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ABSTRACT

The report describes an experimental study involving an on-line placement system in Boulder, Colorado which permitted applicants to request information from a terminal on any job stored in the computer. Data were collected on applicants referred by the Employment Service: whether or not hired, reason for not being hired if not hired, applicant characteristics, and job characteristics. A telephone follow-up, made approximately 150 days after placement, determined tenure on the job, wage rate, hours worked, reason for termination, and date of termination when applicable. Applicants who were referred as a result of a computerized job search had a better chance of finding jobs, stayed on the job longer, and earned more money than applicants referred through self-service microfiche readers. There was not evidence, however, that the computer increased the chances of placement or duration on jobs over those achieved by manual applicant searches for special target groups. Speed of retrieval and consequent cost decreases favor the computer search procedure over the manual. With better applicant and job descriptors, the system could likely be improved. Nearly 50 pages of appendixes provide an abridged version of the users' guide, referral status file descriptors, and regressions. (Author/JR)

Report DLMA 21-26-74-21-1

A STUDY OF ON-LINE USE OF JOB INFORMATION IN EMPLOYMENT SERVICE LOCAL OFFICES

Volume I: An On-Line Experiment

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October 1975

Final Report for Period February 15, 1974 - October 31, 1975

Prepared for

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This report is available in two volumes. Volume I describes an on-line job matching experiment in Boulder, Colorado, which collected information on placements, referrals and duration of jobs referred by an on-line system versus other means. Volume II describes the simulation of computerized job matching modeled after the activity in Salt Lake City, Utah.

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16. Abstracts

The study was an experiment in the use of an on-line placement system in Boulder Colorado. The experiment permitted applicants to request information from a terminal on any job stored on the computer. Every long term job order received by the local office resulted in a search against the applicant file. Data were collected on applicants referred by the Employment Service: whether or not hired, reason for no hire if not hired, applicant characteristics, and job characteristics. A telephon follow-up, made approximately 150 days after placement, determined tenure on the job, wage rate, hours worked, reason for termination if the applicant was no longer workin and date of termination. Results of comparisons between computer assisted placement of applicants and placement by other means are presented. The costs, benefits & design of an optimal job matching system are discussed.

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ABSTRACT

A computer terminal was installed in Boulder, Colorado. It was connected to the University of Michigan computer in Ann Arbor. Before the experiment, jobs received by the Employment Service statewide had been sent to Denver each evening and converted to microfiche for distribution to local offices. The experiment permitted applicants to request information from a terminal on any job stored on the computer. Job orders for permanent jobs received by the local office resulted in a search against the applicant file. Applicant cards were pulled from a manual file and further screened.

Data were collected on applicants referred by the Employment Service: whether or not hired, reason for no hire if not hired, applicant characteristics, and job characteristics. A telephone follow-up, made approximately 100 days after placement, determined tenure on the job, wage rate, hours worked, reason for termination if the applicant was no longer working, and date of termination.

Applicants who were referred as a result of a search of computerized applicant files had a better chance of finding jobs, stayed on the job longer and earned more money than applicants referred through self-service microfiche readers. However, applicants referred through manual applicant search and walk-in applicants who saw an employment officer, also had a better chance of being placed than did applicants who were referred through the self-service use of microfiche.

Applicants referred by computer or manual employer search stayed on the job longer than applicants referred by other methods such as self-service and job development. However, manual applicant searches were done only for special target groups such as veterans that were given special priority. Therefore, there is no evidence that the computer increased the chances of placement or duration on jobs over those achieved by manual applicant search.

Speed of retrieval appears to be the main advantage of the computer over manual applicant search. If the computer holds adequate information, a computer applicant search can be carried out in seconds. A manual search takes 15-20 minutes.

Use of the computer to make job searches was expected to be an important advantage of an on-line system. Applicants would be given a computer search if they had trouble locating a job in the immediate area or if they wanted to search on criteria other than their exact occupational codes. However, very few applicants were placed in this manner. Not a single job search resulted in a job in the Denver area, only an hour's drive from Boulder.

It is possible that the computer would make more difference in both applicant and job searches in a large city like New York or Los Angeles, where manual methods would be much more costly. It is also possible that if better applicant and job descriptors were provided, a computer system would make more difference. Finally, a computer can be helpful in a counseling situation even if it doesn't lead to a placement.

In the computer simulation described in Volume II, an office with an on-line computer system was modeled to permit simulated allocations of employees and machines. Volume II demonstrates that simulation can be a useful planning tool for local Employment Service office managers.

Acknowledgments

The list of people deserving our thanks is very long. We received excellent cooperation at all levels. Betty Christgau, the project monitor, and Joe Epstein, Herman Travis, and Howard Rosen of the Office of Research and Development, Manpower Administration, U.S. Department of Labor, all took a great interest in the project and provided many helpful suggestions.

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Ted Maughan, A. Barclay Gardner, Edna Smith, Gordon Thiriot, Blaine Pitts and Roy Findley of the Utah Department of Employment Security cooperated completely with the time study of the Salt Lake City local office. Special thanks go to Lee Blakesley and his entire staff at the Salt Lake City Placement Center who participated in the time study.

Set Theoretic Information Systems Corporation of Ann Arbor made a data management support package available. Charles Holt made several useful suggestions on an earlier draft of the report.

It is the staff of this project to whom thanks are most due. Michael A. Kahn served as the principal consultant for information and systems and designed the local office model. Donald Rumelhart had primary responsibility for the MICRO system and the systems staff. Boyd Bronson helped considerably with training and programming. Vaughn Frick wrote the local office simulation program. Kurt Kovacs worked on the referral data base, and Susan Tuin served as the administrative assistant.

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CHAPTER ONE

MAJOR FINDINGS

An experimental computer assisted job-applicant matching system installed in Boulder, Colorado, highlighted some of the benefits and limitations of computerized job matching. (A chapter reference is given for each finding. All references are to Volume I unless otherwise noted.)

1) It is feasible to transmit data from a data communication computer in one state to a central computer in a remote state such as a regional office. The primary advantage of such a configuration would be to minimize software costs, not to open up job orders to a wider clientele. During the experiment not a single applicant found a job in Denver using the computer. The computer was used as a device to screen jobs that met the applicants' specified criteria. Denver was one hour away from Boulder. (Chs. 2 and 5)

2) Two different modes of computer search were used in the experiment. In the first mode a search of the job file was made for an applicant. In the second mode a search of the applicant file was made against a given job order. The first mode was used infrequently and when used had little impact on improving the probability of placement. The second mode was used for every permanent job order and significantly increased the probability that the applicant chosen would find a job compared to applicants selecting their own job from self-service microfiche. (Chs. 2 and 3)

3) In Salt Lake City very little use is made of the computer terminal for actual job matching. Most job matching occurs when an applicant finds his own job posted on the board or if the computer matches an applicant against a job order in the evening. (Vol. II, Ch. 5)

4) The benefit of the computer terminal for job matching depends critically on the size of the applicant job files. It is possible that in a large city such as New York or Los Angeles the computer can be

beneficial for both helping applicants that come into the office searching for a job as well as searching for applicants when a job order arrives.

5) The Dictionary of Occupational Titles (DOT) was used as the primary search code for searches against applicant files. This code proved to be an inadequate descriptor, necessitating manual screening of applicant cards. A better search field would be a descriptor based language such as DECAL currently being developed by the Department of Labor. Only 20 percent of the placements made had identical applicant and job DOT's. (Ch. 2)

6) During the experiment the Boulder local office referred the majority of their applicants through use of self-service microfiche. This method was supposed to cut down on employment officer time and hence increase productivity. However, the ratio of placements to referrals was so low with this method (10%) that while employment officers spent less time servicing each transaction they had to service more transactions. Employers had to see more applicants before they found a suitable applicant. These factors probably led to a drop in job orders placed in the Boulder office, sharper than at other Employment Offices in the state. (Ch. 3)

7) It was originally thought that there would be significant differences in placement rates between centralized mode and individualized mode. In centralized mode a single terminal operator does the job search for an applicant seeking a job. In individualized mode each employment officer does his own search. However, so few job searches were done by employment officers for clients in the office that the differences in placement rate by mode could not be tested. (Ch. 3)

8) Inability to locate applicants matched by the computer for a given job was a major problem. A suggestion made but not tried was to assign applicants a unique code and record this on a telephone recorded message. Applicants could call the recording any evening. If their numbers were recorded and they appeared the next morning at the office they could be screened and given first preference for a job referral. Applicants not matched would be given a lower priority on referrals. (Ch. 3)

9) The use of the terminal eliminated the need to preset rigid criteria for applicant search. If the terminal operator did not find any applicants she could often slightly change the criteria until a suitable applicant was found. This appears to be an intriguing area for further experimentation. (Ch. 3)

10) There was a definite learning effect in computer placements. As the terminal operator became more experienced, the placement rate increased. However, an economic downturn in the economy offset the learning effect toward the end of the experimental period, leading to a decline in the placement rate. (Ch. 3)

11) A multiple regression model was developed to predict the probability that a given applicant using a given method of referral would find a given job. The model for example predicted a probability of near zero for a white college student using self-service mode to find a permanent job in a professional occupation requiring experience. The probability was near 1 for a Spanish applicant called in August or September, 1975, as a result of a manual search in a benchwork or structural occupation for a part-time job requiring only basic literacy. (Ch. 3)

12) In most employment offices, employment officers searching files or microfiche to help applicants find jobs or find applicants for a given job could do as good or a better job as the computer in a local office the size of Boulder as measured by probability that a job referral would result in a placement. (Ch. 3) However, the computer can do the search faster. If each state had to make a major investment in new software to make job matching possible, it is unlikely that the job matching would be cost effective. However, if job matching can be done through regional centers or if software is developed centrally and distributed to each state, the matching systems can be cost effective. (Ch. 5)

13) The computer can provide many new services to employers and applicants in addition to job matching, such as customized job order taking for employers. With customized order taking, the computer can recall information about previous orders, saving the employer time in

describing job duties and saving the order taker time in writing up orders. Much more detail can be stored about jobs than would be possible under existing arrangements. The computer can restore the personalized touch by recalling information about the employer.

14) A continuous wage history of persons employed in Colorado was used to determine wages and tenure on the job of applicants placed by the Employment Service. A telephone follow-up supplemented information collected from the wage history. Tenure information was obtained on 85% of the placements. Persons placed by computer and manual search were employed the longest and received the highest aggregate wage during the period from placement to follow-up. (Ch. 4)

15) A simulation can be an effective tool for a local office manager to use to evaluate the effect of different configuration on client flow. (Vol. II)

The foregoing conclusions were based on a pilot study in Boulder. The findings may not of course hold true for all Employment Service offices. Limitations of the study are discussed in Chapter Six.

CHAPTER TWO

BACKGROUND

The United States Employment Service has automated the placement of applicants through computerized job matching in selected areas. The Utah Employment Service developed the first State Job Matching system; other matching systems have been developed for New York, Milwaukee, and California. The California system was shut down, however, due to lack of resources. Plans for matching systems are underway in other states.

Most evaluations of matching systems have been limited. They have been primarily concerned with data on placements before and after the system was initiated and have failed to isolate other factors which may have contributed to increases or decreases in placements.

This study has been developed as an aid to policy makers concerned with the relative benefits and costs of on-line systems. Its purpose has been to analyze the usefulness of such systems, but its techniques have far wider applicability. Other manpower programs could be evaluated by modifying the various models described in this paper.

Previous Research

The study is a continuation of a project which was started in 1970 and funded by the Manpower Administration to develop prototype labor market information systems. One of several by-products of the earlier study was a prototype information-storage-and-retrieval system called MICRO that can be used by employment officers to match applicants to jobs or vice versa.[1] MICRO was used in the current experiment.

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[1]For a complete description of this project, see the final report by Malcolm S. Cohen, On the Feasibility of a Labor and Information System, Institute of Labor and Industrial Relations, University of Michigan-Wayne State University, Ann Arbor, 1974, 3 Volumes.

In the earlier study, a terminal was used in a primarily counseling situation to aid counselors in helping youth find jobs. In that context, the counselors felt the terminal was a useful aid. That evaluation was based upon subjective evidence; i.e., the counselors' opinions. In a counseling situation, an applicant can often be helped without being placed if he is counseled to go back to school or to change career lines.

Purpose of Study

The purpose of the current study is to use objective evidence such as data on referrals, placements, and tenure on the job in a full-service local office environment rather than in an office whose primary objective is youth services and counseling. The Boulder, Colorado, local office was selected by the Denver Regional Office of the Manpower Administration and the State of Colorado Division of Employment as the site for this experiment.

Organization of Report

Chapter 3 discusses the results of comparisons between computer-assisted placement of applicants and placement by other means.

Chapter 4 discusses a follow-up study carried out by the Colorado Division of Employment. Employers were contacted by telephone three to four months after placement to determine the employment status or termination date of each applicant. Since the Colorado Division of Employment maintains wage records on most persons employed in the state, it was possible to compare the quarterly wages of those placed by computer-assisted methods with those placed by other means.

Chapter 5 discusses the costs, benefits and design of an optional matching system.

Chapter 6 summarizes some limitations of the study.

Description of Experiment

An on-line placement system was installed in the Boulder, Colorado, office of the Employment Service. The system included one terminal with access to the University of Michigan computer in Ann Arbor. Nightly

transmission of applicant and Job Bank data made possible an up-to-date data base. Card images were transmitted from a Mohawk Data Systems key-to-disk computer to the University of Michigan's IBM System 360/67 in Ann Arbor. All Job Bank data received by the state for inclusion in the next day's Job Bank microfiche distribution was transmitted to Ann Arbor; the transmission included applicant characteristic and referral data recorded by the local office in the preceding two to three days. This delay was part of the normal Colorado Employment Service operating procedure.

