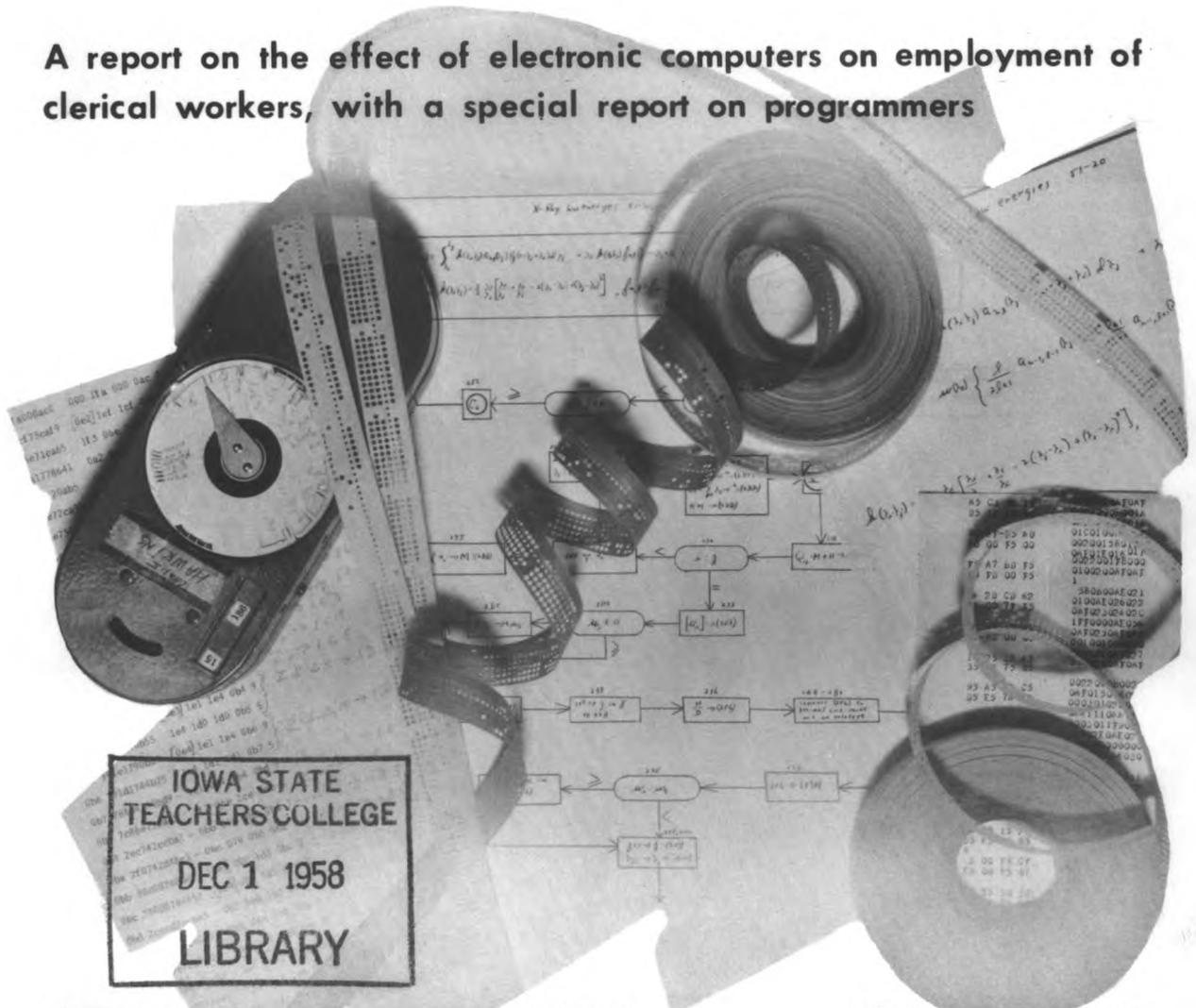


AUTOMATION

and Employment Opportunities for

OFFICEWORKERS

A report on the effect of electronic computers on employment of clerical workers, with a special report on programmers



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UNITED STATES DEPARTMENT OF LABOR
James P. Mitchell, Secretary

BUREAU OF LABOR STATISTICS
Ewan Clague, Commissioner

in cooperation with Veterans Administration

Occupational Outlook Series

Bulletin No. 1241

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October 1958

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For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 15 cents

The Library of Congress has cataloged the series
in which this publication appears as follows:

U. S. *Bureau of Labor Statistics.*

Bulletin. no. 1- Nov. 1895-
Washington.

no. in v. illus. 16-28 cm.

Bimonthly, Nov. 1895-May 1912; irregular, July 1912-
No. 1-111 issued by the Bureau of Labor.

1. Labor and laboring classes—U. S.—Period.

HD8051.A62 331.06173 15-23307 rev*†

Library of Congress r58t2

The Library of Congress has cataloged this
publication as follows:

Paschell, William.

Automation and employment opportunities for office-
workers; the effect of electronic computers on employment
of clerical workers, with a special report on programmers
{by William Paschell and Daniel P. Willis, Jr.} in coopera-
tion with Veterans Administration. {Washington, U. S.
Dept. of Labor, Bureau of Labor Statistics, 1958.

vi, 14 p. illus. 27 cm. (U. S. Bureau of Labor Statistics.
Bulletin no. 1241)

1. Electronic data processing. 2. Clerks—U. S. 3. Programming
(Electronic computers) 4. {Occupations—Description (Business)}
I. Willis, Daniel Phillips, joint author. II. Title. (Series)

HD8051.A62 no. 1241 651.26 L 58-61
Copy 3. HD8039.O32U65

U. S. Dept. of Labor.
for Library of Congress

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†

Foreword

This bulletin on the effect of automation on employment of officeworkers is designed primarily for use in vocational guidance of young people considering the choice of a field of work. The first part contains a general discussion of the implications of the use of electronic data-processing equipment for clerical personnel. The second part discusses in detail one of the new occupations --programmer--which has emerged with the development of automation. The study, financed largely by the Veterans Administration, was originally prepared for use in their vocational rehabilitation and education program. Because of the widespread interest in office automation, the material is being made available for more general distribution.

