization problems. The study indicated that a ten per cent increase in usable raw materials could be achieved with a five per cent trim in waste.

4. C. K. Dewitt, Manager, Administrative Systems Planning and Programming, Lockheed Missiles and Space Company, Determination of Manpower Reduction Made Possible by Application of Electronic Data Processing Equipment to Administrative Systems (Lockheed Missiles and Space Company, unpublished study). For the past two years, LMSC has been engaged in a sizable program of applying electronic data processing techniques to administrative systems in the areas of finance and accounting, inventory control,

manufacturing control, and procurement. Part of this program includes the evaluation of all proposed major systems installations from the standpoint of their economic return, i.e., cost to develop and install, manpower and equipment savings from the new method, break-even point, and indirect, non-economic benefits. Management decisions on implementation of each automation proposal are based on this evaluation. The specific objectives of these studies are to facilitate management decisions on the development of a given systems proposal from the standpoint of economic payoff. The criterion established for accepting or rejecting a proposal is that the cost of the new method should approach one-half the cost of the old one.

5. Merl R. Felder, S. V. McCleary, Douglas Aircraft Company, Inc., The Impact of Automation on the Douglas Aircraft Company (unpublished and unavailable to the public). By auditing automated manufacturing and administrative systems within the company, the authors are seeking to analyze the diverse factors affected by the changed technology within the company. A major goal of the project is the establishment of information flow channels which will provide for coordination of the various existing evaluation committees and controlling authorities engaged in directing the introduction of automated technology in the company.

In common with many other companies, Douglas is faced with "creeping automation," difficult to isolate and define. The company, feels, therefore, that comprehensive data gathering should begin at the planning stage of each installation of automated machinery; in order to do this, guidelines for defining the introduction of such machinery should be established and data flow methods initiated.

6. F. L. Weldon, Matson Research Corporation, The New Offshore Labor Problems (Matson Navigation Company, unpublished, April 1962). This study seeks to determine the tradeoff payments between labor-saving changes, the cost of continued workforce size, and the cost of alternative plans for easing the transfer of the unutilized labor force to new jobs. Developing an analytical model relating jobs, employees, and costs, this paper finds that it would be feasible and economically sound to reduce the present workforce size to levels consistent with reasonable earnings for each individual retained.

IV. Information Theory, Decision Theory, and Operations Research: Their Role in Developing an Automated Technology

1. Roy Radner, Center for Research in Management Science, University of California, Berkeley, Economic Problems of Information and Organization (Office of Naval Research, to be completed in 1965). Professor Radner and his colleagues are developing various models of incorporating information and decision theory into an economic model of management behavior. In part, they are studying the effect of information availability and cost on the organization of productive activity. Since a major aspect of automation involves the use of computers to solve informational problems, this research effort delves into the problem of the impact of automation on the decision processes of management. Professor Radner's study has resulted in a number of theoretical and empirical papers which are published at intervals by the Center for Research in Management Science. The study may be extended for three years beyond its expected date of completion.

2. T. Marschak and C. B. McGuire, Center for Research in Management Science, University of California, Berkeley, Information Technology and Organization (Center for Research in Management Science; expected date of completion, August, 1965). Marschak and McGuire are attempting to develop theoretical concepts for treating the informational content of managerial decisions and to investigate the economic characteristics of alternative information technologies. While different in theoretical content and methodological design from the Radner studies, this research plays the same role, vis-a-vis automation, as does the project described above.

3. F. E. Balderston, Center for Research in Management Science, University of California, Berkeley, Research on the Savings and Loan Industry and its Regulatory Framework (Ford Foundation; expected date of completion, December, 1965). In part, this study attempts to develop a series of computer programs for the diagnosis and warning of regulatory problems in savings and loan associations. Professor Balderston's research, therefore, deals directly with the problem of automation from a technological point of view -- how can decisions-making processes formerly handled entirely by human analysis be simplified and improved through the use of a computer technology. The author's empirical work centers on savings and loan associations in California.