Each Employment Service office in the state was receiving microfiche copies of the state's job orders. Separate microfiche listings were available at the Boulder office for the Boulder-Longmont area, the rest of the metropolitan Denver area, and the rest of the state. Thus, an applicant might have had to search several microfiche listings in looking for a job.

The State of Colorado Division of Employment and the Department of Labor Regional Office selected the Boulder office for the experiment because it was expected to be stable during the experimental period. Chapter 6 describes some limitations of the site.

The on-line system tested in Boulder involved no new forms and required virtually no programming by the Colorado Division of Employment. For the most part, it used existing Employment Service data.

The design and operation of an optimal matching system for Colorado would cost several million dollars over a 3-to-4 year period. Such a system is described in Chapter 5. The optimal matching system would use descriptors for both applicants and jobs. Codes from the Dictionary of Occupational Titles were used to describe applicants and jobs in this experiment.[2]

In the experiment, job orders, descriptions and job titles were coded in free form English and could be retrieved. Job titles or job descriptions could be accessed by a key word or any part of a key word; i.e., Engl for English. In this example, the computer would retrieve

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[2]U.S. Department of Labor, Dictionary of Occupational Titles, Third Edition.

all orders containing any words starting with "Engl."

Research Issues

The major research questions the Boulder experiment dealt with were the ways in which placement rates, percentages of referrals not qualified, numbers of placements, wage rates and retention rates[3] differed among different modes of placement. Modes used in the experiment included the following:

1) Search of computer applicant file by terminal operator using the computer terminal as a job order is received.
2) On-line search of job file for an applicant who walked in.
3) Self service using special job listings prepared on the computer terminal, but which could have been prepared in batch mode. The listings were organized by whether experience was required on the job. Within each experience group the listing was organized by occupational code (DOT).
4) Job development by an employment officer.
5) Employment officer referral of walk-in applicant to jobs of which employment officer was aware.
6) Employment officer search using microfiche to help an applicant find a job.
7) Self service using microfiche. The microfiche were organized by office and occupational code (DOT).
8) Manual applicant search leading to the applicant being called in.

Other research questions of interest are listed below.

1) On a selected basis, applicants who had difficulty finding jobs in Boulder were told that they could be given a computer search of any jobs in the state. How many placements were made in Denver, a one-hour drive from Boulder, as a result of computer job searches?
2) Two modes of terminal operation were possible: individualized mode and centralized mode. In individualized mode, each employment officer personally used the terminal for job

[3]For a discussion of retention rates see Chapter 4.

searches. In centralized mode, one person did all job searches for the entire office. What factors made one mode of operation more attractive or feasible than the other?

3) In order to assess the relevance of search criteria, it is useful to compare the descriptors of the applicant placed in a job with the descriptors listed in the job order. The Colorado manual system uses occupation codes for primary occupational classifications. When job DOT codes were compared with applicant DOT codes, how many actually matched?

4) How did placements in the Boulder local office compare with those in other local offices during the period of the experiment?

5) The Institute of Labor and Industrial Relations has developed a prototype information system, MICRO. MICRO allows users to ask English-like questions about data stored in the computer. Under what circumstances was this retrieval tool useful in job placement?

6) Which demographic characteristics increased the probability of placement success?

7) What were the characteristics of hard-to-place applicants in the sample?

A number of other research issues - the methodology for selecting the optimal number of terminals, the ratio of employment officers and receptionists to terminals in the individualized mode, and the optimal number of microfiche readers were considered. They are addressed in the simulation experiment described in Volume 2.

MICRO Information Storage and Retrieval System

Employment officers were able to make use of the MICRO Information Storage and Retrieval System developed by the Institute of Labor and Industrial Relations.[4] The MICRO system allows Employment Service

[4]Two volumes are available which describe the system: Michael A. Kahn, Donald L. Rumelhart and Boyd L. Bronson, MICRO Information Retrieval System MICRO Training Manual, and Technical Reference Manual, the Institute of Labor and Industrial Relations, University of Michigan-Wayne State University, Ann Arbor, Michigan.

personnel to ask the computer structured questions in an English-like language without the intervention of a programmer. For example, an applicant may have wished to consider only those jobs in Denver County paying over $5.00 an hour in a certain occupation. To make such a request to the computer, an analyst could say "FIND IN JOBS WHERE MIN-PAY>5.00 AND DOT IS 013156 AND COUNTY IS DENVER."

Data Files

As a result of the experiment, four major data files (exclusive of the data described in Chapter 4) were created:

1) Applicant Data File
2) Job Data File
3) Job Description Data File
4) Referral Status Data File

The Applicant Data File contained characteristics of applicants registered in the Boulder office and was searched every time that office received a job order. Appendix A contains a list of fields found in the Applicant Data File.

The Job Data File contained summary codes about every job in the statewide Job Bank and was accessible to employment officers wishing to aid applicants searching for a particular job. See Appendix A for a list of fields in the Job Data File.

The Job Description File contained descriptions of jobs in free form English. These descriptions were part of the standard Job Bank system. Queries about the data stored in this file were made by searching for a key word or part of a key word. Descriptions could be printed out for any job order selected. See Appendix A for hypothetical job descriptions.

The Referral Status Data File was primarily used to evaluate the computer experiment. It could also be used by the manager of an Employment Service local office for evaluating local office performance or for employer development. The file contained information on each referral made by the Boulder office. This information included data on the job, applicant, date of referral, and date of placement. When no placement was possible, it listed causes; i.e., "not qualified" or

"another applicant selected." See Appendix B for the file description.

The experimental period ran from July 1 through October 30, 1975, although data was collected before and after the experiment. Prior to the experimental period, a training session was given. A user's manual was prepared and is excerpted in Appendix A.[5]

Activity in the Local Office Before the Experiment

For many years, the Boulder office kept statistics on placement transactions, which are shown in Figure 1. A notable yearly increase in placements from 1970 to 1973 is followed by a decline in 1974.

A model was developed to relate placement transactions in Boulder to trend changes, seasonal factors and economic conditions in the Boulder-Denver labor market area. This model makes it possible to explore the question whether or not the 1974 decline in placements can be explained by the decline in the business cycle and whether the months selected for the experiment are typical or atypical in terms of number of placements.

The model we developed follows:

$$P_t = B_0 + B_1 UR_t + B_2 JANUARY \ldots B_{12} NOVEMBER$$

where P_t is the number of placement transactions in a given month

UR_t is the unemployment rate in the Boulder-Denver SMSA measured on a residence basis for the month

JANUARY = 1 in January; 0 otherwise

FEBRUARY = 1 in February; 0 otherwise

ETC.

Coefficients and t statistics estimated from the model are shown in Table 1. The t statistics measure the statistical significance of a variable. It is accepted with a 95 percent probability that a variable with a t greater than 2 is significantly different from 0. The dummy variables, January to November, measure the difference expected in placements between any given month and December with the

[5]The availability of the reference and technical manual is discussed in Footnote 4.

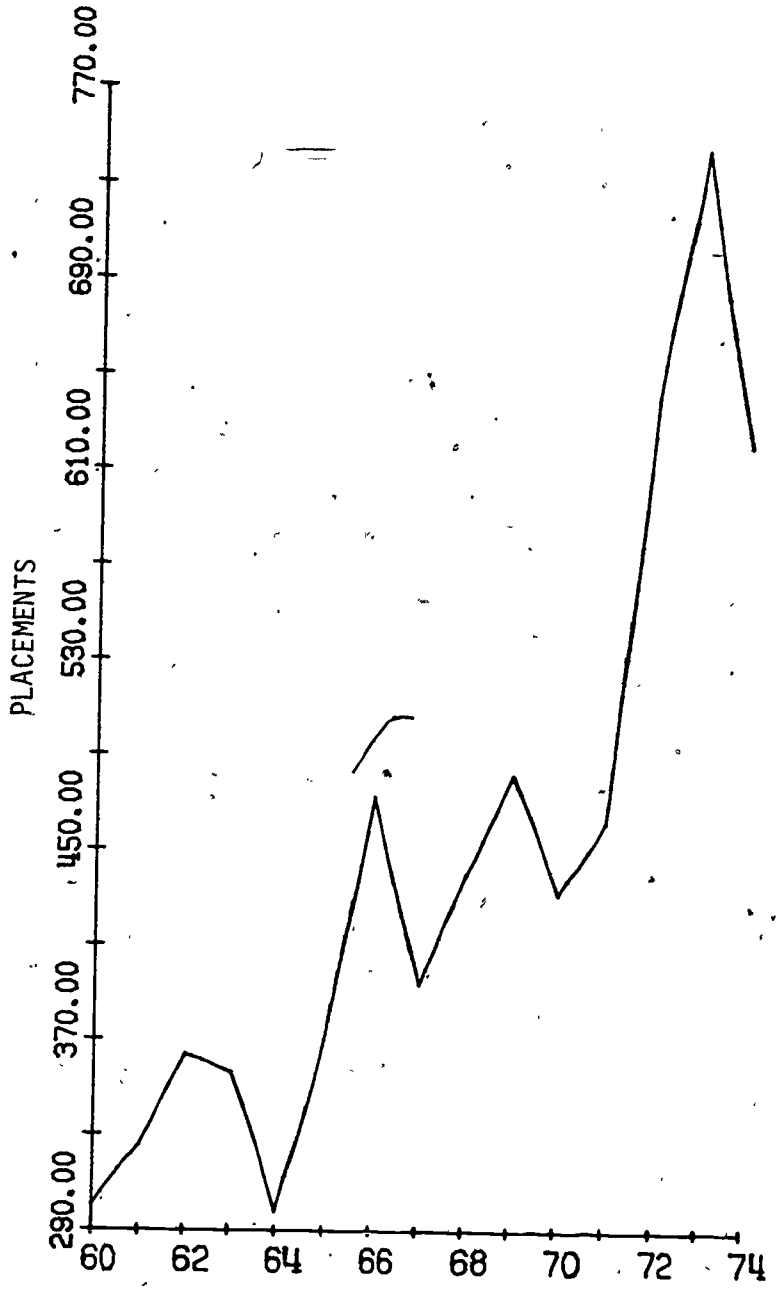

FIGURE 1. PLACEMENTS MADE IN BOULDER OFFICE 1960-1974.

TABLE 1. COEFFICIENTS AND t STATISTICS ESTIMATED FROM PLACEMENT EQUATION

DEPENDENT VARIABLE - NUMBER OF PLACEMENTS

Variable	Coefficient	t Statistic
Constant	1185	8.7
UR	-191	-6.6
January	58	0.8
February	-51	-0.7
March	24	0.3
April	60	0.8
May	150	2.0
June	210	3.0
July	55	0.8
August	33	0.5
September	113	1.6
October	131	1.9
November	65	0.9

$R^2 = .65$ SE = 109.24

unemployment rate held constant. For example, the coefficient for June was 210, indicating that other things being constant, June placements are 210 above December placements. December was the low month of the year. According to our model, May, June, September and October were the highest placement months. A time trend originally included in the model was found to be insignificant.

The unemployment rate in 1974 increased by one-half of one percent, implying a decline in placements of about 100 a month, which is exactly what happened.

Although these conclusions make sense, they are tentative because they are based on an insufficient number of observations over the full range of the business cycle. Unfortunately, unemployment data for Denver before 1970 are not available in a form consistent with current data. The use of this model to infer the effect of terminal-assisted placement would be unwarranted. The unemployment rate was higher during 1974 than in any other year since 1970, and other important changes had been made in the local office. During April 1974, self-service microfiche readers were installed; the combined effect of the self-service microfiche readers and the terminal cannot be separated with a time series analysis. However, the analysis in Chapter 3 does separate the effects of the two operations.

This example demonstrates the difficulty of using before-and-after placement data as a lone evaluation tool. Had job matching been installed at the end of 1970, results of a time series analysis would be totally misleading unless it included adjustments for changes in the area's unemployment rate.

During the period from April 1, 1974, through June 30, 1974, prior to the experiment, there were 442 placements at the Boulder office in permanent jobs. There were over 1100 placements in one- to three-day jobs. The remaining 220 placements were either from four to 150 days or over 150 days, but only for a day or so a week or as needed.

The placement/referral rate for casual or intermittent jobs is not meaningful because the Employment Service acted as the hiring agent. The employer usually hired any person the ES selected. The statistics

show a 99 percent placement/referral rate, but a referral was often not recorded if the applicant was not hired.

For jobs of a non-casual and non-intermittent nature the placement/referral rate is of greater interest. Of 2925 referrals made, only 15 percent resulted in hires. The reasons given by employers for not hiring workers are shown in Table 2.

TABLE 2. APPLICANTS NOT HIRED - REASONS FOR NO HIRE

	#	%
Applicant refused job	41	1.40
Failed to report for interview	456	15.56
Failed to report for work	32	1.09
Job filled	707	24.17
Applicant not qualified	1127	38.53
Applicant failed test	1	.03
Another applicant selected	116	3.97
	2480	84.75

By far the most common reason was the applicant's lack of qualifications.

Before the computer was installed, employment officers would search applicant cards filed by Dictionary of Occupational Titles (DOT) groups. If the DOT codes were sufficient job and applicant descriptors, a high degree of match between the applicants' DOT code and the DOT code of the jobs in which they were placed could be expected.

The DOT code used by the Colorado Employment Service consists of six digits. The first digit identifies the broad occupational job family of the occupation; e.g., professional, managerial or service. The first two digits narrow the job title to broad occupational groups; e.g., engineers or clericals. The third digit narrows the job further. The last three digits pinpoint worker traits required in the job; e.g., ability to deal with people, things or data. Only 20 percent of applicants hired were placed in jobs where their six-digit DOT code was identical to the job DOT code. About 25 percent of applicants hired matched on a three-digit code. One third of applicants matched on the first two digits. Half of the applicants matched on the first digit only.