This study was conducted by the United States Department of Labor's Bureau of Labor Statistics. The bulletin was prepared by William Paschell and Daniel P. Willis, Jr., under the supervision of Cora E. Taylor. Since this study covers a new field, it was necessary to obtain much of the information directly from users of electronic data-processing equipment. The Bureau wishes to acknowledge the generous assistance and cooperation received in this connection from officials of business establishments, Government agencies, and other organizations.

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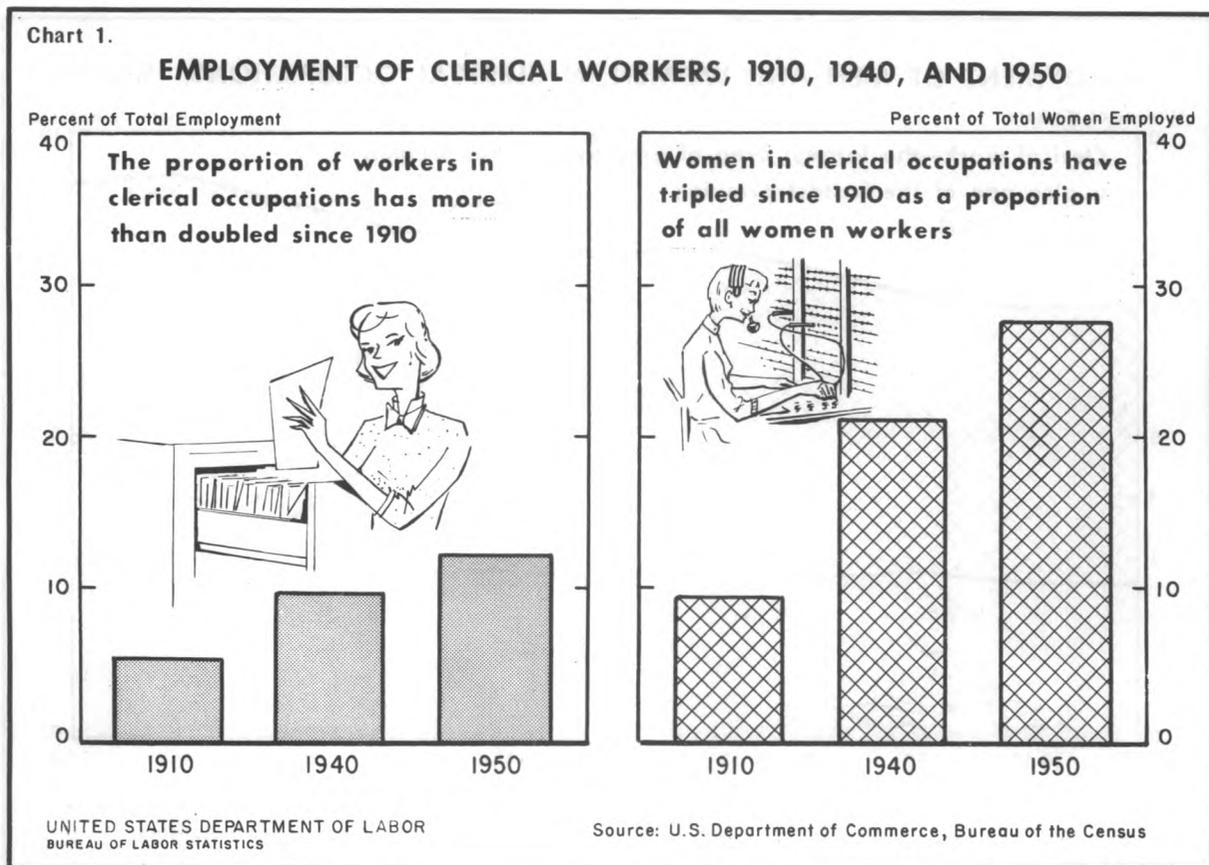
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AUTOMATION AND EMPLOYMENT OPPORTUNITIES FOR OFFICEWORKERS

Introduction

A great force of clerical workers --more than 9 million in mid-1958--is employed to take care of the vast amount of recordkeeping and other paperwork essential to the operation of government and private business. Clerical workers represented about 1 of every 7 workers in the United States in 1958, a higher

proportion than in any previous year. In 1910, only 1 in 20 workers was in a clerical occupation. By 1940, the proportion of clerical workers had risen to 1 in 10, and in 1950 it was 1 in 8 employed workers. Since then, clerical employment has grown more slowly, but it is still increasing faster than the work force as a whole. (See charts 1 and 2.)