4. Robert S. Morgan, candidate for the Ed.D. degree, University of California, Berkeley, Changes in Administrative Organizational Structure Associated with Electronic Computer Operations: A Study of Selected California School Districts (unpublished, available through the author). The purpose of this study is to investigate changes in administrative organizational structure associated with the installation and operation of electronic computers in selected California school districts. Published research indicates that automated processes and computer operations can alter concepts and practices of administration and organization structures; this study is directed toward gathering empirical evidence from which the organizational changes in education may be compared with those of business, industry, and government. The data are being secured from approximately

eight school districts in California, using interview and questionnaire techniques. Three questions will be investigated in the course of the project: 1) what formal or informal changes in administrative assignments have been made as the result of the introduction of computers; 2) what additions or deletions have been made in education staffs as a result of the introduction of computers; 3) what evidence is there to indicate probable administrative or organizational change. The findings of this study with respect to labor force needs resulting from the introduction of an automated process differ markedly from those of many other studies: as a result of the introduction of this technology, increased personnel will be needed in the school districts.

5. G. L. Bergst, Lockheed Missiles and Space Company, A Systems Approach to Analyzing the State's Information Problems and Developing a Conceptual Plan for a Comprehensive Information System (State of California, Director of Finance; to be completed on August 1, 1965). Using system analysis, design, effectiveness criteria and implementation plans, this project will attempt to develop a method for monitoring the formal information flow within the state government. The organizational objectives of the state's information system will be evaluated with respect to devising a computerized system for handling this information flow.

6. G. B. Dantzig, T. C. Hu, W. S. Jewell, R. W. Wolff, R. E. Barlow, R. van Slyke, F. Proschan, and R. M. Oliver, Operations Research Center, University of California, Berkeley (Office of Naval Research, National Science Foundation, National Institute of Health, Army Research Office, American Gas Association, U.S. Forestry Service; a number of studies, published at intervals by Operations Research Center, Berkeley). The primary function of the researchers at the Operations Research Center is to devise means of adapting computer systems to production processes, information flow problems, generalized maximization problems, etc. While these studies are too numerous and complex to describe in detail here, they represent a major aspect of research in the development of an automated technology. A brief review of the techniques used are included here to give the reader a sense of the nature of this development. These studies all involve the development of mathematical methods in the science of decision-making and their application to specific problems. Linear and non-linear programming, programming under uncertainty, large-scale system optimization, integer programming, reliability theory, queuing theory, traffic systems and clinical trials are all used to solve complex optimization problems for commerce, industry, and the government.

Researchers at the Center note that operations research has become an important tool in the planning operations of large-scale industrial complexes. As an example, they cite the use of linear programming in the Standard Oil Company: currently this company employs more "computing power" than was used five or six years ago for all technical computation of any kind in the United States.

V. The Impact of Automation on the Attitudes of Individuals and Organizations

1. Adam Gifford, Department of Economics, San Diego State College, A Union View of Technological Change (to be completed in June, 1965). This paper deals with the attitude of union leaders toward technological change in their own industries. The author will attempt to determine if there is any relationship between union structure and union views on the rate of technological change and, secondly, whether or not a relationship exists between the skill level of union membership and the position of the union leadership on this subject. In order to consider these questions, the officers of all national unions were surveyed, using a series of questionnaires.

2. Irving Bernstein, Paul Prasow, and Paul Sultan, Institute of Industrial Relations, University of California, Los Angeles, Social Adaptability of Workers in Automated Industries (expected date of completion, June, 1967). Using the California aircraft industry as a case in point, this study attempts to consider the changes in worker attitudes which resulted from being automated out of one job and trained for another. Do they find the adjustment easy or difficult? Do their job attitudes improve or deteriorate? What effect does the length of time elapsed since the job change have on worker attitudes? Finally, what effect do education, skill, and various personal characteristics have in changing these attitudes? The research will be conducted by a series of questionnaire surveys conducted at various points subsequent to the introduction of a technological change.

VI. Manpower and Employment Policies

1. Kenneth L. Maxwell, John Vanderburgh, Don Mayall, Gaylord Pitts, and Odessa Dubinsky, California State Department of Employment, Central Office and Area Office Research and Statistics Units, Occupational Guides for 356 California Occupations. Reports on these studies appear in Occupational Guide, a publication of the California Department of Employment which appears periodically. Their purpose is to develop a series of reference materials for school and employment counselors which describes the job content, environment, and opportunities in occupations composing the California work force. The guides are developed through interviews and surveys conducted with employers and employees. On the basis of a large number of these surveys, the authors offer the general conclusion that job opportunities are unevenly distributed among occupations of the same skill level.