Table 3 illustrates the crossover between the occupations applicants were classified in, and the jobs they found. Applicants shown outside of the boxes worked in occupations other than the ones in which they were classified. Crossover is largest for applicants in managerial occupations. One factor accounting for considerable crossover is the similarity between unskilled occupations classified under different major occupation codes such as benchwork laborers, structural work laborers, miscellaneous laborers, etc. All laborers have the same last three digits of the DOT code. Almost one-fourth of those DOT's not matching on the first digit matched on the last three digits.

The remaining non-matches were predominantly in low-experience jobs. About 60 percent of the non-matching jobs required no experience. Another 27 percent required only one to six months of experience, but this is typical of most Employment Service jobs in Boulder.

A low percentage of minority group and poorly educated applicants failed to find jobs. An analysis was undertaken of applicants who were referred to three or more permanent jobs and who were not hired during April-August 1975. The analysis showed that out of 165 such applicants, only nine had completed less than 12 years of school, only two were Spanish Americans and only one was Black.

The local office had a mandate to provide service to veterans. About one-quarter of all applicants placed in permanent jobs during 1974 were veterans.

TABLE 3. PERCENTAGE OF CROSS OVER MATRIX

OCCUPATION OF APPLICANT VERSUS OCCUPATION OF JOB

SECOND QUARTER, 1974
BOULDER LOCAL OFFICE

Occupation of Applicant		Occupation of Job											
		0	1	2	3	4	5	6	7	8	9	Total[a]	Number
Professional	0	[40]		20				5	20	10	5	100%	20
Managerial	1		[18]	18	24	12	6		6	12	6	100%	17
Clerical, sales	2		2	[54]	22	2	0	2	13	3	4	100%	69
Service	3			3	[79]				12	1	4	100%	72
Farming	4				*	*				*		100%	6
Processing	5							*	*			100%	2
Machine trade	6			*	*	*		*	*	*		100%	14
Bench work	7			4	10				[65]	7	13	100%	55
Structural work	8			3	12	4		4	16	[51]	9	100%	90
Misc.	9			7	33	5	4		10	21	[19]	100%	57
													402

[a]Percentages do not add to 100 due to rounding.

*Under 15 applicants in occupation, so allocation is not shown.

Table excludes placements for student summer jobs. These students are assigned a special DOT code. Crossover would not be a meaningful concept for this group.

CHAPTER THREE

BOULDER EXPERIMENTS

Placement Success Search Modes

In this section, applicants referred through the use of a computer terminal are contrasted with applicants referred through other placement methods. Additional research issues are discussed. The job retention of applicants placed by computer terminal versus those placed by other means is the subject of Chapter 4.

During the experimental period, July 1, 1974 - October 31, 1974, several different modes of placement were used in the Boulder local office:

1) On-line search of applicant file.
2) On-line search of job file.
3) Self-service via microfiche.
4) Self-service via computer print-out.
5) Employment Office use of microfiche.
6) Job development.
7) Applicant walk-in.
8) Applicant call-in.

1. On-line Computerized Search of Applicant File

For every long-term job order received by the Boulder office, a computer-aided search of the applicant file was initiated by a central terminal operator; preference was given to veterans during this process. Applicant searches were usually made soon after an order came in; the order would appear on microfiche put out by the Colorado Division of Employment for state-wide distribution the following day.

Once an applicant search was completed, the terminal operator manually pulled those applicants' hard-copy, characteristic cards. An employment officer screened the applicant cards, and the terminal operator called in the applicants the employment officer selected.

There was room for improvement in several of the procedures followed in the local office.

First, it would have been desirable to completely eliminate the manual cards and replace them with on-line information. Since the experiment was scheduled to end in a relatively short time, two parallel systems had to be maintained. Many clerical tasks - filing, searching, and indexing cards; reactivating old applications; and purging inactive applications - could have been eliminated by automating the manual file.

Second, the computerized version of the applicant card contained only the information already keypunched in Denver for reporting purposes plus a limited amount of extra information for matching purposes. This compromise was necessary; otherwise the local office would have had three parallel systems in operation -- the manual file, the Michigan computer file, and the state reporting file. The information added for matching included the number of months of experience of the applicant in the occupation of his DOT code, his willingness to go to Denver, and his minimum acceptable pay. Appendix A illustrates the information available on applicants.

The information most frequently examined on the manual cards and not found in the computer included descriptions of the applicant's previous work history and the type of work for which he was qualified. For example, one administrative assistant position might have required mainly bookkeeping skills; another writing skills; a third, administrative skills; and a fourth, typing skills. One secretarial job might have required typing at 60 words per minute; another, shorthand experience. The ideal system would have had multiple occupation codes to indicate the range of jobs for which each applicant could qualify.

Third, many of the applicants did not list phone numbers on their application cards. Noncomputerized placement in the Boulder office largely depended upon the applicant being in the office early enough each day to see if there was a job offered that interested him and for which he was qualified.

Use of the computer could lead to procedural changes that would improve the placement process, reduce applicant trips to the local office and lead to a better match between referred applicants and jobs. One such procedure would assign each applicant an identifying number. Each night, the applicants who had been matched with jobs that day but who had not been reached by telephone would be able to learn of the jobs by calling a central operator or recording. It was not possible to institute such a procedure during the experiment because of its short duration. Many applicant/job matches did not lead to referrals or placements because the applicant could not be reached before the job was removed from the Job Bank.

Fourth, the applicant search process proved to be a learning experience for the central terminal operator, a clerk with some prior Employment Service experience in Unemployment Insurance. She was not an employment officer; but by the end of the experiment, she was knowledgeable enough to search for applicants on the basis of worker trait groups such as 887 for laborer. She could use the "data," "people" or "things" codes which identified proficiency in working with data, people or things.

Fifth, the experiment illustrated how an on-line system can be used effectively for applicant search. The terminal operator was able to exercise some judgmental control over the matching process by varying the criteria used to select applicants for jobs and by finding applicants for difficult orders. For many routine job orders, however, batch matching might be adequate.

2. On-line Search of Job File

Before the start of the experiment, it was thought that the most important component of an on-line match system in a typical local office was the use of the terminal to help walk-in applicants find jobs. The findings in Boulder led to an almost completely opposite conclusion. Only in very special circumstances is an on-line job search useful for helping applicants find jobs. Explanations of some of these circumstances follow.

1) An applicant's aspirations are inconsistent with the labor market. For example, the on-line system was used to show applicants that more education was necessary to obtain their desired salary. For example, one applicant wanted a job as an administrative assistant. The system printed 28 jobs for administrative assistants at or above his stated minimum pay on the terminal. Three of these jobs were open to persons without college degrees and those required some highly technical skill, such as a proficiency in two languages. This particular applicant was counseled to return to school and complete one more year of college. He was not placed through the use of the computer terminal; but he was aided.

2) An applicant is willing to move or commute. A manual search of many areas would take a long time. The computer can perform a search which would otherwise be very time consuming. However, Employment Service clients seem likely to want to do very little commuting or moving.

In the four months of the experiment, not a single job search resulted in the placement of an applicant in Denver, even though Denver is less than 60 miles from Boulder and a very pleasant ride. It may be that Boulder's attractive location deters people from sacrificing pleasant surroundings for income.

3) A large labor market, such as Los Angeles or New York, may have so many job openings that applicants cannot examine them all intelligently without mechanical assistance.

Salt Lake City, Utah, had an on-line job matching system in operation; but walk-in applicants received very little help with job searches by terminal. The majority of applicants used display boards listing various jobs arranged by occupational group.

4) An automated matching system can do a better job of searching applicants and for job orders than can be done manually. The Boulder experiment did not adequately test what an ideal placement system can do, although its on-line job searches for walk-in applicants did use free form English key words in job descriptions and titles, numerous categorical descriptors, and occupation codes from the Dictionary of

Occupational Titles; thus, even an ideal match system would be unlikely to significantly improve on-line matching for those applicants who just walk into the local office, although batch matching of jobs and applicants could be significantly improved. In most instances an on-line matching system cannot be justified solely on the grounds that it performs well in finding an applicant a job when he is in the local office. However, the computer performs other functions which might justify its use.

3. Self-service Microfiche

Every night, all jobs on the Employment Service statewide Job Bank were updated, put on microfiche, and sent to each local office of the Employment Service by special messenger before 8 a.m. the next morning. Applicants finding a job on the microfiche through self-service took the job's control number to an employment interviewer who called the Denver Job Bank central control for permission to refer. Employment interviewers were supposed to do some screening. The number of applicants they saw and the number of applicants designated not qualified by employers raises some doubt about how much screening they did.

4. Self-service Printout

Microfiche available in the Boulder local office were organized in Dictionary of Occupational Titles (DOT) code order. Even though applicants knew their own DOT's, they did not know which other DOT's might be alternative occupations. Five copies of an alternative listing were printed every morning on the computer terminal. This listing was organized into two groups: jobs requiring experience and jobs requiring no experience. Within each group, the jobs were in DOT order. The listings were limited to Boulder area jobs.

The availability of the listing resulted in two services to applicants. The first made more copies of the job listings available; it saved time spent waiting in line for the microfiche reader. The second service made it easier for an applicant to search through job listings.

The main purpose of on-line access to the computer was to locate a job for a person by carrying out a number of alternative searches using various criteria. If these criteria are general for a large group of applicants and can be specified in advance, then several different listings can be prepared in a batch system, making on-line access unnecessary.

5. Employment Officer - Microfiche

The instances in which an applicant received help finding a job from the employment officer who used his skill to help the applicant search the microfiche were recorded.

6. Job Development

If an applicant was a veteran or designated for special services, an attempt was made to develop a job for him. Job development was the only situation in which the employment officer talked directly to the employer before sending the applicant to him. Therefore, a higher placement/referral ratio for job development referrals would be expected than in the self-service referrals mode.

7. Applicant Walk-in

In some instances, when an applicant walked into the office, an employment officer knew of a job possibility. For example, if a meteorologist walked into the office looking for a job, an employment officer might send him to the National Center on Atmospheric Research (NCAR). Some employers had agreed to cooperate with the Employment Service in hiring veterans, and a veteran who walked in might be sent to such an employer. In these cases, referral was done personally without the use of the on-line system or the microfiche reader.

8. Applicant Call-in

Employment officers rarely did manual searches for applicants unless an employer had agreed to a special arrangement benefiting some target group, such as veterans. When this happened, the employment

officer could go through the manual file and pick out suitable applicants, but usually he called in applicants he knew instead of searching the manual ifles. Most of these applicants came from the employment officer's caseload.

Results of Experiment

Table 4 summarizes the number of placements made during the experiment by different modes, the placement/referral ratio, number of placements, and referrals found not qualified by the employer. The two modes of placement with the highest placement rates are applicant walk-in and manual applicant search.

The manual applicant search category is quite misleading. One firm accounts for 30 of the 84 placements. This firm had 31 referrals and 30 placements. It was willing to hire veterans on a 90-day contract; and when the employment officer in charge of veterans was unable to obtain a permanent placement for a veteran, he could send the worker to the firm on the 90-day basis. If applicant searches had been done routinely rather than only for veterans in a caseload situation, the placement rate might have been about .4-.5 in this office. However, the cost of manual applicant searches is very high; a search could take anywhere from 15 minutes to two hours depending on the nature of the job order. Searches were done in very special circumstances only.

The walk-in category also had a placement rate of over .5. This category includes circumstances in which an employment officer knew of a job possibility when an applicant who met the job qualifications walked in. In some instances, the job was listed on the microfiche. In other instances, it was not. In these circumstances, there was usually something special about the applicant that increased his chances of being placed in this way. Only 27 such referrals were made in 4 months.

The employment officer-microfiche category included the active participation of both the applicant and employment officer in job searches. In this instance, the employment officer was also screening the applicant more carefully. Here the placement ratio was .3.

TABLE 4. PLACEMENT BY DIFFERENT METHODS

BOULDER, COLORADO 7/1/74-10/31/74

Method*	Referrals	Placements	Placement Rate	Referral Fraction Not Qualified
1. On-line Search of Applicant File	150	29	.19	.35
2. On-line Search of Job File	131	17	.13	.29
3. Self-Service Microfiche	2282	243	.10	.29
4. Self-Service Printout	550	57	.10	.39
5. Employment Officer-Microfiche	339	103	.30	.26
6. Job Development	142	28	.19	.38
7. Applicant Walk-in	27	14	.51	.14
8. Manual Applicant Search	129	85	.65	.13
All Methods	3750	576	.154	.30

*A statistical analysis of variance technique showed the variable "method" to be highly significant at the .0001 level. The F statistic was 50. This explained 10% of the variation in the placement rate.

The two lowest categories in terms of placement ratio success were both self-service: only 10 percent of these referrals resulted in placements.

Surprisingly, the computer did only slightly better than self-service in job search for applicants. However, the computer was only used in this connection if a special problem arose or if the applicant was willing to move or commute outside of Boulder. There were never more than 200 jobs listed on the microfiche for the Boulder area. When this list was further subdivided into occupational categories, the number of jobs an applicant needed to look at was small. For example, a person wanting a clerical job could limit the number of jobs to 30 or 40. Little would have been learned and much time wasted using the computer when it was not needed.

If an applicant wanted a job paying over $5.00/hour or a job anywhere in the state, he might have had to look at 1000 jobs to determine which, if any, met his criteria. In this instance the computer could be very useful.

It is interesting to note, however, that not a single on-line job search resulted in a placement in Denver. During the four months in question, 23 placements of all types made from Boulder were recorded as in Denver, 4 percent of all placements. However, some of the 23 placements may have been employers with branch offices in Boulder. Therefore, some of the 23 so-called Denver placements may have been Boulder placements.

There were two types of on-line job searches. One was done when the applicant was present. The other was done in his absence by pulling his card from the manual file. The first activity accounted for only five placements but resulted in a placement referral rate of .18. The second activity accounted for 12 placements but had a placement referral ratio only slightly higher than that of self-service. If the optimal matching system described in Chapter 5 were implemented, the second ratio would probably be much higher.