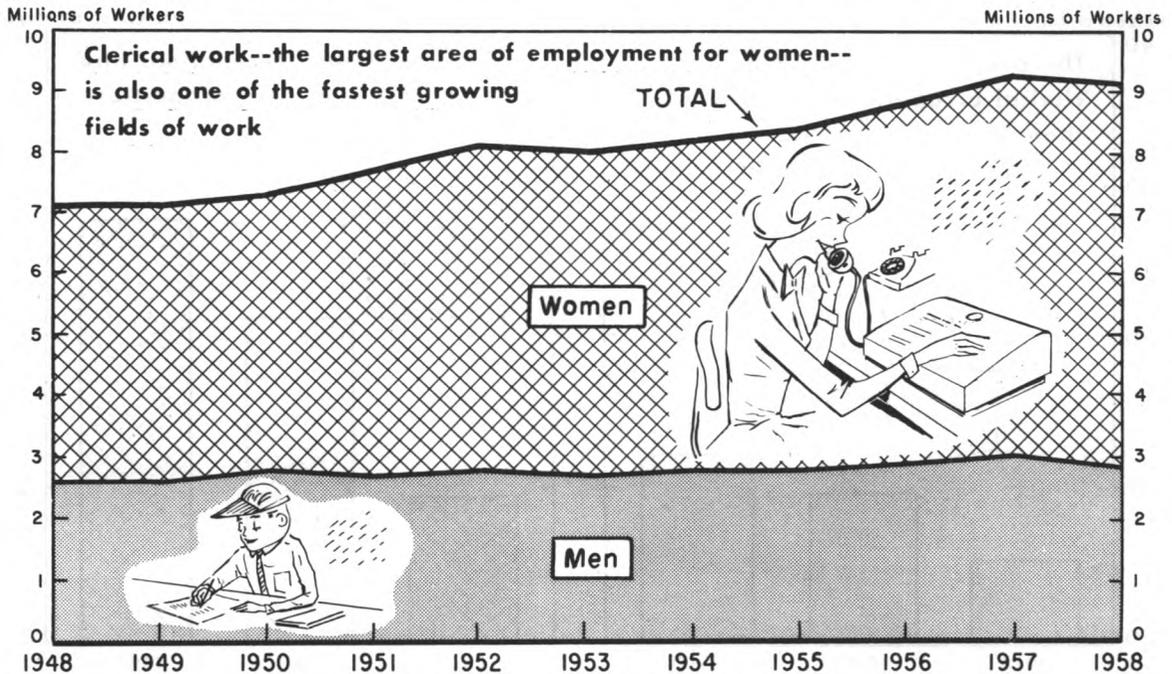
The rapid rise in clerical employment reflects the ever-increasing volume and complexity of the clerical work handled by the Nation's expanding industries and by government agencies. In this work, clerical employees have for many years used typewriters and a variety of other machines, including adding, calculating, bookkeeping, billing, and duplicating machines. More recently, many large offices have installed punch-card equipment--machines which record data on cards by punching holes in them, and which then sort the cards and tabulate and print the data from them. Despite these advances, the number of officeworkers has continued to climb, and employers are constantly looking for new and improved machines to handle the ever-growing workload.

In the last few years, attention has focused on a new development in office machines--the use of electronic computers to handle tremendous amounts of data. Electronic computers have attracted

great interest because of their capacity to perform millions of computations--adding, subtracting, dividing, and multiplying--automatically and with lightning speed. At a government installation, it was estimated recently that it would take one person a year to perform computations on a desk calculator that could be done in about half an hour by a large electronic computer. When a computer is assembled in a unit with various types of related equipment, an electronic data-processing system is formed. Such a system consists of a central computer and "peripheral" equipment including converters which transfer information from punched cards to magnetic tape (or the reverse operation); readers that make the instructions on the tape or cards usable by the computer; and printers that record the final results in a form that can be read. A computer system can automatically do such jobs as prepare payrolls for thousands of employees, control inventory on a multi-

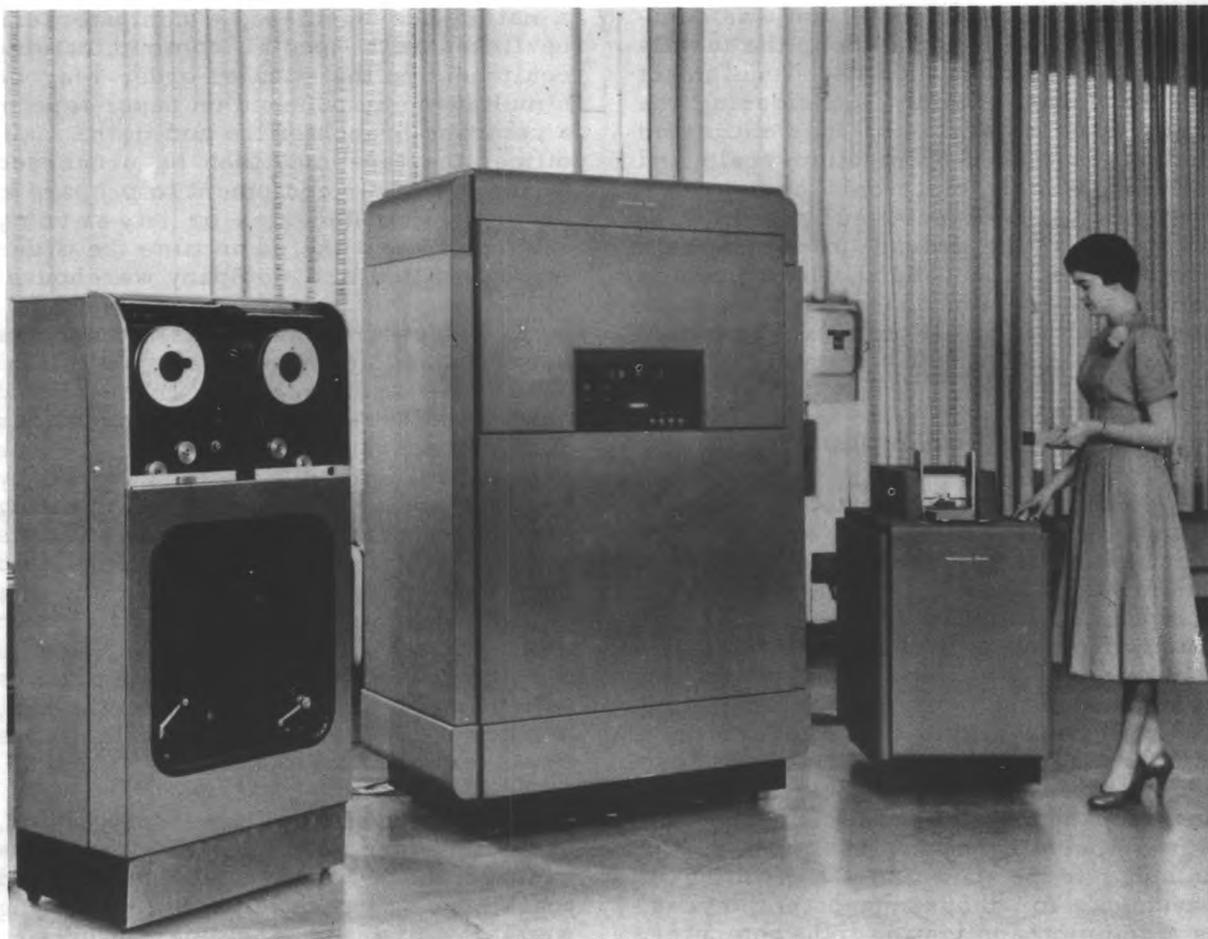
Chart 2.