2. Institute of Industrial Relations, University of California, Berkeley.

Joseph W. Garbarino, A Study of Wage Policy, Inflation, and Full Employment. Partial reports on this study are included in the author's Fringe Benefits and Overtime Barriers to Full Employment, Institute Reprint No. 230; and "Income Policy and Income Behavior," in Arthur M. Ross, editor, Employment Policy and the Labor Market (Berkeley and Los Angeles: University of California Press, 1965).

Margaret S. Gordon, National Retirement Policies and the Displaced Older Worker, Institute Reprint No. 250.

Margaret S. Gordon, U.S. Manpower and Employment Policy: A Review Essay, Institute Reprint No. 249.

R. A. Gordon, A Study of Employment Goals for the United States. Partial reports on this study are included in the author's Has Structural Unemployment Worsened?, Institute Reprint No. 234; and "Full Employment as a Policy Goal," in Ross, editor, op. cit.

Myron L. Joseph (Carnegie Institute of Technology), A Study of the Hours of Work Issue.

Richard A. Lester (Princeton University), A Study of National Manpower Planning in a Free Society.

Martin P. Oettinger (University of California at Davis), A Study of Old and New Uses of the Unemployment Compensation Concept in a Program of Labor Market Adjustment.

David C. Smith, The Canadian Full Employment Goal, Institute Reprint No. 251.

VII. Unemployment and the Unemployed

1. Institute of Industrial Relations, University of California, Berkeley.

R. A. and M. S. Gordon, editors, Prosperity and Unemployment: The Expansion of the Last Five Years (to be published by Wiley). This is a volume of papers presented at the Institute's third annual conference held in connection with its Ford-financed research project on Unemployment and the American Economy, in New York City, June 14-16, 1965. The volume includes major papers on the behavior of GNP, labor force participation, employment, unemployment, and the wage structure.

Paul Jacobs, A Study of the Displaced Worker: The Impact of Unemployment on the Unemployed and Their Families. A partial report on this study is included in "Unemployment as a Way of Life," in Arthur M. Ross, editor, Employment Policy and the Labor Market (Berkeley and Los Angeles: University of California Press, 1965).

Richard G. Lipsey (University of Essex, England), A Study of Structural Transformation Versus Deficient-Aggregate-Demand Theories of Unemployment. A report on this study is included in the author's "Structural and Deficient-Demand Unemployment Reconsidered," in Ross, editor, op. cit.

David C. Matza, A Study of Youth and Unemployment.

Arthur M. Ross, editor, Negroes and Jobs (to be published by Harcourt Brace). This is a volume of papers dealing with various aspects of the labor market problems of Negroes.

David C. Smith (Queen's University, Ontario), A Study of Postwar Relationships Between Unemployment and Growth in Canada. A partial report on this study is included in the author's "Seasonal Unemployment and Economic Conditions," in Ross, editor, Employment Policy and the Labor Market. See, also, the reference to Smith's paper on The Canadian Full Employment Goal in Section VI.

Guenter Wittich, a doctoral dissertation on Policies to Combat Postwar Unemployment in West Germany.

VIII. The Labor Market and Labor Mobility

1. Institute of Industrial Relations, University of California, Berkeley.

Inter-related Studies of Entry and Job Changing in a Large Metropolitan Area, a group of studies of the functioning of the San Francisco Bay Area labor market. The Institute has begun work on this project, but the program may not be completely carried out unless arrangements for extramural financial support are successfully concluded. The plans call for seven sub-projects: 1) analysis of published and unpublished statistical data relating to the characteristics of the Bay Area labor market and to changes in labor demand and supply in the area; 2) a survey of employer labor market policies and practices; 3) a survey of union policies and practices; 4) a survey of employment agencies, placement services, and secondary school and junior college counsellors; 5) a study of labor mobility based on a household survey (the Institute expects to enter into a contract with the U.S. Bureau of the Census to conduct this survey); 6) studies of the impact of automation on skill requirements; and 7) specialized studies, which will be related to the overall project, but which will be concerned, e.g., with developments in particular industries or occupations.

Lloyd Ulman, Labor Mobility and the Industrial Wage Structure in the United States, Institute Reprint No. 254.

Sue Van Atta, a doctoral dissertation on Some Historical Aspects of Structural Unemployment.