Applicant searches in response to each job order had the highest placement referral rate of the on-line placement categories. It

accounted for the greatest number of on-line placements, 24. The placement ratio was double that of self-service.

Employment Service personnel found applicant computer search to be so valuable that they were most upset when the experiment ended and the service ended. Computer search could reduce the burden placed upon employers and applicants by preventing referrals when the probability of placement is very low.

Not Qualified

Another interesting aspect of Table 4 is the referral fraction of those not qualified. Both types of self-service had the same placement rate (.10). The two types of self-service were microfiche and printout. The microfiche listing arranged jobs by occupational code for jobs listed at the Boulder office. The printout grouped Boulder jobs requiring experience separately from Boulder groups requiring no experience. Within each experience group, the jobs were arranged by occupation code (DOT).

Self-service printout referrals resulted in a higher fraction of jobs that applicants found not qualified than self-service microfiche referrals. We hypothesize that this is due to either:

1) The groupings "experienced" and "inexperienced" might have encouraged applicants to seek jobs for which they were not qualified; or
2) Applicants using microfiche might have been timid about searching for jobs outside their DOT's, especially if there was a line waiting to use the microfiche readers. Applicants using computer listings probably wouldn't be as harassed.

The high fraction of applicants not qualified on applicant searches is attributable to inadequate descriptors stored in the computer. Chapter 5 proposes an adequate system.

Experience

Another significant factor affecting the placement ratio is whether or not the job required experience. Table 4 does not show

TABLE 5. PLACEMENT BY DIFFERENT METHODS BY EXPERIENCE REQUIRED BY JOB BOULDER 7/1/74-10/31/74

Method	Placement Rate[a]		Not Qualified[b]		Total Number of Referrals	
	No Experience	Experience	No Experience	Experience	No Experience	Experience
1. On-line Search of Applicant File	.30	.16	.23	.40	40	110
2. On-line Search of Job File	.14	.12	.39	.27	28	103
3. Self-Service Microfiche	.12	.09	.28	.29	864	1413
4. Self-Service Printout	.10	.10	.38	.39	232	318
5. Employment Officer Microfiche	.52	.17	.15	.33	128	211
6. Job Development	.31	.14	.34	.39	44	98
7. Applicant Walk-In	*	*	*	*	8	19
8. Manual Applicant Search	.82	.49	.06	.20	64	65

*Insufficient number of cases to permit tabulation.

[a]Fraction of referrals resulting in placements.

[b]Fraction of referrals found not qualified.

differences between jobs requiring experience and jobs requiring no experience. Table 5 presents this breakdown. In every instance, jobs requiring experience had a lower placement rate than jobs requiring no experience except referral by self-service printout, where the referral rate was the same whether jobs required experience or not. The higher placement rate on jobs requiring no experience is understandable for several reasons:

1) Jobs requiring no experience also require less skill. They are lower paying, and employers have lower hiring standards.
2) Employers requiring experience must determine if the applicant has relevant experience. This is one more area in which the employer could disagree with the applicant and the employment officer regarding employee qualifications.

If one limits the comparison of placement success among the various methods to jobs requiring experience, omitting manual applicant search because it was done only in certain very special circumstances, the placement rate varied from .09 to .17. Placement was highest for employment officer use of microfiche for job search and computer applicant search and lowest for self-service applicant use of microfiche or computer listings.

With regard to the proportion of applicants not qualified, in almost every instance, jobs requiring experience had a higher proportion not qualified than jobs requiring no experience. The only exception was computer job search, where the reverse was true.

In terms of the merits of a computer system, one could weigh the following cost savings:

1) Reduced time for Employment Service staff to do applicant searches as job orders come in.
2) Reduced time required by employment officers to help applicants search microfiche.
3) Increased productivity of counselors.
4) Reduced applicant job-searching time.
5) Reduced employer time interviewing unqualified applicants.

The Boulder experiment makes the following activities appear to be less important than originally expected.

1) Give applicants wider flexibility about geographic area.
2) Give applicants who come into the office a better way to search the available jobs.

Individualized Versus Centralized Mode

One interesting question posed at the beginning of the experiment was the conditions under which two modes of terminal operation -- individualized and centralized -- would be advantageous for job placement.

Under centralized mode, a single terminal operator makes job searches for applicants possible at the direction of the employment officers. Under individualized mode, each employment officer makes his or her own job searches using the terminal.

The most important factor affecting the usefulness of individualized mode is the amount of time spent by the employment officer in job searches for applicants. In the Boulder local office, this time was virtually nil. Applicants selected their own job orders by microfiche readers. Applicants were matched against job orders by computer, but this activity can most readily be performed in centralized mode since order taking is centralized.

Centralized mode was the only feasible mode in the Boulder local office. It had many advantages:

1) Only one person had to be trained, although employment officers did receive initial training.
2) Only one computer terminal was required.
3) Individual employment officers did not have to interrupt their routines; they could glance at computer output on their desks.

Originally, it was hoped that the experiment could operate in both centralized and individualized modes for on-line job searches. However, there were so few placements made in centralized mode that no conclusions about centralized versus individualized modes could have been drawn with any degree of statistical reliability had the original design been followed.

There were many more placements resulting from on-line applicant searches than on-line job searches. It would have been statistically possible to test the difference in placement rates between centralized and individualized modes for applicant searches, but individualized mode made absolutely no sense for applicant searches. Job orders were taken centrally, and applicant searches were best done on-line by one person as the job order came in.

In a counseling situation where a great deal of employment officer time is spent helping applicants find jobs, the advantages of individualized mode could be weighed against the cost.

Comparing Boulder's Experience to Other Local Offices

Part of the original design called for the activities in Boulder to be contrasted with those in other local offices in Denver and in a central local office to determine if placements during the experiment increased or decreased relative to other local offices.

Such a contrast would be useful if the computer system was the only thing that changed in the Boulder offices during the experiment. However, the Boulder local manager left, the assistant manager left, self-service microfiche readers were installed, and a new emphasis was placed on veteran placement.

In the long run, a computer matching system might lead employers to increase their use of the Employment Service if they felt the system gave them better service. Such a result couldn't possibly be expected to occur in four months. Even if it were possible, it wouldn't prove very much if the halo effect caused utilization to drop after the "new gimmick" wore off a year later.

There was no halo effect in this experiment; no publicity on the experimental system was given to employers because it was scheduled to be removed after the brief experiment was over.

Table 6 compares Boulder's placement experience during the periods July 1, 1974 - October 31, 1974, and July 1, 1973 - October 31, 1973, with the experience of some other local offices in the state. Of most interest is the decline in nonagricultural placements over 150 days in the offices shown in Table 7.

TABLE 6. COMPARATIVE APPLICANT SERVICES

Five Areas in Colorado

Four Months Ending October 31, 1974 and October 31, 1974

	Denver	Fort Collins	Greeley	Brighton	Boulder
1973					
New Applicants	21,921	3097	3028	1605	4447
Applicants Referred	10,653	1757	2666	785	3014
Applicants Placed	4,922	1249	1504	391	1581
Placement Rate	.462	.711	.564	.498	.525
Nonagricultural Placed	4,840	1160	1343	370	1554
Nonagricultural Placed Less Than 3 Days	740	394	242	30	675
Nonagrcultural Placed Over 150 Days	3,923	770	1028	290	876
1974					
New Applicants	24,302	2554	2773	1856	4004
Applicants Referred	9,897	1694	2548	904	2933
Applicants Placed	4,164	985	1322	399	1184
Placement Rate	.421	.581	.519	.441	.404
Nonagricultural Placed	4,107	928	1183	384	1145
Nonagricultural Placed Less Than 3 Days	634	307	292	14	495
Nonagricultural Placed Over 150 Days	3,285	602	810	157	517

TABLE 7. PLACEMENT CHANGE IN 1973-1974

Office	Change in Nonagricultural Jobs Over 150 Days (July 1 - October 31)
Denver	-16.3%
Fort Collins	-11.8%
Greeley	-11.2%
Brighton	-45.9%
Boulder	-41.0%

Source: Table 6

Declines were experienced in all offices, but primarily in Boulder and in Brighton. In Brighton, however, the number of over-three-day placements actually increased due to a tremendous increase in placements 4-150 days in length. Boulder's total placements declined by only about 20 percent if one counts applicants for all jobs regardless of duration. The declines in Boulder could be attributable to the frustration of employers and applicants at the large number of referrals necessary to make a placement via the self-service mode as well as the economy.

Another interesting comparison between Boulder and Denver is the average placement rate on long-term jobs between the two areas. The data in Table 6 do not address this issue: They show the number of individuals referred and the number of individuals placed. An individual going to 20 job interviews would be counted only once as a referral. The data in Table 6 are appropriate for answering questions about the effectiveness of service in different offices but not for comparing different placement methods. It was also necessary to obtain data on transactions in Denver and Boulder from July 1, 1974 - October 31, 1974.

Boulder accounted for 1361 nonagricultural referrals compared to 4215 in Denver. Virtually all placements made in Boulder on jobs of less than 150 days were either made with one referral or were recorded that way. Assuming the same was true in Denver, the number of referrals made to jobs lasting 150 days or more can be computed by subtracting the 369 placements made in Boulder in

jobs under 150 days and the 799 made in Denver in jobs under 150 days from total placements. Since there were 162 placements in Boulder in jobs over 150 days and 762 in Denver, we obtain a placement rate of .16 in Boulder and .22 in Denver. If the more complete data for Boulder had been used to compute the rate in order to validate the assumptions made, the placement rate would have been .155. This suggests that as far as referrals to long-term jobs are concerned, Boulder has had a poorer placement/referral record but one not greatly different from Denver's.

Computer Placements - Learning Effect

In Chapter 2, it was hypothesized that on-line placements would increase as the central terminal operator became more familiar with the procedures. A display of placements by half-month periods is shown in Table 8.

TABLE 8. PLACEMENTS BY HALF MONTH

July - October, 1974

	Period	Computer Placements	Total Placements	Ratio
Half Month	1	1	59	.02
Half Month	2	4	49	.08
Half Month	3	5	93	.05
Half Month	4	11	99	.11
Half Month	5	3	57	.06
Half Month	6	11	111	.10
Half Month	7	8	67	.13
Half Month	8	3	41	.08
		46	576	.13

During the first four half months, computer placements increased in every half month. Half-month 5 resulted in a sharp decline, but total placements also declined sharply during this period. In addition, the office was closed for Labor Day. Finally, terminal and computer problems were frequent during this period. Similarly in half-month

8, total placements declined as well as computer placements, reflecting decreased activity in the office during this period. Another interesting comparison, the placement/referral ratio, is shown in Table 9.

TABLE 9. COMPUTER REFERRAL AND PLACEMENTS BY HALF MONTH

July – October, 1974

Period	Computer Placements	Computer Referrals	Ratio
1	1	28	.04
2	4	38	.10
3	5	46	.10
4	11	72	.15
5	3	17	.18
6	11	27	.40
7	8	34	.24
8	3	19	.16

The change in the on-line placement/referral ratio reflects two factors. The first factor is the learning effect which led the ratio to increase every period from 1 to 6 despite fluctuations in labor market conditions. The decline during periods 7 and 8 reflects the general decline in labor market conditions, which is evidenced by the decline in total placements during this period. During bad times, the placement/referral ratio is lower than in good times. The decline in the on-line placement referral rate in the last month is proportional to the decline in total placements in the office.

Other Factors Affecting Placement

Tables are not a convenient way of displaying the multiple factors that affect placement success. First, tables summarizing the effect of several factors would take many pages and would be difficult to interpret. Second, the entries would be too thin to permit valid interpretation of many of the effects.

Multiple regression analysis is an alternative approach:

several factors can be introduced simultaneously and their separate effects can be measured.

In the multiple regression model, the dependent variable had a value of 1 if the referral resulted in a placement and 0 otherwise. This variable is known as a dummy variable, and the equation can be interpreted as a probability or discriminant function.[1]

The coefficients can be interpreted as indicating the effect each factor has on the probability of a given applicant being hired. Table 10 presents the findings. To interpret Table 10, consider the variable, permanent job. The coefficient is -.12, which represents the difference in the probability of a referral resulting in a placement between a permanent and temporary job. The t statistics for the variables all indicate that the coefficients are statistically significant except for on-line job search, on which there were too few observations to measure placement rates.

Whites had a more difficult time getting jobs than nonwhites, probably because both the Employment Service and employers discriminated in reverse for the small number of nonwhites in the area. Applicants with Spanish surnames likewise had a higher probability of employment.

Permanent jobs resulted in a lower placement rate than nonpermanent jobs because both applicants and employers were fussier with permanent applicants. Jobs requiring experience took more careful screening. The more educated an applicant, the less likely he was to find a job on a given referral, both because of the nature of jobs listed by the ES and because of the aspirations of college students and graduates.

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[1]Econometric problems arise in these functions if least squares approach is used to estimate the model because the least squares assumption of homoscedasticity is untenable. An alternative procedure is to use generalized least squares. However, our primary interest is in the coefficients since there is no bias in the estimation of the coefficients. Even though the standard errors are probably overstated, least squares is used. See Cohen, Lerman, Rea, A Micro Model of Labor Supply, U.S. Dept. of Labor, BLS Staff Paper 4, 1970 p. 193 for a more complete explanation.