EMPLOYMENT OF MEN AND WOMEN IN CLERICAL OCCUPATIONS, 1948-58



Source: U.S. Department of Commerce, Bureau of the Census. 1958 Estimated by Bureau of Labor Statistics from Bureau of the Census Data.

UNITED STATES DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS



Operator placing punched cards in a card-to-tape converter

tude of items, or produce speedy results from masses of statistics concerning the entire population of the United States.

Although computers are often described as machines that can "think," this is, of course, not so. Like other machines, they must be operated or controlled by people who start them, feed work into them, make certain they work properly, remove the completed work, and otherwise tend them. Computers are useless unless they are given the proper instructions for performing the many computations necessary for the final result. The people who prepare the instructions are called programmers. Other workers are also needed to aid in preparing the work for the machines. The purpose of this study is twofold: to discuss the implications of automation

for employment in office occupations generally, and to describe in detail one of the major new occupations that has developed in connection with the use of electronic data-processing equipment--that of programmer.

Development of Office Automation

Electronic computers were developed during World War II as an aid in solving intricate scientific and engineering problems such as gunfire control, but their application to the processing of office data is more recent. The Federal Government led the way in 1951, when an electronic computer was installed by the Bureau of the Census to help compile the statistics of the 1950 Census of Population. The first computer

installation in a business firm was completed in 1954. Since then, the installation of computers and related equipment has proceeded rapidly, considering the high cost of the systems. It is estimated that more than 800 medium-scale and 200 large-scale electronic computer systems had been installed by early 1958. At that time, the average medium-scale system cost about \$250,000 or rented for \$7,500 a month; a large-scale system cost more than a million dollars or rented for at least \$25,000 a month.

Application of Automation

Computers can be used to perform many of the accounting and related functions commonly required in large businesses. Electric, gas, and telephone companies, for example, are using computers to make up monthly bills for many thousands of customers; the computing system does the complete job of printing the customer's name and address on a bill, listing each item, figuring the cost, adding taxes and other necessary items, and then adding the total bill. Payroll work, including computation of the amounts to be paid and the printing of paychecks for thousands of employees, is a common application of the computer. In large insurance operations, the machines may be used to prepare notices of premiums due, compute dividends, calculate agents' commissions, make the millions of computations used in actuarial departments, and prepare statistical tables. Some business firms and government agencies use computers in inventory control so that they may know at any time the supply of items of each type in several warehouses or other outlets. Computers are also used to help employers plan for the future--for example, in analyzing the market for goods, forecasting sales, and estimating production requirements.

Some computing systems are built to do a specific job. A central computer, for instance, installed by an airline or hotel chain, stores information gathered from many locations and enables a clerk in one city to answer travelers' questions about available reservations in a matter of seconds. In firms doing

a nationwide business, a computer can be linked with special communications equipment so that a sales order may be simultaneously punched on paper tape in a company branch office and in the main office; the tape may then be processed by the computer equipment to prepare an up-to-the-minute sales or inventory report at about the same time the order is being filled in a company warehouse.

In government offices, computers may be used in large-scale statistical operations or in preparing research and other special reports. The tremendous clerical operation of keeping records for the millions of workers covered by Federal social security and of digesting masses of data collected by the Census Bureau on the population of the United States are areas where computers are especially helpful. A computing system in one State keeps up-to-date records for nearly 5 million automobile drivers --by name, address, date of birth, sex, and driving record--and even determines fines for traffic violations.

In scientific and engineering fields, computers are used in solving problems such as those relating to launching and tracking earth satellites, forecasting weather, simulating oil refinery processes, and controlling the operation of industrial machine tools (sometimes called numerical control). Since these applications involve the employment of relatively few clerical workers, they are not as important for purposes of this report as the use of computers to process masses of office data.

New Occupations Related to Office Automation

The use of electronic computing systems has created a number of new office occupations and has changed the functions performed in others. Some of the new jobs, especially those in programming (see detailed report on programmers), require considerable related experience or education at the college level. Many of the other jobs related to the operation of computing systems also require higher levels of skill and training than are needed for most other types of clerical work. In general, high school graduation is the minimum educational requirement.

The following is a brief listing of jobs which may be found in companies

with large-scale electronic data-processing equipment.