IX. Other

1. Institute of Industrial Relations, University of California, Berkeley.

Trevor Bain, Union Work Rules and Technological Unemployment in the Flat Glass Industry (unpublished Ph.D. thesis, University of California, Berkeley).

A group of doctoral dissertations dealing with various aspects of the relationship between changes in unemployment rates and wage rates, by Sara Behman, Pauline Fong, and Mahmood Zaidi.

Ida R. Hoos and Brownie Lee Jones, Office Automation in Japan, Institute Reprint No. 217.

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OFFICE OF THE DIRECTOR
INSTITUTE OF INDUSTRIAL RELATIONS

BERKELEY, CALIFORNIA 94720

The Institute of Industrial Relations, in cooperation with the California Commission on Manpower, Automation and Technology, is conducting a study to prepare an annotated inventory of current research on the impact of automation and other technological changes on governmental, academic, and business activities in the State of California.

Defining automation broadly, there are indications that the impact of this phenomenon may have been particularly pervasive in California. Undoubtedly much research has been conducted and is presently going on in this area. Unfortunately, the results of this research effort may not be fully utilized because of a lack of communication among the various groups engaged in research.

In this study, we are attempting to include research in the following areas:

- (1) Studies which attempt to evaluate the nature and direction of the technological changes which are or will be taking place within the various industries and localities of the state.
- (2) Research which attempts to project the growth in California's labor force, in terms of the total labor force, and/or by occupational, industrial, or geographic characteristics.
- (3) Research which attempts to assess the impact of specific technological changes, or automation in general, on the employment prospects of particular groups of workers or workers in various occupations and industries.
- (4) Studies which deal with the impact of these changes in technology on the educational or training needs of California's industries and labor force.
- (5) Studies evaluating the impact of these changes on the competitive position and probable product mix of industries in the state.

- (6) Studies which describe or evaluate the impact of technological change on labor-management relations in particular areas or industries.
- (7) Finally, studies which attempt to evaluate the efforts of governmental agencies, academic institutions, business concerns, and unions in dealing with any or all of the above problem areas.

As is perhaps demonstrated by the length and diverse nature of this list, the impacts of technological changes are often devious and difficult to define precisely. Thus the list is intended only to suggest the general nature of research projects in which we are interested, and not to limit the scope of included material.

Enclosed are several copies of a questionnaire designed to seek information on any relevant research (begun or completed since the beginning of 1962) which your organization is conducting. Your cooperation in supplying the requested information will be greatly appreciated. Should you need additional copies of the questionnaire, we would be glad to supply them. A return envelope is enclosed for your convenience.

Sincerely,

(Mrs.) Margaret S. Gordon
Associate Director

MSG/bep

Enclosures

INVENTORY OF CURRENT RESEARCH ON AUTOMATION AND TECHNOLOGICAL
CHANGE AND ITS IMPACT ON CALIFORNIA

Name of firm or other organization conducting this research:

Address:

Source of funds (if outside financial support is involved):

Title or subject of this research:

Principal researcher(s):

Telephone number and extension:

Actual () or expected () date of completion:

If published, please state title, place, date, and form of publication:

If copies are available, please indicate source and price:

SUBSTANTIVE SUMMARY OF RESEARCH

1. Please state the nature of the problem being investigated.

Quantitative Summary of Survey Response^a

	<u>Number surveyed</u>	<u>Number responding</u>	<u>Number doing research</u>	<u>Number of research projects</u>
Industrial corporations	161	71	5	7
Academic individuals	72	24	4	4
Academic research organizations	24	18	5	5
Management consultants and lawyers	14	8	0	0
Banks, finance, and insurance companies	10	8	0	0
Private research organizations	7	7	5	9
Government agencies	4	4	1	10
Labor organizations	<u>19</u>	<u>10</u>	<u>4</u>	<u>3</u>
	311	150	24	38

^aDoes not include studies conducted by the Institute of Industrial Relations, University of California, Berkeley.