TABLE 10. MULTIPLE REGRESSION

Model Predicting Probability A Particular Referral Will Result in a Placement

Variable	Coefficient	t Statistic
Constant	.31	7.4
Method of Referral		
On-line search of job file	**	**
On-line search of applicant file	.11	4.0
Job development	.08	2.9
Walk in	.42	6.4
ES Officer used fiche	.18	9.0
Call in based on manual search	.50	16.1
(Self-service = .00)		
Occupation		
Clerical	-.03	-1.8
Professional-managerial	-.07	-2.8
Benchwork-structural	.04	2.8
(All others = .00)		
Pefmanent job	-.12	-5.4
Education		
Job requires some college	-.07	-5.4
Job requires high school grad	-.03	-1.7
(Job requires only basic literacy = .00)		
Job requires experience	-.05	-3.9
Applicant has Spanish surname	.06	2.0
Applicant is white	-.06	-1.8
Referral in August or September	.04	3.7

**Variable not even significant at .10 level.

R^2 = .147 SE = .33 n = 3750

On-line applicant searches raised the probability of job searches resulting in placements by .11 over self-service. Applicants who were lucky enough to receive special attention, possibly because they were veterans or in a high demand area or knew the employment officers or were in a target group, had a much higher probability (between .42 and .50) of obtaining a job than applicants who found a job through self-service. These applicants were referred through manual searches or were told about a job when they walked in.

The employment officer using the microfiche increased the probability of placement by .18 over self-service.

Applicants applying in August or September -- high employment months -- had a probability of the referral resulting in a placement .04 higher than applicants applying in July or October.[2]

Regression analysis can be used to predict the probability that a particular job search and applicant referral will result in a placement. In order to see how, assume that the profile of an applicant and of a job are as follows:

1) Applicant wants benchwork occupation.
2) Computer is used for applicant search.
3) Job requires only reading and writing.
4) Job requires no experience.
5) Applicant has a Spanish surname.
6) Referral is made in August.
7) Job is for 140 days.

The probability of such a referral resulting in a placement can be computed as follows:

.31	constant
+.04	benchwork
+.11	computer applicant search
0	no formal education requirement
0	job requires no experience
.06	applicant has Spanish surname

[2]Seasonal factors alone suggest October is a high employment month. But high unemployment in the area lowered the probability in October.

.04 referral made in August

__0 job for under 150 days

.56 applicant has probability greater than .5 of referral resulting in placement

It is possible that a similar model could be used to determine the probability of success before a referral is made. Ideally, data would be collected on a number of job and applicant attributes that would lead to a good match, but that was not the objective of this project.

There are extreme cases where the dependent variable is near zero or even completely negative. The white college student or graduate using the self-service mode to find a permanent job requiring experience in a professional occupation has a computed predicted variable of less than zero. It arises because some of the variables which were assumed to be additive actually interacted in a more complicated way.

A number of specifications of interactions were attempted, but they greatly complicated the model; the changes in most coefficients were minor, and the interaction terms were rarely significant.

Only two specifications are worth illustrating. One concerns the treatment of veterans. Veterans were placed primarily by manual applicant search or walk-in. When a separate regression was run for applicants placed by these two methods, being a veteran improved the probability of placement by .24. However, this result is attributable in large part to the favorable treatment one large company gave veterans during the sample period. The specification is illustrated as follows:

$$H = .707 - .168PERM - .587PRO + .242VET$$
$$(7.8) \quad (-1.9) \quad (-4.8) \quad (3.1)$$

t statistics are shown in parentheses.

$R^2 = .218$ SE = .43 n = 156

Where

H = 1 if a hire; 0 otherwise (placement probability)

PERM = 1 if the job is permanent; 0 otherwise

PRO = 1 if the job is a professional occupation; 0 otherwise

VET = 1 if the applicant is a veteran; 0 otherwise

A variable for veteran status was not significant in the other strata.

The other specification of interest was a separate regression for jobs requiring experience versus jobs not requiring experience. Table 11 presents the results.

Pay By Method

Another factor important in evaluating the success of different placement methods is the starting pay offered. Table 12 shows the pay by method.

A few dozen jobs that were excluded from the hourly pay averages pay on a commission basis. It was impossible to allocate an hourly rate to these jobs.

Outside of manual applicant searches, which were done only in special circumstances primarily for veterans, on-line job searches resulted in the highest average pay. Applicants could use the computer to find high-paying jobs. The two next highest average wages were employment officer-aided search and applicant computer search. Self-service applicant searches resulted in considerably lower wages.

Occupational Distribution

Table 13 presents the referrals made and placement rate by occupational group cross-classified by experience.

In the blue collar occupations, experience was a more significant factor in explaining differences among hire rates. Table 14 shows hire rates by occupation according to search method. A breakdown by experience is also given for the blue collar occupations.

TABLE 11. MULTIPLE REGRESSION MODEL

Predicting Probability a Particular Referral Will Result in a Placement

Variable	Jobs Requiring No Experience		Jobs Requiring Experience	
	Coefficient	t Statistic	Coefficient	t Statistic
Constant	.29	8.2	.11	8.9
Method of Referral				
On-line search of job file	**	**	**	**
On-line search of applicant file	.18	3.2	.08	2.5
Job development	.19	3.4	**	**
Walk-in	**	**	.49	6.3
ES officer used microfiche	.34	9.9	.07	3.0
Call in based on computer search	.59	12.3	.40	9.9
(Self-service = .00)				
Occupation				
Clerical	**	**	-.06	-4.1
Professional-managerial	**	**	**	**
Benchwork-structural	.06	2.8	**	**
(All others = .00)				
Permanent job	-.21	-6.3	**	**
Education				
Job requires some college	-.11	-2.9	**	**
(Job requires no college = .00)				
Applicant has Spanish surname	**	**	.08	2.1
Referral in August or September	.04	1.9	.04	2.9
	R^2 = .245 SE = .349 n = 1413		R^2 = .081 SE = .318 n = 2334	

**Variable not even significant at .10 level.

TABLE 12. MINIMUM AVERAGE HOURLY PAY BY METHOD OF PLACEMENT

	Commission Jobs	Non-Commission Jobs	
		Hourly Rate	Number
1. On-line search of applicant file	2	2.73	27
2. On-line search of job file	1	2.95	16
3. Self-service microfiche	15	2.43	228
4. Self-service printout	3	2.46	54
5. Employment officer - microfiche	0	2.78	103
6. Job development	1	2.55	27
7. Applicant walk-in	0	2.31	14
8. Manual applicant search	5	3.06	80
All methods	27	2.67	549

TABLE 13. PLACEMENT RATE BY OCCUPATIONAL GROUP OF JOBS
Boulder July 1, 1974 - October 30, 1974

Occupational Group	No Experience Required		Experience Required	
	Referrals	Placement Rate	Referrals	Placement Rate
Professional	84	.05	190	.05
Managerial	46	.04	147	.01
Clerical, Sales	213	.10	715	.10
Service	424	.19	465	.14
Farming	34	.14	44	.13
Processing	48	.10	17	.17
Machine Trade	41	.09	113	.18
Bench Work	290	.34	116	.12
Structural Work	93	.31	318	.18
Misc.	140	.19	212	.15

TABLE 14. SEARCH METHOD, HIRE RATES BY OCCUPATION AND EXPERIENCE

(Number in Parentheses)

Search Method	Occupation						
	Prof, Man	Cler, Serv Sales	Process, Mach		Bench, Struct		Misc
			No Exp	Exp	No Exp	Exp	
On-line search of applicant file	.13 (23)	.13 (82)	.00 (3)	.28 (7)	.70 (10)	.18 (11)	.28 (14)
On-line search of job file	.04 (23)	.11 (79)	.00	.20 (5)	.40 (5)	.00 (9)	.40 (10)
Self-service microfiche	.02 (311)	.11 (1161)	.05 (53)	.13 (84)	.13 (208)	.12 (276)	.10 (289)
Self-service printout	.04 (48)	.09 (317)	.15 (20)	.38 (18)	.02 (35)	.12 (56)	.10 (56)
Employment officer microfiche	.06 (43)	.15 (128)	.00 (6)	.10 (10)	.72 (70)	.30 (49)	.39 (33)
Job development	.00 (5)	.14 (84)	.25 (4)	.20 (5)	.25 (8)	.28 (21)	.40 (15)
Applicant walk-in	.00 (2)	.58 (17)	.00	.00	.33 (6)	.00	1.00 (2)
Manual applicant search	.16 (12)	.55 (49)	.06 (3)	1.00 (1)	.87 (41)	.83 (12)	.63 (11)

CHAPTER FOUR
FOLLOW-UP DATA

Follow-up data are an important component of a manpower information system. Unfortunately, the Employment Service standard data systems limit follow-ups to questions about whether or not an applicant referred by the Employment Service is placed.

In the Standard Referral System, jobs are classified as 1-3 days, 4-150 days, or over 150 days. This classification is based on information received from the employer at the time the job order is listed rather than on how long the applicant works.

In this study, two evaluations determined the length of time employees spent on the job. The first evaluation used a telephone follow-up conducted approximately 100 days after placement by the Employment Service local office.

The second follow-up matched Employment Service records with tax records supplied by employers under a compulsory wage-records program. Under Colorado law, employers must report each employee's wages and Social Security number every quarter. The Social Security number of each applicant placed by the Employment Service was matched and his earnings determined. Data on each applicant's starting wages, taken from Employment Service records, allowed evaluators to make a reasonable estimate of the length of time he had been on the job.

If an employee had received a wage increase, it would bias upward the estimate of the time he had spent on the job. The combined use of phone follow-ups and wage-record estimates on the same applicants provided a cross-check on the validity of both sources of data. Employers do not always remember when employees terminate. Employers go out of business or sell their businesses. These factors could make phone follow-ups even less accurate than wage-record estimates. The major error in wage records arose for applicants placed in October. There was less than three months of data on these applicants.

Although this error affects the size of the estimate, it does not affect the comparisons between placement methods. For the follow-up purposes, these errors were well within a tolerable range with either method. Combining methods improved the accuracy even more.

For most evaluation purposes, wages earned were of more interest than time on the job. If two identical applicants were placed on two jobs and worked the same length of time, but one applicant earned more than the other, the higher earnings would be considered to be more important.

Telephone Follow-up

The telephone follow-up was conducted about 100 days after applicants were placed.[1] Employers were asked the following questions:

1) What was applicant's date of placement (to cross-check against ES records)?
2) Is applicant still working for you?
3) If applicant is still employed,
   A) what is his hourly rate?
   B) how many hours has he worked per week, on the average, over the last three months?
4) If the applicant is no longer employed,
   A) what was his final hourly rate?
   B) when was his last date of employment?
   C) what was the reason for his departure?
      a) quit voluntarily
      b) fired
      c) layoff
      d) other

[1]The experiment ran between July 1, 1974, to October 31, 1974. However, some persons referred in late October were not placed until middle November, or even later in a few rare cases. Follow-ups began in October and were carried out through April, 1975. Follow-ups were carried out in April to pick up a few firms that could not be contacted earlier and to cover November referrals, even though the data for November referrals were not included in the final evaluation.

We had some follow-up information on over 95% of all applicants. Successful telephone follow-ups were made on about 60% of the 576 applicants. The local office did not make any follow-ups involving long-distance calls. Denver, about 40 miles away, was a local call. One city, Longmont, only 12 miles away, was a long-distance call. Since many of the same employers were in the wage-records follow-up, there was little point in making repeated calls to difficult-to-contact employers. What is more, the Colorado Division of Employment frowned upon contacting employers for non-placement purposes.

Since the experimental objective was to determine the difference between computer and non-computer placements, and since the data collected was more than enough for this purpose, the evaluators did not argue forcefully for additional follow-up instruments such as written questionnaires or employer interviews. It is difficult to resist the temptation of using the Boulder experiment to collect all kinds of information about the general effectiveness of the labor market, the placement process, and the Employment Service; but these issues were not paramount to the experiment.

Continuous Wage History

The Continuous Wage History File was matched against the Social Security numbers of applicants placed in the period, July 1, 1974 - October 31, 1974. Wage records were obtained for the seven quarters from second quarter 1973 to fourth quarter 1974. About 60 percent of the applicants matched exactly on Social Security number and employer number.

The limited degree of success of the initial match was partly due to the coding of employer identification numbers for the 576 placements and partly to the coverage in effect in 1974. If a similar project was undertaken in 1975 using a computerized address file, 80-85 percent of all placements in Colorado could probably be matched, due to the increased coverage of more employers and the increased ability of the computer to match records. This improvement would be caused by the extended coverage of Unemployment Insurance and the improved technology of using the computer to assign codes to employers.

Information was available even in cases where the employer who hired the applicant was not the employer listed in the wage-record file. In these instances, the evaluators had the wage records of the "other" employer.

Finally, there was information on referrals made by the Employment Service for some non-matches. If an applicant was placed in a second full-time job a month after placement in a first full-time job, he was assumed to have worked less than a month in the first job.

There was some information on which to base an estimated separation date for 550 of the 576 referrals resulting in placements. However, separation dates were assigned to only 485 of them.

Duration of Job

Table 15 presents the average number of days on the job based on our best estimation of separation days from all sources. The table shows average days on the job by placement method. The table underestimates the actual number of days worked because each applicant who was still employed at the time of follow-up was assigned the number of days between the date of hire and the date of follow-up. Follow-ups were conducted an average of 100 days after the date of placement, with a range of 75 to 200 days. These are calendar days from placement to follow-up, not days worked.

Table 15 shows that on-line applicant searches resulted in the highest average duration on the job of 79 days, which was higher than by any other placement methods. Manual applicant searches were next with 78 days. Many of these manual searches were for 90-day contract jobs, however.

Computer on-line searches should show the greatest pay-off on jobs requiring experience because the search criteria are more complex. These jobs had an average 95-day tenure. (Not shown in table.)

The lowest tenure occurred on jobs found when the employment officer helped an applicant use the microfiche. Interestingly, these applicants had a considerably higher placement rate than average, so that an explanation is not readily apparent.