Electronic Computing System Personnel

Job title	D. O. T. No. ¹	Job duties
Project planner	0-68,505	Plans and administers the installation of a data-processing system.
Systems analyst	0-69,985	Devises broad outline of plan to program an operation.
Programmer	0-69,981	Writes the detailed instructions or program used to guide the machine system. A senior programmer may head a team of programmers whose assignments differ in complexity.
Coding clerk	1-36,05	Converts programmer's instructions into special machine "language" or code.
Console operator	1-25,17	Operates the central control unit or console of the electronic computer. Uses program instruction sheets to determine setup of equipment and operating procedures. Keeps operating records such as machine performance and production reports.
Peripheral equipment operator	Operates converters, printers, and other machines which are a part of the electronic system. If machines do not operate properly, he reports this to supervisor.
Card-tape converter operator	1-25,60	
High-speed printer operator	1-25,98	
Key-punch operator	1-25,62	Operates machine to punch series of holes on cards. The holes represent data or coded instructions for the electronic equipment.
Data typist	1-37,32	Operates electric typewriter equipped with special keyboard to transcribe coded program instructions or data on magnetic tape.
Tape librarian	1-20,04	Maintains files of tapes and issues them to electronic machine operators when called for. Classifies, catalogs, and cross-indexes reels of tape according to data content. Prepares record for file reference.

¹The Dictionary of Occupational Titles (D. O. T.) code numbers, unpublished when this bulletin was prepared, will appear in a forthcoming publication of the U. S. Department of Labor's Bureau of Employment Security, Occupations in Electronic Data-Processing Systems.

Because this is a new field, job titles and duties do not follow a well-defined pattern. For example, in some companies, one person may perform the duties of both the analyst and programmer and a different job title may be used. Similarly, many companies do not employ coding clerks since their programmers do coding as well as programming work. In some cases, special workers called "tape handlers" may be assigned to change magnetic tape reels on machines; in other cases, this job may be done by the machine operators. In addition to the workers with special titles, a few clerks, messengers, and other officeworkers perform duties related to the electronic processing of

data. As in other office operations, a unit supervisor is usually in charge of each specific section of work and higher grade supervisors are responsible for broader areas of work.

Effect of Automation on Clerical Workers

Occupations affected by automation

While new occupations are being created because of the use of electronic data-processing systems, other jobs are being abolished or the functions of workers are being changed. In general, clerks employed in routine and repetitive office jobs are the workers most likely to be affected by the installation of electronic equipment. The machines displace many clerks who sort and file office records or operate various office machines--addressing, adding, calculating, bookkeeping, and billing machines. This does not mean that all people in routine clerical jobs will be displaced. For example, in an insurance company that uses electronic computers, clerks are still needed to number, type, and file insurance policies; to check this work for accuracy; to make changes in addresses of policyholders; to keep records of medical examinations; and for other similar functions. Furthermore, clerks in some jobs may be easily shifted to work that is related to the use of electronic computing systems. For example, companies that switch from mechanical punch-card equipment usually use their key-punch operators to prepare the punched cards or magnetic tapes that are fed into computers. Moreover, if additional operators are needed, typists can easily be trained to do this work. Tabulating-machine operators may be upgraded and retrained to work on the new machines.



COURTESY OF NATIONAL BUREAU OF STANDARDS

Tape handler changing tape on one of the machines in an electronic computing system

Clerical workers in jobs requiring the use of considerable judgment or contact with other people--secretaries, receptionists, claim clerks, complaint clerks, and bill collectors, to name a few--are least affected by automation. Moreover, the large occupation of stenographer is not likely to be much affected. For many years, dictating machines and other related equipment have been used, but the number of stenographers

employed has continued to grow rapidly.

Industries affected by automation

The greatest headway in the introduction of electronic data-processing equipment is being made in large organizations, particularly in those which use a high proportion of clerical workers in relation to their total employment. So far, government agencies, insurance companies, and public utilities (gas, electric, and telephone companies) --all of which have large concentrations of clerical workers--have been among the leading users of electronic computing systems; banks also are expected to become major users of computers in the future.

Many big corporations in a wide range of manufacturing industries--electrical equipment, petroleum products, chemicals, aircraft, automobiles, and steel--have also installed electronic computers. These companies not only use their computers as an aid in solving engineering and scientific problems and in the control of machine tools but also to perform office functions such as processing payrolls or maintaining inventories.

A few computer centers have also been set up recently to do data-processing work on a fee basis. These centers provide a new source of employment in the occupations related to operating computer systems. Computer centers, and most of the central and regional offices of big corporations and government agencies, are located in large cities. The effects of automation on employment, therefore, will be greatest in these urban areas.

Prospective effects of automation on employment

Because electronic data-processing machines are capable of performing vast amounts of work with relatively few workers, some people have expressed concern that a large part of the clerical work force may be displaced. So far there is little evidence of this. One of the reasons for installing the new equipment is to make possible the handling of greater amounts of increasingly complex data and to provide additional, more timely reports,

Thus, the net effect may be greater output per person and a declining rate of growth in clerical employment if the use of electronic equipment becomes widespread.

Although it is still uncertain when office automation will have the greatest impact on clerical employment, the effects are not likely to be extensive for several years. Even in such routine jobs as those of file clerk and adding, billing, or calculating machine operator, many employment opportunities should continue to arise throughout the early 1960's. Since large-scale electronic data-processing equipment is complex and expensive, even big companies take time to weigh carefully the advantages of a computing system. It may take many months to complete the studies needed in arriving at a decision to install a computer. After the equipment is ordered, a great deal of time must be spent before the actual installation in order to plan for and to train personnel in its use. Furthermore, most companies spend several months--sometimes a year or more--in so-called "parallel" operations, when the regular clerical staff continues to perform all or part of the work that is being run on the computer. This dual operation gradually tapers off as the details are worked out for a smooth transfer of the functions to the computing system.