Respondents

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
<u>Industrial Corporations</u>		
Aluminum Co. of America 1501 Alcoa Building Pittsburgh, Pa.	no	
American Brake Shoe Co. 530 Fifth Avenue New York, New York	no	
American Forest Products Corp. 2740 Hyde Street San Francisco, California	no	
American Pipe & Construction Co. 400 S. Atlantic Blvd. Monterey Park, California	no	
American Potash & Chemical Corp. 3000 W. 6th Street Los Angeles, California	no	
American President Lines 601 California Street San Francisco, California	no	
Associated Spring Corp. Bristol, Connecticut	no	
California & Hawaiian Sugar Refining Corp. Crockett, California	no	
California Brewers Ass'n. 155 Montgomery Street San Francisco, California	no	
California State Chamber of Commerce 350 Bush Street San Francisco, California	no	
Cannon Electric Company 3208 Humbolt Street Los Angeles, California	no	

Organization	Relevant research being done	Number of projects
Carnation Company 5045 Wilshire Blvd. Los Angeles, California	no	
Castle & Cooke, Inc. Box 2990 Honolulu, Hawaii	no	
Chemetron Corporation 840 N. Michigan Avenue Chicago, Illinois	no	
Chrysler Corporation 341 Massachusetts Avenue Detroit, Michigan	no	
CMTA 373 S. Airport Blvd. S. San Francisco, California	no	
Consolidated Rock Products 2730 S. Alameda Street Los Angeles, California	no	
Crompton & Knowles Corp. 93 Grand Street Worcester, Massachusetts	no	
Crown Zellerbach Corp. One Bush Street San Francisco, California	no	
Cyprus Mines Corporation 523 W. 6th Street Los Angeles, California	no	
Douglas Aircraft Co., Inc. 3000 Ocean Park Blvd. Santa Monica, California	yes	1
The Electric Storage Battery Company 2 Penn Center Plaza Philadelphia, Pa.	no	
Emhart Corporation 102 Washington Street New Britain, Connecticut	no	

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
Federal-Mogul-Bower Bearings 11030 Shoemaker Avenue Detroit, Michigan	no	
FMC Corporation 1105 Coleman Avenue San Jose, California	no	
Ford Motor Company The American Road Dearborn, Michigan	no	
Foremost Dairies, Inc. 425 Battery Street San Francisco, California	no	
Fruehauf Trailer Company 10940 Harper Avenue Detroit, Michigan	no	
The Garrett Corporation 9851 Sepulveda Blvd. Los Angeles, California	no	
General Controls Company 801 Allen Avenue Glendale, California	no	
General Electric Company 570 Lexington Avenue New York, New York	no	
General Foods Corporation 250 North Street White Plains, New York	no	
General Motors Corporation 3044 W. Grand Blvd. Detroit, Michigan	no	
Georgia-Pacific Corporation Box 311 Portland, Oregon	no	
Harvey Aluminum, Inc. 19200 S. Western Avenue Torrance, California	no	

Organization	Relevant research being done	Number of projects
George A. Hormel & Co. Austin, Minnesota	no	
International Business Machines Corporation 590 Madison Avenue New York, New York	no	
International Pipe & Ceramics Corporation Box 269 East Orange, New Jersey	no	
International Telephone & Telegraph Corporation 67 Broad Street New York, New York	no	
Koppers Company, Inc. 1301 Koppers Bldg. Pittsburgh, Pa.	no	
Lockheed Aircraft Corporation 2555 N. Hollywood Way Burbank, California	yes	3
The Marquardt Corporation 16555 Saticoy Street Van Nuys, California	no	
North American Aviation, Inc. 1700 E. Imperial Highway El Segundo, California	no	
Northrup Corporation 9744 Wilshire Blvd. Beverly Hills, California	no	
Pacific American Steamship Association 16 California Street San Francisco, California	no	
Pacific Maritime Association 16 California Street San Francisco, California	no	

Organization	Relevant research being done	Number of projects
Pacific Telephone & Telegraph Company 140 New Montgomery Street San Francisco, California	no	
Packard Bell Electronics Corporation 12333 W. Olympic Blvd. Los Angeles, California	no	
Proctor & Gamble Company 301 E. Sixth Street Cincinnati, Ohio	no	
Raytheon Company Spring Street Lexington, Massachusetts	no	
Rexall Drug & Chemical Co. 8480 Beverly Blvd. Los Angeles, California	no	
Robertshaw-Fulton Controls Co. Grayson Controls Division Long Beach Blvd. at Long Beach Freeway Long Beach, California	no	
Rohr Corporation Foot of "H" Street Chula Vista, California	no	
St. Regis Paper Company 150 E. 42nd Street New York, New York	yes	1
Shell Oil Company 50 W. 50th Street New York, New York	no	
Shipowners Association of the Pacific Coast Box 549 San Mateo, California	no	
Signal Oil & Gas Company 1010 Wilshire Blvd. Los Angeles, California	no	