TABLE 15. AVERAGE NUMBER OF DAYS WORKED BY SEARCH METHOD AT FOLLOW-UP

(Numbers in parentheses indicate observations)

Search Method	All Jobs
On-line search of applicant file	79 (25)
On-line search of job file	72 (16)
Self-service microfiche	60 (192)
Self-service printout	52 (47)
Employment officer microfiche	48 (91)
Job development	61 (24)
Applicant walk-in	58 (12)
Manual applicant search	78 (77)

Table 16 corrects for the biases caused by applicants not having terminated by the time of follow-up by showing the distribution of time worked by method. Table 16 shows much the same pattern as Table 15 except that manual applicant searches have more placements lasting 90 days or more.

Table 17 presents average aggregate wages by placement method of employees in the third and fourth quarter of 1974. The longer applicants were followed, the more accurate the wage-record estimates could be. However, this increased accuracy is very unlikely to make any difference in the comparisons among methods.

Table 17 again demonstrates consistently higher wages for computer searches over self-service searches. Manual applicant searches, for reasons previously mentioned, also are consistently higher than self-service.

Limitations

One possible objection to the study is that applicants placed by one method have sufficiently different characteristics from applicants placed by another method to invalidate the presumed effect of the search method.

In the ideal experiment, applicants would be selected at random or, better, by a selection procedure devised to insure that comparable control groups utilize each method.

These selection procedures could not be put into practice for several reasons. First, it would have been illegal; The ES was required to give veterans preference over other applicants. Second, it could have created difficulty if applicants wanted to use one procedure and were forced to use another. Third, it would have created an artificial situation in the office which might have affected the results of the experiment.

An alternative approach employed here was to study applicant differences among the different methods and report the net effect of each method. Multiple regression analysis similar to that employed in Chapter 3 was used to control for other effects.

TABLE 16. DISTRIBUTION OF APPLICANTS WORKING DIFFERENT PERIODS BY METHOD OF PLACEMENT

Placement Method	(1) Under 30 days	(2) 31-60 days	(3) 61-90 days terminated	(4) 61+ days or over 90 days still employed	(5) % employed after 90 days or at follow-up Column (4)/total
On-line search of applicant file	7	5	0	13	52%
On-line search of job file	6	0	1	9	56%
Self-service microfiche	83	23	17	69	36%
Self-service printout	23	5	6	13	28%
Employment officer microfiche	53	7	6	25	27%
Job development	11	3	2	8	33%
Applicant walk-in	5	2	1	4	33%
Manual applicant search	17	10	3	47	61%

TABLE 17. AVERAGE AGGREGATE WAGES

BY PLACEMENT METHOD

(Number of placements in parenthesis)

Search Method	Total
On-line search of applicant file	$1,116 (12)
On-line search of job file	$1,283 (11)
Self-service microfiche	$ 797 (146)
Self-service printout	$ 783 (36)
Employment officer microfiche	$ 914 (72)
Job development	$ 977 (20)
Applicant walk-in	$ 745 (10)
Manual applicant search	$1,514 (60)

In this context, multiple regression analysis holds the effect of other variables constant and measures the net effect of the placement method.

Continuous wage history provided only 12 observations on applicant searches. It would be difficult to statistically disentangle the effects of other variables with these few observations.

Occupational Differences

Since applicants in certain occupations are more likely to be picked as a result of applicant search, and these occupations have longer average tenure, we cannot tell from the regression whether applicants have the longer tenure because of their occupation or the computer search.

Occupations with the longer tenure include professional, clerical sales, farming or gardening, and benchwork. The extra time on the job ranged from 17 days in benchwork to 43 days in farm and gardening. Clerical sales was 30. Professional was 35.

Table 18 presents occupation by search method by average tenure on the job. It appears that in occupations for which five or more computer applicant searches were made, they resulted in higher tenures than did every other occupation but manual applicant searches. This finding suggests again that computer applicant searches have a positive effect on tenure even after occupational differences are taken into account. The sample was too small to test this effect statistically.

Separation Reason

The telephone follow-up determined the reasons for separation. It obtained data on about 200 referrals which led to jobs the applicant held less than 90 days. Of these, the employer laid off 10 percent and fired 10 percent, while another 70 percent quit. Other reasons were given for the termination of the remaining 10 percent. Applicants who quit were receiving $2.41 an hour, compared to $3.08 for those who were fired.

Table 19 presents separation reason by method used to find the job for applicants who worked less than 90 days.

Not a single applicant placed by computer was fired. Of the 25 applicants placed by manual search, seven (28 percent) were fired. The universe is very small, however.

TABLE 18. OCCUPATION BY SEARCH METHOD

BY AVERAGE TENURE ON THE JOB

(Numbers of observations in parentheses)

Search method	Occupation				
	Professional	Clerical - Sales Gardening - Farm	Service	Processing Benchwork	All other
Walk-in and job development	0	94 (7)	40 (12)	* (3)	46 (14)
Self-service microfiche	100 (6)	79 (39)	49 (69)	69 (21)	52 (57)
Self-service printout	* (1)	74 (9)	37 (16)	* (4)	53 (17)
Manual applicant search	* (2)	105 (12)	43 (11)	84 (38)	70 (14)
Employment officer microfiche	* (2)	* (4)	17 (11)	51 (47)	42 (27)
On-line search of applicant file	* (2)	138 (6)	* (4)	74 (5)	54 (8)
On-line search of job file	0	92 (8)	* (2)	* (1)	44 (5)
All methods	100 (13)	89 (85)	43 (125)	68 (119)	51 (142)

* means not shown for cells with fewer than 5 observations.

TABLE 19. SEPARATION REASON BY SEARCH METHOD

FOR APPLICANTS NOT WORKING AT FOLLOW-UP

Search Method	Fired	Layoff	Other	Quit	Total giving reason	Unknown
Job development	1	0	3	3	7	9
Applicant walk-in	0	0	0	5	5	3
Self-service microfiche	9	5	3	70	87	36
Self-service printout	0	2	3	15	20	14
Manual applicant search	7	2	2	14	25	5
Employment officer microfiche	3	12	6	26	47	19
On-line search of applicant file	0	1	1	6	8	4
On-line search of job file	0	0	0	2	2	5
	20	22	18	141	201	95

CHAPTER FIVE

COSTS, BENEFITS, AND DESIGN OF AN OPTIMAL SYSTEM

Introduction

This chapter describes the design of an optimal system for matching and is based on the experience in Colorado.

The Colorado Division of Employment is undergoing a major reorganization following the plan established by the Joint Evaluation Team.[1] The primary objective of this reorganization is to enable the agency to better serve its clients, both applicants and employers. The reorganization serves as a model for other agencies. The agency wishes to provide self-service so that applicants can find their own jobs in Job Information Service (JIS) centers and to create case loads in special Individual Development Service (IDS) centers to give more attention to target group needs.

The Colorado agency is facing major legal actions that demand that it be responsive to certain target groups. As economic conditions change, there is a constant need to reevaluate ways of meeting priorities. One-time annual planning must give way to daily or weekly planning. Changing priorities can cause administrative nightmares in a manual information system.

The Colorado agency is convinced that it needs a responsive information system to carry out its mandate of change. This system would facilitate job matching and provide better utilization of the management information designed into the MODS system. It would be flexible enough to respond to changing needs; every applicant would be exposed to every job opening on a continuing basis.

The optimal system will be designed to provide hard evidence on the relative usefulness of a variety of matching languages which will be built into the experimental design of the project. Because of economies of scale in computer operation, the system is most economical on a regional basis.

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[1] A report by the Joint Evaluation Team spells out recommendations on the reorganization.

The system will give special attention to employers. Job analysis data will be collected during employer development visits and made available to job order takers. The interactive system will bring back the personalization lost when job order taking became centralized.

Clients, employers, and managers must be provided with adequate information if the ES program is to succeed.

Objectives of a Job Match System

The ideal system would have the following objectives:

1) Redesign agency forms to maximize their usefulness in a computerized matching environment.
2) Design a placement information system to compare every worker to every job on a continuing basis.
3) Tie the system to a Regional Manpower Information Center.
4) Study several alternative matching algorithms for different classes of applicants or study an algorithm which handles applicants having differing characteristics in different ways. Different algorithms will be used and data will be collected on their effectiveness.
5) Weigh the relative gain in placement quality and quantity (if any) against the relative additional cost (if any) of a flexible language.
6) Restore the individualized attention given employers through on-line storage of employer information.
7) Increase productivity of ES staff by designing a system to reduce the paperwork which takes so much of the employment officers' time. Manual files will be replaced by computerized files whenever it is cost effective to do so.
8) Increase the usefulness of MODS data by permitting more flexible use of the data base.
9) Design a system which facilitates continuous monitoring of service rendered special target groups, i.e., minorities and veterans.
10) Permit the computer to serve local officers instead of forcing local office staff to serve the computer.

Project Design

The proposed system will provide immediate and comprehensive data about on-going job placement operations. It will eliminate hundreds of man and machine hours spent in preparing routine, and often unused, reports. It will permit the following operations:

1) The on-going analysis of ES penetration into the labor markets.
2) Continuing validation of ES planning and in-progress planning changes.
3) The creation of a single, regional data base.
4) Computer modeling and forecasting of worker demand, industry, and labor supply.

Alternative Job Match Languages

Several Department of Labor job-applicant matching systems have been developed. Wisconsin, Utah, and New York use on-line, real-time matching. Other states are planning batch matching systems.

It is proposed that applicants be matched using one of several algorithms selected on a stratified, random basis. Data on the algorithms' comparative effectiveness and on the effectiveness of their various characteristics will then be collected. Some algorithms will be tested for certain occupational groups only. Others may be tested for all occupations.

These systems can be characterized four ways:

1) Degree of interaction with the user (batch or on-line).
2) Type of descriptor used.
3) Algorithm used to match applicant and jobs.
4) Degree of match.

There are several descriptor types:

1) Job Analysis Vocabulary (JAV) (use of entire system).
2) Detailed Experimental Computer-Assisted Language (DECAL) (entire system).
3) Dictionary of Occupational Titles (DOT).
4) Worker Trait Groups.

5) Free Form English.

6) Selected skill indicators (which may be a part of JAV or DECAL) such as MIPSWA, Education, Language, GATB, GED, and SVP.

There are various degrees of match.

1) An EXACT match is required between descriptors and characteristics specified and those matched (MUSTS only).

2) A BEST match is found by weighing some factors as more important and other factors as less important (MAYS).

3) A COMBINATION match uses both MUSTS and MAYS.

Chart 1 shows the use of an exact match and a combination match in searching for applicants.

Matching algorithms can be characterized by the methods used to set weights for the match:

1) Preset in the computer.

2) Set based on applicant and employer choice.

3) Selected by employment officers.

4). Selected by terminal operator.

Weights can be selected interactively, as in the experiment; or they can be preset in batch matching.

It is impossible to specify exactly which of the hundreds of variants should be tried, but continued experimentation will make it possible to narrow the range.

Only applicants requesting the service will be included in the applicant file. Others can use self-service microfiche readers to select their own jobs.

Training costs can be minimized by using teams trained in particular search strategies and moving them from one office to another. Because many of the search strategies will be computer initiated, employment officers will not always need to know which algorithm is being used.

CHART 1. USE OF MATCHING IN APPLICANT SEARCH

EXACT:

Find in APPS where OCC is clerical and EXPERIENCE > 30 and MINPAY < 3.00 and TYPING > 60 and SHORTHAND > 80 and FORMER EXPERIENCE is ADMIN. and MIPSWA is 17194 and 17130.

COMBINATION:

Find in APPS where OCC is clerical and EXPERIENCE maybe > 30 and MINPAY < 3.00 and TYPING > 60 and SHORTHAND maybe < 80 and FORMER EXPERIENCE is ADMIN. and MIPSWA is 17194 and 17130.

MIPSWA:

17194 = IBM Selectric

17130 = IBM Transcriber

NOTE: Abbreviations could be used in actual practice but are not shown in this example because they would make the example less clear.

Proposed Activity in the IDS Offices

Five IDS office activities used to illustrate the use of the proposed placement-information system are described below. Each assumes that operations go through a centralized terminal operator in each office.

Activity No. 1 - Recording Job Orders

Currently, valuable information is not available to job order takers. They cannot draw on ES employer histories, and each employer must repeat his personnel needs with each set of job orders. A job order's circulation is delayed until the day after it is received. Manual files are seldom searched for suitable applicants.

In the proposed system, the job order taker will be given three kinds of background information:

1) Characteristics of the firm.
2) Existing job classification and placement history.
3) Record of ES services to this employer (see charts 2 and 3).

This information would be recorded for frequent ES users only. The quantitative decision setting the breakpoint between frequent and other users can be made as data are collected.

After the job order taker has processed a job order and entered it into the system, a standard applicant search will be performed, and a list of prospective applicants will be produced. (See Figure 2.)

Activity No. 2 - Applicant Search

Applicant searches will be carried out at the following times:

1) When the job order first enters the system.
2) Two days after the job order enters the system if no referrals have been made at the time.
3) At weekly intervals after entry into the system.
4) On special request, e.g., as part of a special service to employers.

Applicants can call a phone number to determine if their application was matched on a given day if they do not have a phone number.

CHART 2. HYPOTHETICAL COMPUTERIZED EMPLOYER RELATIONS FILE

Employer Name	- ABC Company
Address	- 14444 W-14th Street
City, State, ZIP	- Boulder, Colorado 80302
Employer ID	- 12345678901
Nature of Business	- Paper Wholesaler
# of Job Orders last 12 months	- 7
# of Referrals last 12 months	- 12
# of Hires last 12 months	- 3
Personnel Contact	- Alice Jones
Employers Job Classification #	- Job Title

101 - Programmer
109 - Sr. Systems Analyst
135 - Computer Operator
212 - Keypunch Operator
501 - Secretary
812 - Foreman
989 - Laborer

NOTE: For each job classification there is a second set of information.

CHART 3. SAMPLE REQUESTS FOR EMPLOYER FILES

1) GET FIRM WHOSE PHONE IS 452-4116

or

GET FIRM WHOSE EMPLOYER ID IS 12345678901.