In the long run, it is expected that an increasing amount of clerical work in business firms and government agencies will be taken over by electronic computing systems. Employers are faced with the necessity of processing a load of officework that grows heavier as business expands and as functions such as accounting, budgeting, and marketing become more complex. It has been demonstrated that the computers can perform this work with greater speed and accuracy than a large clerical staff. As companies gain experience in using this equipment, they will be able to shift more and more office functions to computers. Smaller and less expensive computers are expected to be used in a growing number of establishments that cannot afford the more expensive computers.



The job of console operator is one of the new occupations arising out of the use of electronic computers

Moreover, other new office machines which will probably become available may be used along with computers to speed up recording, copying, and other aspects of office work.

These developments will not only increase the output of clerical workers and slow down growth in clerical employment, but will also change the character of many jobs. Just as machine bookkeepers have largely replaced hand bookkeepers in big companies, programmers and computer operators may take over the bookkeeping function. The demand for workers in jobs related to computers will continue to grow. Many of the new jobs--methods analyst, programmer, computer-console operator, and other computing-system machine operators--will generally pay better and require higher levels of skill and training than most other clerical jobs. Moreover, a continued increase is expected in the number of officeworkers in jobs not greatly affected by office automation--for example, secretary, stenographer, messenger, receptionist, and others involving contacts with customers and the public.

In the future, as in the past, the greatest number of employment opportunities in clerical work will come from employee turnover. Turnover is exceptionally high in the clerical field, because so many of the workers in these jobs are young women who, after a few years, stop working to marry or to care for children. Employers have cited the high rate of turnover among officeworkers as one of the factors influencing their decision to install electronic computing machines.

The fact that these machines are likely to be used to a growing extent on a shift basis--sometimes around the clock--points to increasing employment of men. Moreover, the extensive use of computing equipment may reduce the number of part-time clerical jobs--most of which are now filled by women. The widespread use of electronic data-processing equipment may reduce the proportion of women employed in clerical occupations. Nevertheless, women will continue to predominate in the clerical field and turnover will provide thousands of job openings each year.

Nature of Work

The occupation of programmer is one of the newest in the country. People in this occupation prepare "programs" for the great new electronic computers, specifying exactly what steps these machines should take to get the desired results. The "program" is put on cards or tapes, as indicated in the first section of this report, and a complete operation such as preparing bills for many thousands of customers can then be done at amazing speed by the electronic computer and its peripheral equipment ("readers," converters, and printers). Programmers usually specialize in 1 of the 2 main types of work on which computers are used--processing the great masses of data which have to be handled in large business and government offices, or solving scientific and engineering problems.

There are four main steps in programming--analyzing the problem, preparing a flow diagram, writing detailed instructions, and making sure the program works on the computer. The programmer uses his knowledge of what the computer can do and his familiarity with the subject matter of a problem to plan the most efficient way of using the computer. For example, in planning to use an electronic computer to do the vast amount of clerical work involved in making up a payroll--computing gross and net pay, typing and sorting paychecks, and keeping records--the programmer analyzes how payroll records are prepared. To understand the kinds of reports needed and their timing, he may have discussions with company personnel at all levels. When all the information is assembled, the programmer prepares a flow chart showing the logical order in which various operations must be performed by the machines. He then writes the many hundreds--sometimes thousands--of program instructions. The final instructions are coded into special machine language which is converted into holes on punched cards and paper tapes or marks on magnetic tapes.

Finally, the programmer must have several trial runs of the cards or tapes made on the computer in order to "debug" his program (check its accuracy). To complete this entire process may take a few months or a year or longer, and the instructions prepared may fill several bulky volumes.

Programmers engaged in solving scientific or engineering problems also perform analytical work, prepare flow charts, write instructions, and test their programs. In this work, however, the programmer deals chiefly with scientists and mathematicians who give him the problem in complicated mathematical formulas which he has to simplify into arithmetic forms the computers can handle. This "numerical analysis" can be applied to many types of research problems; for example, in connection with missile designing, the computer can be used to give answers to a variety of simulated flight problems. The basic idea is to mathematically imitate a physical situation and, by solving the equations, anticipate the results without actually seeing or doing an experiment. In one of the newest applications, a few programmers prepare instructions for the electronic devices that control machine tools in factories; these devices make it possible to produce aircraft parts and other products with greater precision and speed than when machines are controlled by human beings. In this type of work, sometimes called "numerical control" of machine tools, programmers often work closely with engineers and skilled machinists.

In big offices with large computing systems, several programmers at different levels of responsibility may work as a team on one problem. A senior programmer may have overall responsibility for the entire program and may direct other programmers. Beginning or junior programmers are usually assigned to write specific parts of broad programs. Methods, systems, or procedure analysts are sometimes employed to do most of the analytical

work required for programming and to make recommendations as to whether a particular operation can be handled efficiently by a computer.