Organization	Relevant research being done	Number of projects
Simpson Timber Company 2000 Washington Bldg. Seattle, Washington	no	
Socony Mobil Oil Co., Inc. 150 E. 42nd Street New York, New York	no	
Southern California Edison Co. 601 W. 5th Street Los Angeles, California	yes	1
Southern Pacific Company 65 Market Street San Francisco, California	no	
Standard Oil Company 225 Bush Street San Francisco, California	no	
Swift & Company Union Stock Yards Chicago, Illinois	no	
System Development Corporation 2500 Colorado Avenue Santa Monica, California	no	
Textron, Inc. 10 Dorrance Street Providence, Rhode Island	no	
Thompson Ramo Wooldridge, Inc. 8433 Fallbrook Avenue Canoga Park, California	yes	1
Tidewater Oil Company 4201 Wilshire Blvd. Los Angeles, California	no	
Union Oil Company of California Union Oil Center 461 S. Boylston Street Los Angeles, California	no	

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
United States Plywood Corp. 55 W. 44th Street New York, New York	no	
United States Steel Corp. 71 Broadway New York, New York	no	
Western Growers Association 3091 Wilshire Blvd. Los Angeles, California	no	
<u>Academic Individuals</u>		
Professor Murray R. Benedict Department of Agricultural Economics University of California Berkeley	no	
Professor Leonard D. Cain, Jr. Sociology Department Sacramento State College Sacramento	no	
Professor Herbert J. Chruden Department of Business Administration Sacramento State College Sacramento	no	
Dr. E. Paul De Garmo Chairman Division of Industrial Engineering University of California Berkeley	yes	1
Professor Robert Dickerson Division of Social Science Humbolt State College Arcata	no	

Organization	Relevant research being done	Number of projects
Professor Robert A. Ellis Sociology Department Stanford University Stanford	no	
Professor Adam Gifford Department of Economics San Diego State College San Diego	yes	1
Professor George C. Hoty School of Business San Jose State College San Jose	no	
Dr. Harold S. Jacoby Department of Sociology College of the Pacific Stockton	no	
Professor Wittold Krassowski Sociology Department University of Santa Clara Santa Clara	no	
Dr. Marvin Lee Department of Economics San Jose State College San Jose	no	
Dr. Vernon A. Ouellette Division of Business San Francisco State College San Francisco	no	
Dr. Orme W. Phelps Claremont Men's College Claremont	no	
Professor Alvin Scaff Sociology and Anthropology Department Pomona College Claremont	no	

Organization	Relevant research being done	Number of projects
Professor Louis J. Shuster Department of Business Administration Sacramento State College Sacramento	no	
Professor Charles Spaulding Sociology Department University of California Santa Barbara	no	
Ronald S. Morgan 7554 East Parkway Sacramento, California	yes	1
Professor Marc R. Tool Sacramento State College Sacramento	no	
Dr. Marjorie Turner San Diego State College San Diego	yes	1
Professor John A. Vieg Pomona College Claremont	no	
Professor W. C. Wagner Raymond College University of the Pacific Stockton	no	
Professor Don Whiteside University of North Carolina Raleigh, North Carolina	no	
Professor J. Merritt Winans Psychology Department Sacramento State College Sacramento	no	
Professor R. E. Wolfinger Department of Political Science Stanford University Stanford	no	

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
<u>Academic Research Institutes</u>		
Bureau of Business and Economic Research San Diego State College San Diego	no	
Bureau of Business and Economic Research University of California Los Angeles	no	
Center for Research in Management Science University of California Berkeley	yes	3
Center for Survey Research San Diego State College San Diego	no	
Economic Research Center San Diego State College San Diego	no	
Graduate School of Business Administration Stanford University Stanford	no	
Graduate School of Business Administration Division of Research University of California Los Angeles	no	
Industrial Relations Division Graduate School of Business Administration Stanford University Stanford	no	
Industrial Relations West Contra Costa Jr. College San Pablo	no	