The telephone number or the employer ID of the firm can be used as an index.

2) DESCRIBE JOB CLASSIFICATION 989.

A detailed description of this job class is then printed.

3) DISPLAY PLACEMENT FOR 989.

The new hires through the ES for this job class are printed.

4) CREATE NEW JOB CLASSIFICATION

A new job classification is added to the employer's records.

5) PLACE ORDER FOR 135.

A job order for a computer operator is to be added to the job bank immediately.

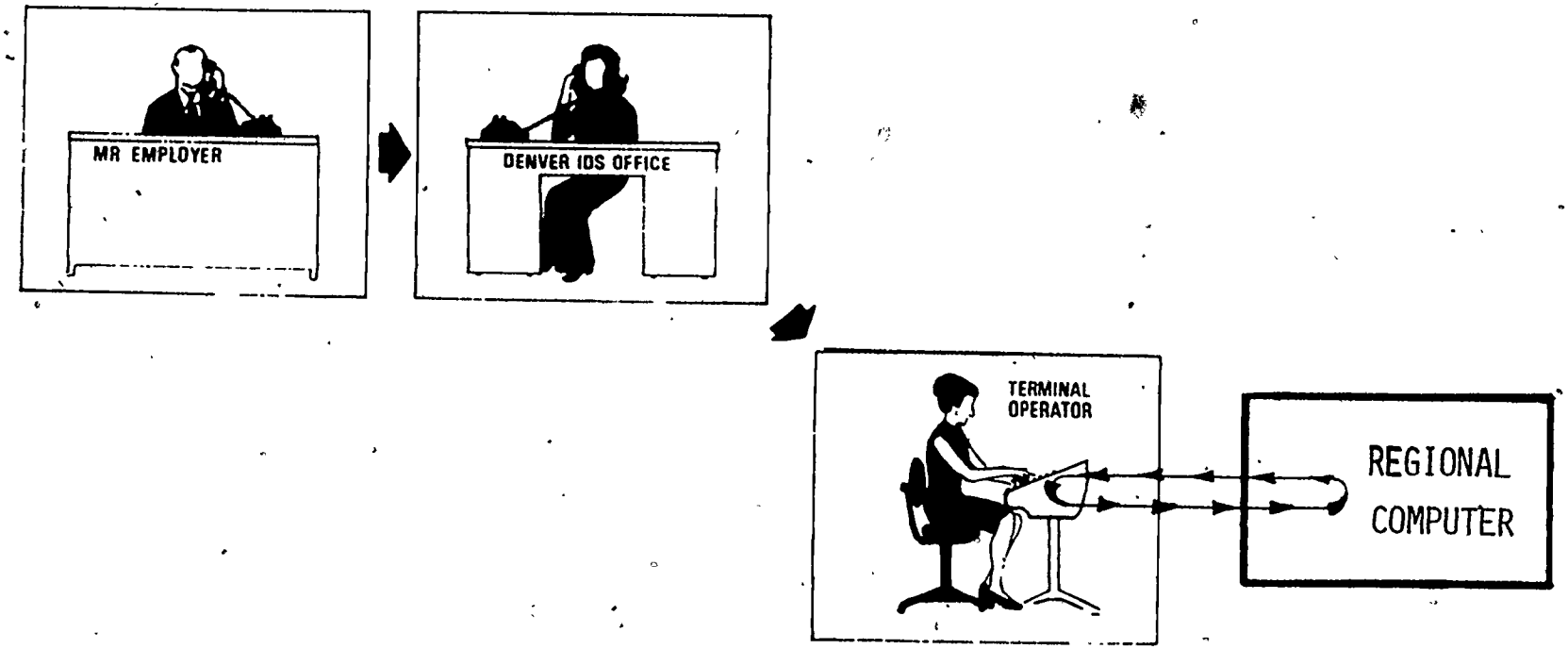


FIGURE 2. RECORDING JOB ORDERS.

Activity No. 3 - Recording Applicant Characteristics

The applicant will fill out much of the applicant characteristics form himself, assisted by an audio/visual aid such as a carousel/tape recorder combination. The interviewer will add to the form those answers which require his judgment and expertise. The completed form will be given to the terminal operator for entry. (See Figure 3.)

Activity No. 4 - Job Search

The job search can be initiated whether the applicant is present or not. The latter use might occur as an employment officer works on his caseload or gives special attention to a target group. Or, an applicant might telephone or mail a search request, in response to a mail campaign, perhaps.

Figure 4 illustrates one type of job search. In this example, the interviewer specifies an applicant's job requirements and gives them to a terminal operator. The results of the search are returned to the interviewer.

Activity No. 5 - Request for Referral

A request for permission to refer might be initiated by an interviewer as a result of JIS activity, as part of a fully computerized job-applicant match, or for some other reason. When permission to refer an applicant to a job is requested, the computer will calculate a closeness-of-match indicator if any more referrals can be made. This indicator could be a number from 0 to 99.

An example of the way this indicator might be used follows.

1) If the indicator is between 71 and 99, the applicant would be referred without further screening by an interviewer.
2) If the indicator is less than 70, a screening interview with an employment officer would be required.
3) If the indicator is less than 30, the system would indicate that the probability of the applicant being placed is small.
4) The interviewer would have the final decision in both (2) and (3).

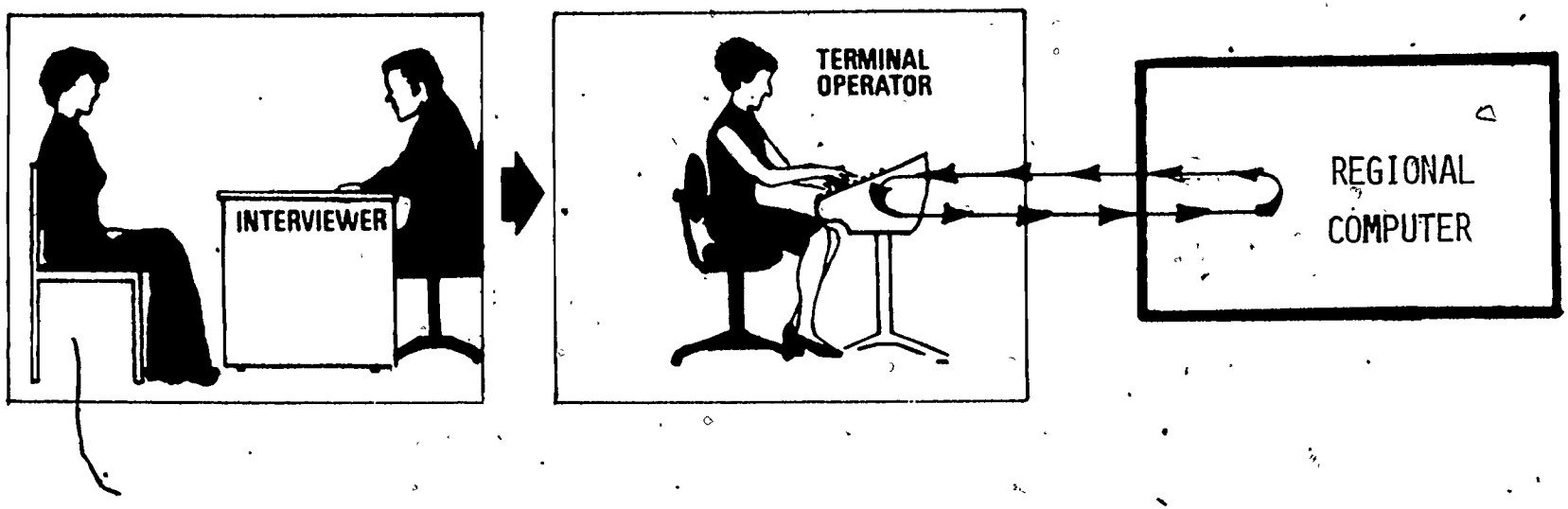
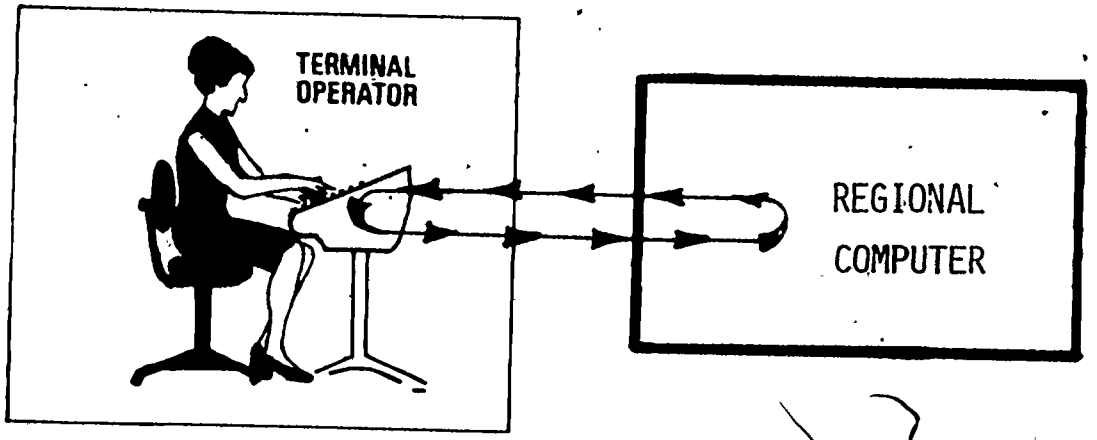


FIGURE 3. RECORDING APPLICANT CHARACTERISTICS.



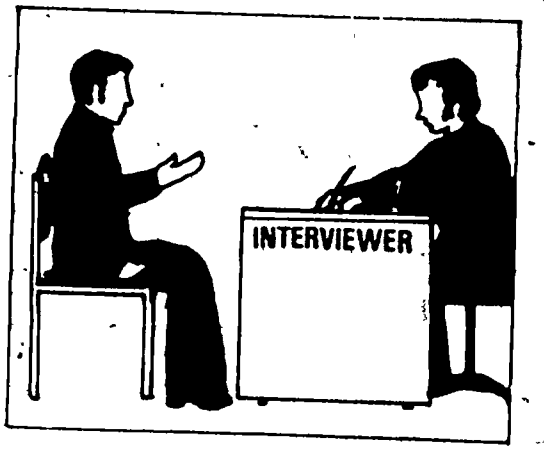


FIGURE 4. JOB SEARCH.

5) Statistics on the success of this screening aid could be easily collected.

6) The breakpoints in this example are illustrative. The algorithm for determining the closeness of match would be modified as experience accumulates. Initially the breakpoints would be low and would be adjusted upward with the accumulation of experience.

(See Figure 5.)

Activity No. 6 - Recording Referral Results

When results of a referral are known, they will be recorded on a standard form and given to the terminal operator (See Figure 6).

Figure 7 illustrates the combined on-line operations in the IDS office. An example of priorities used to determine which activities the terminal operator will process first follows:

1) Referral Request
2) Job Search
3) Applicant Characteristics Entry
4) Referral Results

Job order entry would be handled by a different order taker/operator.

Transfer of Information Between State Agency and the Regional Computer

To carry out the experiment as outlined, the data processing facilities at the state agency and the regional center must work in unison. One proposed flow of information in a batch environment between the two computers is illustrated in Figure 8. Each step of the process is described below.

1) Data Entry: Job Bank and other Employment Service forms will be entered on-line using a key entry system with a mini computer.

2) Transmission to the Regional Computer: Data collected above would be transmitted to the region in the evening and would be available for retrieval the next day. Several transmissions per day may be desirable as well, depending on the load.

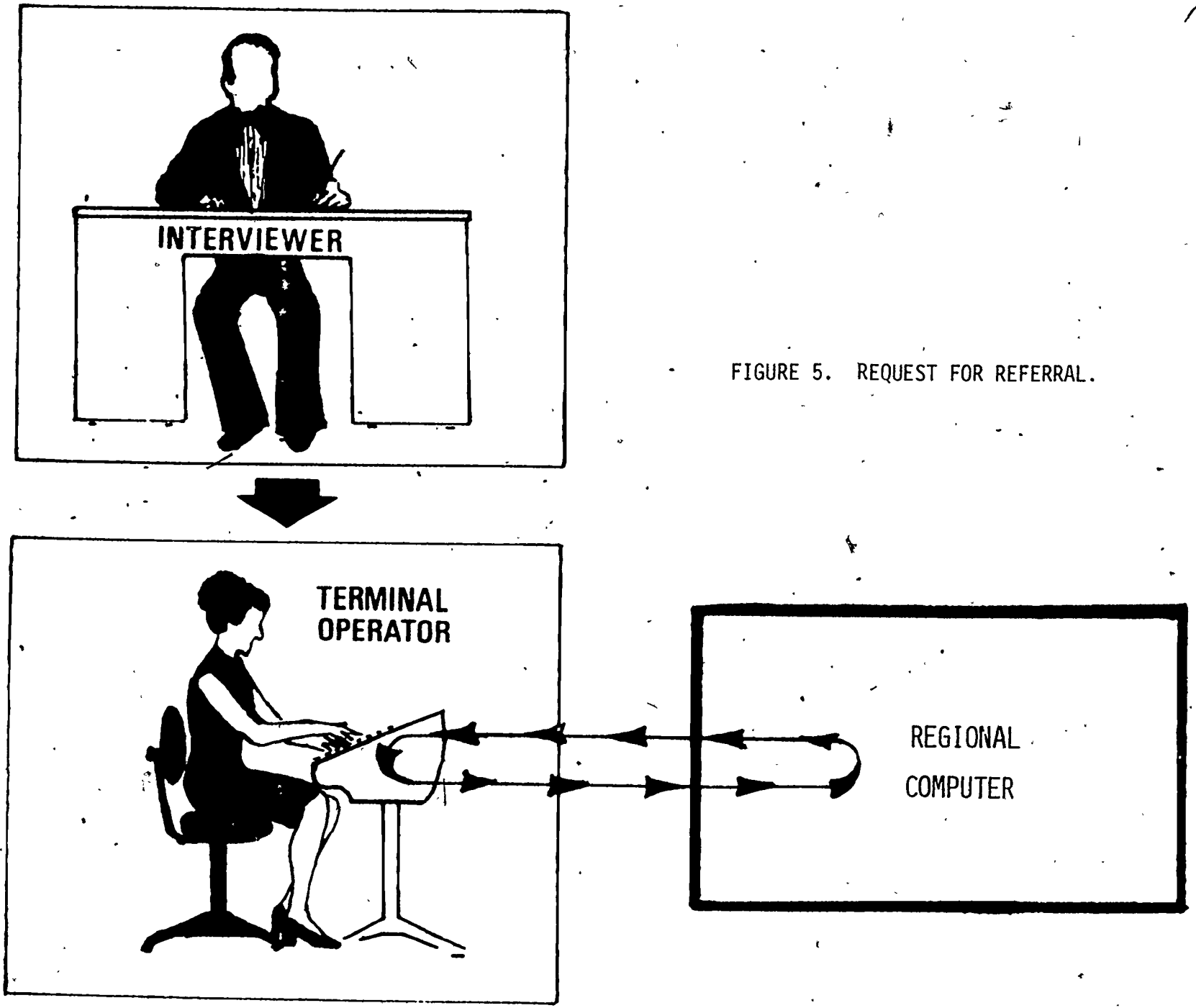


FIGURE 5. REQUEST FOR REFERRAL.