Where Employed

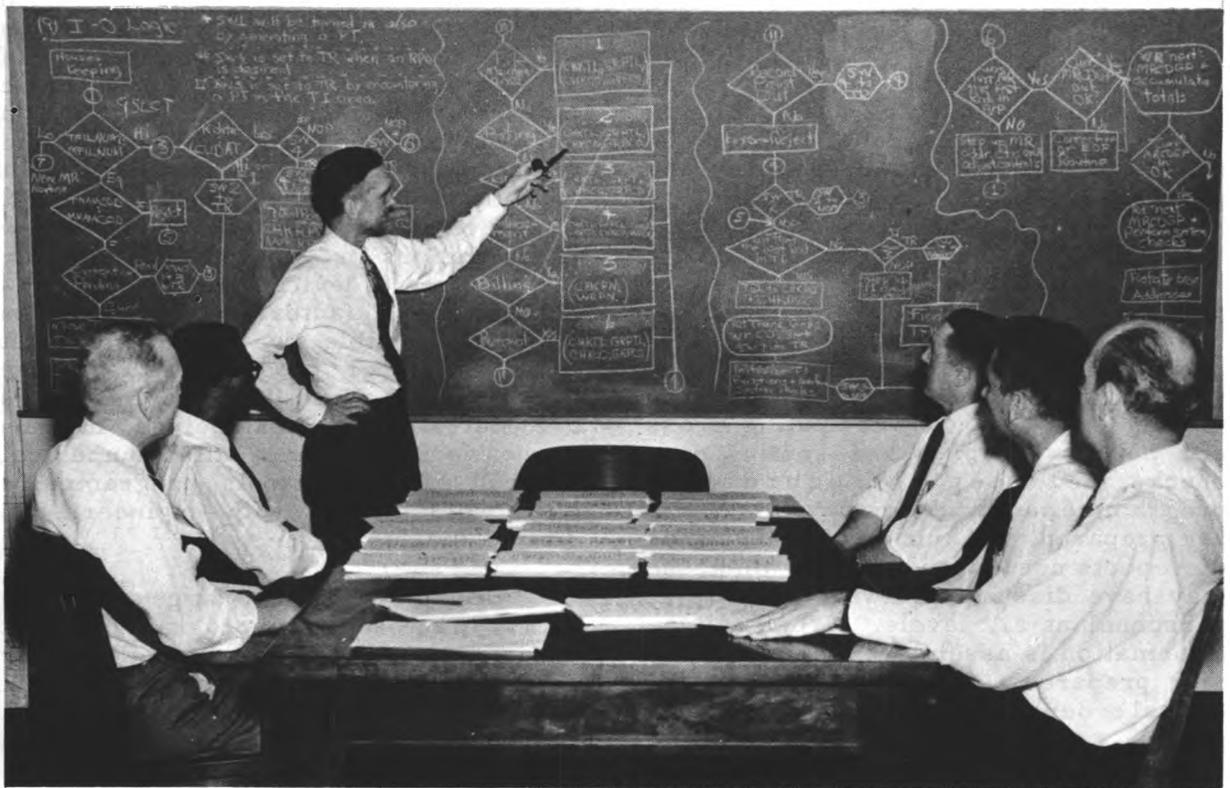
Several thousand programmers were employed in 1958, chiefly in metropolitan areas where the main offices of corporations and government agencies are located. Insurance companies, public utilities, and government agencies are among the leading employers. Programmers are also employed in many manufacturing industries--electrical equipment, petroleum, chemicals, aircraft, automobiles, and others--and in scientific and engineering laboratories, and in newly established computer centers.

The number of programmers employed by a company depends not only

on the size and number of electronic computers in use, but also on the number and complexity of the operations being programmed. A company with 1 large computer may employ from 10 to 30 or more programmers; one with a medium-sized computer may have only 2 or 3 programmers. A number of large companies have several giant computers, although usually only one is at any one office or plant. At each location, one or more medium-sized or small computers may also be used.

Training, Other Qualifications, and Advancement

Companies have been filling most positions in this new occupation by selecting employees familiar with the subject matter to be programmed and giving them training in programming work. Since many of the office operations



COURTESY OF VETERANS ADMINISTRATION

Senior programmer pointing out steps in a flow diagram to other members of a programmer team

which are being taken over by electronic computers involve accounting work, employees with experience in accounting departments have often been selected for programmer training. However, new college graduates are sometimes hired as trainees, particularly for programming scientific work.

Men are preferred as programmer trainees in most areas of work. Although many employers recognize the ability of women to do programming, they are reluctant to pay for their training in view of the large proportion of women who stop working when they marry or when they have children. Opportunities for women to be selected as trainees are likely to be better in government agencies than in private industry.

To find out which individuals have an aptitude for programming and should therefore be selected for training, most companies give general intelligence tests and special tests which measure the ability to think logically and do abstract reasoning, and then interview the people with the highest test scores. Personal characteristics considered important for this occupation include patience, a logical and systematic approach to the solution of problems, and the ability to work with extreme accuracy, paying close attention to detail. Imagination is also an asset, since programmers often have to devise new ways of attacking a problem.

Training in programming is usually given at company expense--often in special schools established by the manufacturers of electronic computing equipment, although large companies which have used computers for several years are beginning to develop their own training programs. Trainees usually spend a few weeks in lecture courses, combined with practical demonstrations of the electronic computing system used by their company. After completing the basic program, trainees practice writing and coding instructions and testing them on the computers. Those who complete this basic program satisfactorily are finally selected as programmers and are usually given several weeks of additional prep-

aration at the company before starting on their first regular assignments. Further training is generally necessary when a company introduces a new type of computer.

Educational requirements have been changing rapidly in this new occupation and may continue to do so. A college degree or equivalent experience is required for all entry programming positions in the Federal Government. In private employment, college graduation is less likely to be required for programmers of office data, although courses in business administration including accounting and statistics are very helpful. Many employers no longer stress a strong background in mathematics for programming of business or other mass data if candidates can demonstrate an aptitude for the work. However, programmers of scientific and engineering problems are usually college graduates with a major in one of the sciences or in engineering and some courses in mathematics.

A growing number of courses in electronic data-processing are becoming available in colleges and universities. Such courses help young people to decide whether they like this type of work and may also help experienced programmers to advance to higher level jobs. About 15 colleges and universities have computing centers and offer programs of computer training including basic courses such as the mechanics of computers, the general logic of programming, and coding for computers, and also advanced courses for managerial personnel. Many other colleges offer one or more courses relating to the use of electronic computers.