Organization	Relevant research being done	Number of projects
Institute for Communications Research Stanford University Stanford	no	
Institute of Government and Public Affairs University of California Los Angeles	no	
Institute of Governmental Studies University of California Berkeley	yes	2
Institute of Industrial Relations University of California Los Angeles	yes	1
Institute of Social Sciences University of California Berkeley	no	
Operations Research Center University of California Berkeley	yes	1
Santa Clara Research Council University of Santa Clara Santa Clara	no	
Society for Automation in Business Education San Diego State College San Diego	no	
Southern California Research Council Occidental College Los Angeles	yes	1

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
Survey Research Center University of California Berkeley	no	
USC Research Institute in Business and Economics (USCRIBE) University of Southern California Los Angeles	no	
Western Management Science Institute University of California Los Angeles	no	
<u>Consultants and Attorneys</u>		
Ralph Hartley Industrial Relations Consultant 3726 Arbutus Court Hayward	no	
Louis J. Kroeger and Associates Personnel and Management Consultants 64 Pine Street San Francisco	no	
L. A. J. Miller and Associates Industrial Relations Consultants Box 2062 Sacramento	no	
Orrick, Dahlquist, Herrington and Sutcliffe 405 Montgomery Street San Francisco	no	
United Employers 610 - 16th Street Oakland	no	

<u>Organization</u>	<u>Relevant research being done</u>	<u>Number of projects</u>
<u>Banks, Finance, and Insurance Companies</u>		
Bank of America 300 Montgomery Street San Francisco	no	
Bank of California 400 California Street San Francisco	no	
Crocker Citizens National Bank 1 Montgomery Street San Francisco	no	
Metropolitan Life Insurance Co. 600 Stockton Street San Francisco	no	
Occidental Life Insurance Company of California 1149 S. Hill Street Los Angeles	no	
Pacific Mutual Life Insurance Company 523 W. 6th Street Los Angeles	no	
Union Bank 3800 Wilshire Blvd. Los Angeles	no	
United California Bank 600 S. Spring Street Los Angeles	no	
<u>Private Research Organizations</u>		
Dr. Edith Arlen Sociological Research, Inc. 148 Beverly Drive Beverly Hills	no	

Organization	Relevant research being done	Number of projects
Diebold Research Programs 430 Park Avenue New York, New York	yes	1
Daniel Johnston and Associates 117 W. Ninth Street Los Angeles	yes	1
Arthur D. Little, Inc. 130 N. Franklin Street Chicago, Illinois	yes	1
Matson Research Company 215 Market Street San Francisco	yes	4
National Labor Bureau C. J. Simpson, Director 681 Market Street San Francisco	no	
Stanford Research Institute Ravenswood Avenue Menlo Park	yes	2
<u>Government Agencies</u>		
California State Department of Employment George Roche, Chief Research Division 722 Capitol Mall Sacramento	yes	10
California Department of Industrial Relations Division of Labor Statistics and Research Maurice Gershenson, Chief 350 McAllister Street San Francisco	no	

Organization	Relevant research being done	Number of projects
U.S. Department of Labor Bureau of Employment Security A. Merrill Anderson, Regional Director Administration and Management Service 450 Golden Gate Avenue San Francisco	no	
U.S. Department of Labor Bureau of Labor Statistics Max Kossoris, Director, Regional Office 450 Golden Gate Avenue San Francisco	no	
<u>Labor Organizations</u>		
American Newspaper Guild Local 52 821 Market Street San Francisco	no	
Bay Area Council of Carpenters 240 Golden Gate Avenue San Francisco	yes	1
Building Service Employees Union Joint Bay District Council #2 240 Golden Gate Avenue San Francisco	no	
California Labor Federation 995 Market Street San Francisco	no	
California State Council of Carpenters 995 Market Street San Francisco	yes	1

Organization	Relevant research being done	Number of projects
East Bay Labor Journal 1622 E. 12th Street Oakland	no	
California Teamsters Legislative Council Hotel Senator 1131 "L" Street Sacramento	no	
ILWU 150 Golden Gate Avenue San Francisco	no	
Marine Firemen's Union 240 Second Street San Francisco	yes	1
Retail Clerks, Local 770 5955 Hollywood Blvd. Los Angeles	yes	1
United Steelworkers of America District Office #38 117 W. 9th Street Los Angeles	no	