Chances for advancement are good in this expanding occupation. In large companies, the junior programmer may become a full-fledged programmer after a year or two of experience and later may be promoted to senior programmer in charge of a team of programmers, or perhaps to methods, systems, or procedures analyst. Promotion is also possible to higher positions such as manager in charge of program analysis,

manager of the computing center, and vice president in charge of methods research.

Employment Outlook

Employment opportunities for programmers are expected to remain very favorable through the early 1960's. Additional programmers will be needed both by employers already using electronic computers, and by those planning to install such equipment. Fewer openings are anticipated in the scientific and engineering field than in programming of office and other mass data. However, the number of qualified candidates for programmer jobs may also be smaller in the technical field, since college graduates with a background in mathematics, science, and engineering--who are preferred for these programming jobs--will be in strong demand for many other types of work.

Continued expansion in employment of programmers is expected over the long run, owing to the same general factors which have led to the increased use of electronic computing systems in the recent past. In offices where the volume of recordkeeping is great, there will continue to be need to reduce the cost of processing tremendous amounts of data and to produce better, more timely reports on which management decisions can be based. Expenditures for scientific and engineering research and development are expected to remain high, and electronic computers will be used as an aid in solving, with extraordinary speed, more and more scientific and engineering problems. Computers will also be used increasingly to work out problems connected with automation of factory processes. Thus, employment of programmers will grow, as additional business establishments and government agencies install their first computers and others expand their computing systems. The Federal Government, which had approximately 100 automatic data-processing installations operating in connection with office-type work in June 1957, planned to install about 35 more shortly thereafter. An increasing number of small companies are expected

to acquire computers and employ programmers, owing to the development of smaller, less expensive equipment designed for use where the volume of work is not large enough to warrant the purchase of elaborate equipment. Furthermore, replacement needs resulting from retirement and death of programmers will provide an increasing number of job openings in the years ahead, since many persons trained in the 1950's were mature employees with several years of working experience.

New technological and other developments may affect the amount and quality of the work of the programmer. For example, the use of programming libraries (files of tested programs) and automatic programming has already eliminated some of the routine work necessary in programming. Extensive use of such aids may reduce the need for some types of programmers and raise the qualifications required for others. Another development which may affect employment opportunities in this occupation is the establishment of additional computing centers which would perform services for clients on a fee basis. Pooling of work in these centers may lead to some reductions in the number of programmers needed by individual companies. Any decreases of this kind, however, are likely to be more than offset by expansion in the programming staffs of the centers, which look forward to a great amount of business from small companies.

Earnings and Working Conditions

Information on programmers' salaries in companies which use large electronic computing systems mainly for office-type operations indicates a wide range in salary levels. This results partly from differences in the complexity of programming operations and the fact that salary levels have not yet become well established in this new occupation. Junior or beginning programmers had starting salaries ranging from \$3,600 to \$5,400 in 1957. Salaries are generally increased annually for a few years--up to a maximum of \$4,500 to \$7,100 for junior programmers. Minimum salaries



COURTESY OF U. S. WEATHER BUREAU

Programmer "debugging" her program on a medium-sized electronic computer

of experienced programmers promoted to the semisenior level generally ranged from \$4,500 to \$6,500, and their maximum salaries were from approximately \$6,000 to more than \$8,500. At the senior programmer level, the range of minimum salaries was from \$5,200 to nearly \$8,000 annually, and maximum earnings were from about \$7,000 to approximately \$12,000. Higher salaries are earned by top-level administrators responsible for programming work.

The Federal Government paid most beginning programmers \$4,040 a year in mid-1958. Some with higher qualifications received a starting salary of \$4,980.

The standard workweek for programmers is usually 35 to 40 hours, depending on the industry. Although the

operators of computing systems (those at the computer's control panel, or operators of the machines that convert and print information) may be on a 2- or 3-shift basis, programmers only occasionally work evenings or weekends --for example, when they have difficulty "debugging" a program. Like most other officeworkers, programmers usually receive liberal vacations, paid holidays, and sick leave, and are also covered by life insurance, pension, hospital, medical, and other employee-benefit plans.

Programmers usually work in well-lighted, air-conditioned, modern offices. Employers make special efforts to provide better than average surroundings for programmers, so that they may concentrate to achieve the extreme accuracy necessary for programming.

Where To Go for More Information

Persons interested in programming jobs can apply directly to large companies that have or are planning to install electronic computing systems.

Information on companies that had electronic data-processing equipment early in 1957 is available in A Second Survey of Domestic Electronic Digital

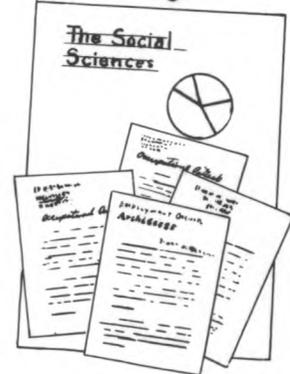
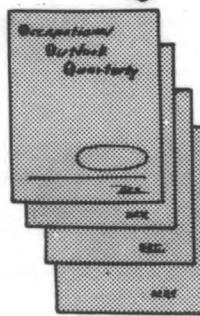
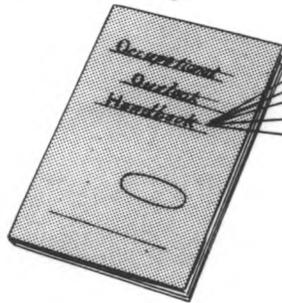
Computing Systems, U. S. Department of Commerce, Office of Technical Services, 1957. (Available from the Department of Commerce, Washington 25, D. C. Price \$7.)

Information about programmer jobs in government agencies can be obtained from the U. S. Civil Service Commission and from the appropriate local civil-service agencies.

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