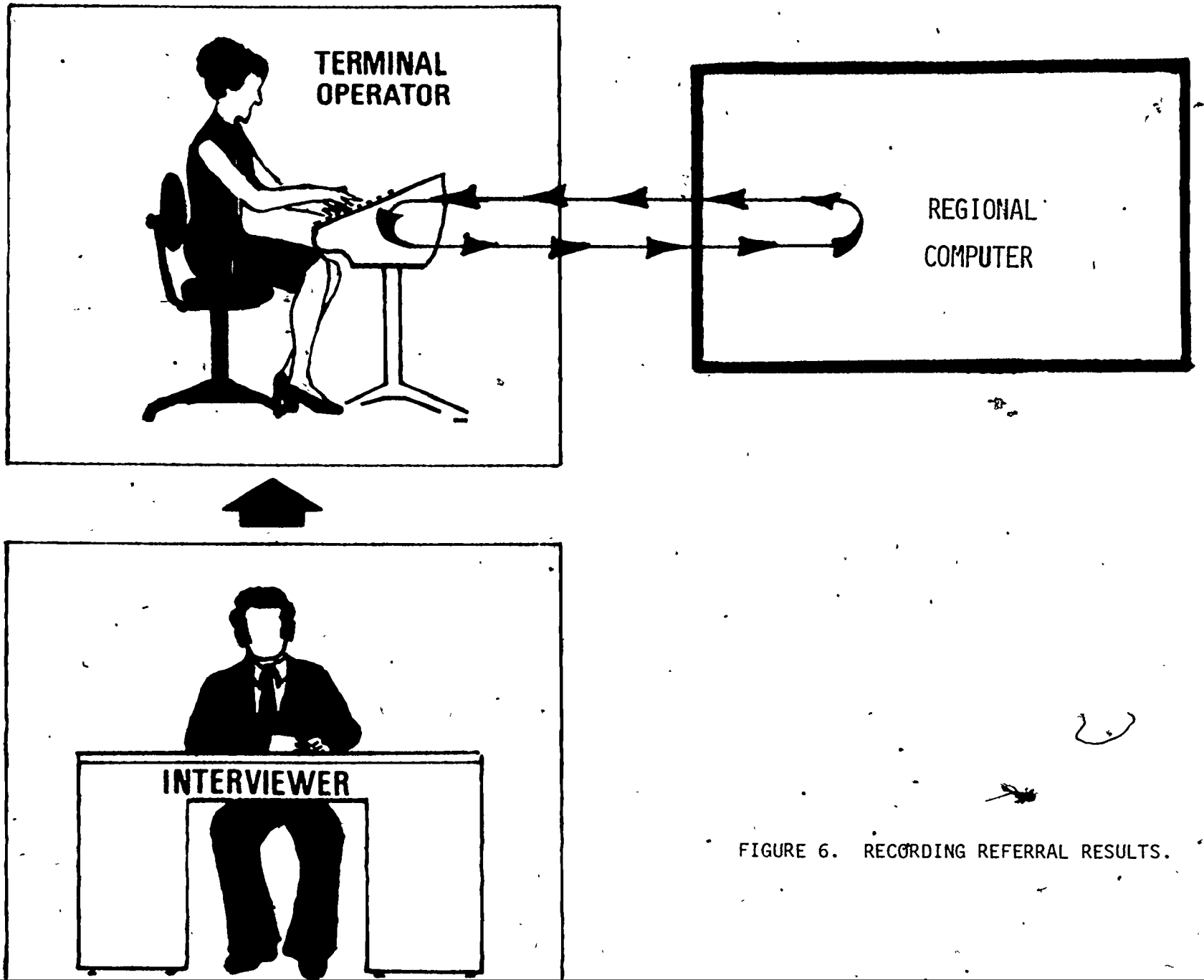


FIGURE 6. RECORDING REFERRAL RESULTS.

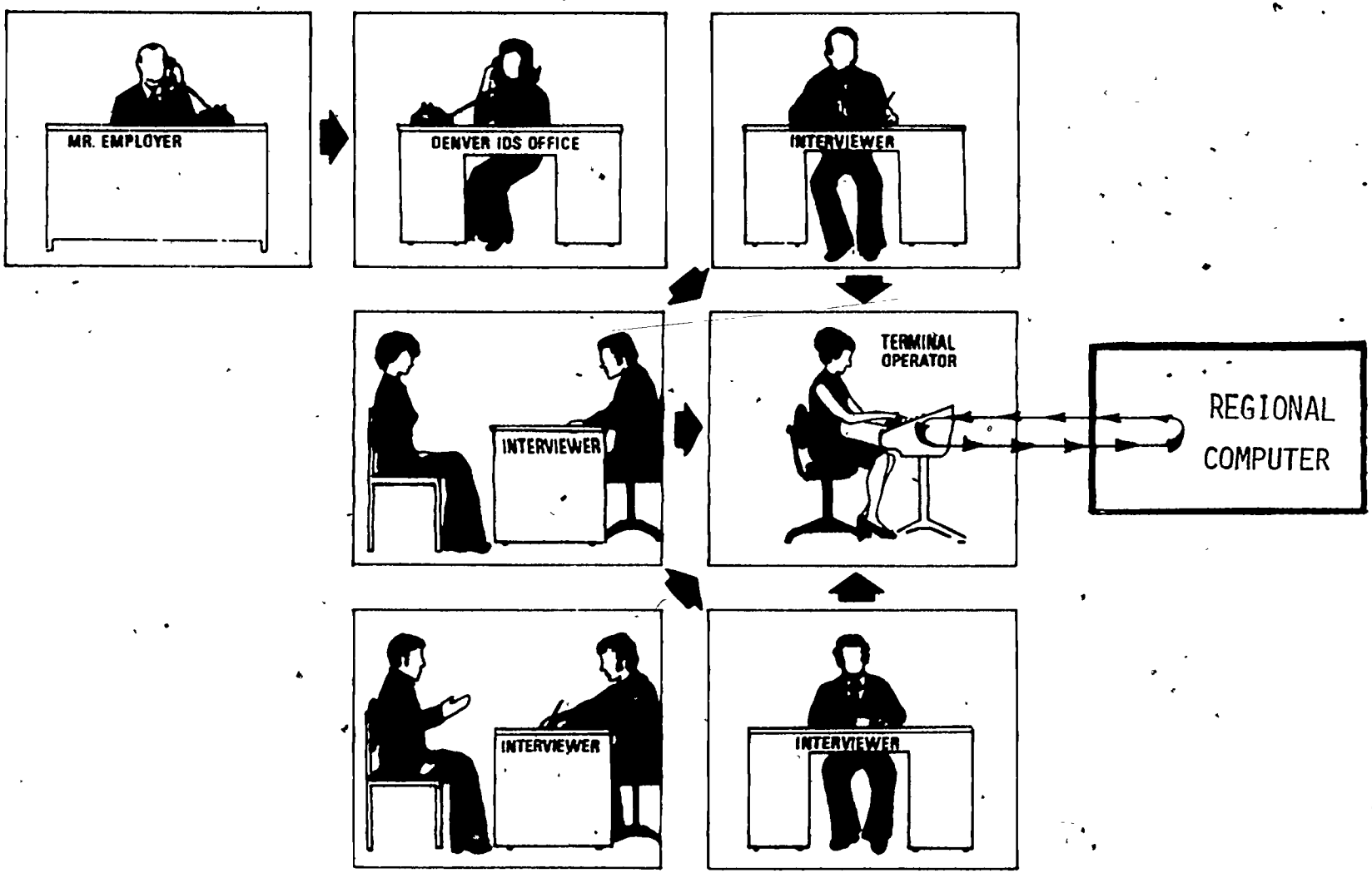


FIGURE 7. COMBINED ON-LINE OPERATIONS OF AN IDS OFFICE.

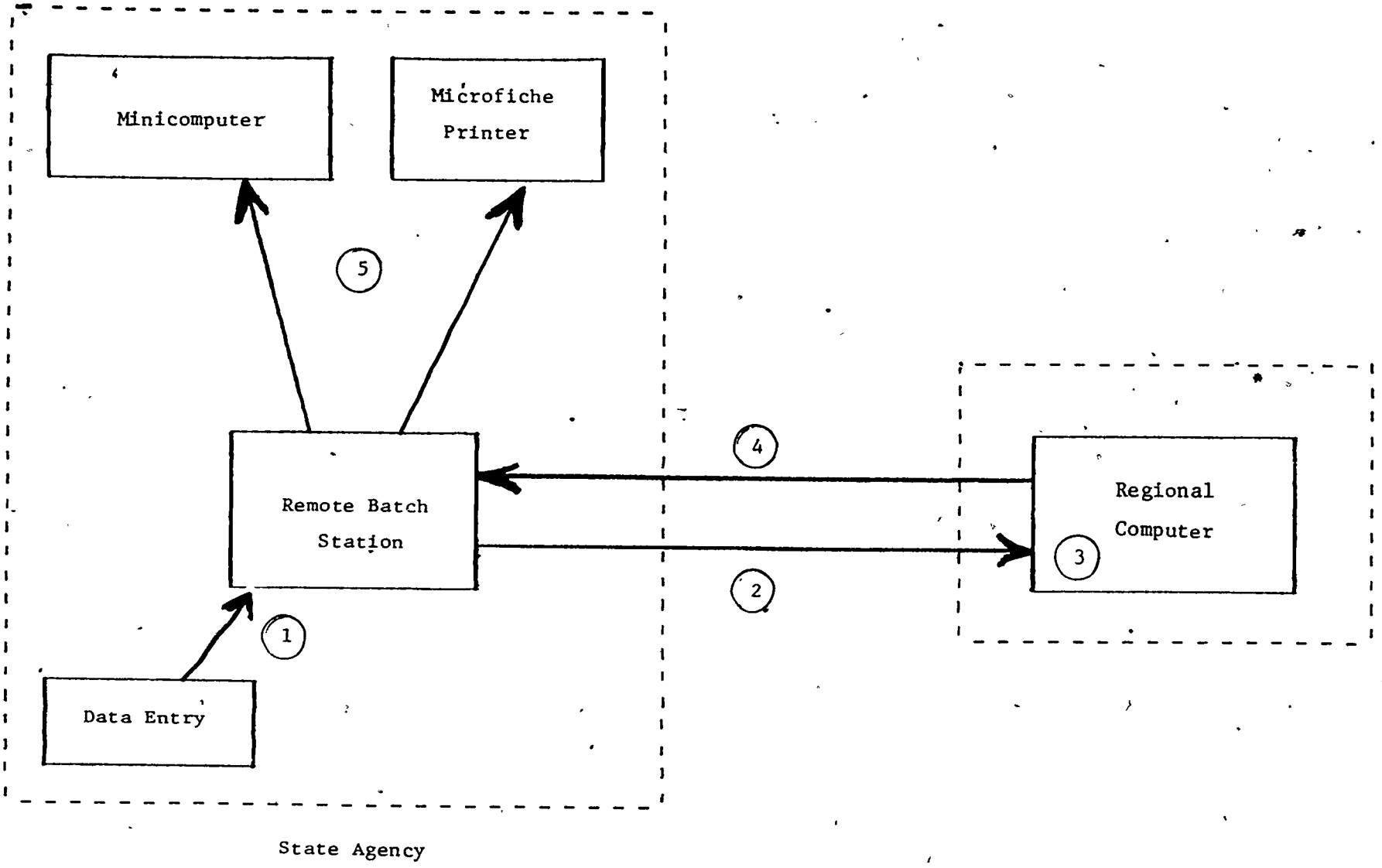


FIGURE 8. ROUTINE OF PROPOSED NIGHTLY DATA PROCESSING ACTIVITIES.

3) Update System: The data received at the region will be used as input to the Update System, which will update the job, applicant, and referral data sets and produce information for transfer to the Job Bank microfiche.

4) Transmission Back to Minicomputer: The information needed to produce the Job Bank will then be transmitted back to the agency minicomputer.

5) Processing of Regional Data: The tape produced on the minicomputer can then be used on a tape-to-microfiche production facility to produce the Job Bank microfiche.

Job Order Control

All requests for referral in the IDS offices are to be made directly on computer terminals. The system will keep track of placements, and it will record basic information about the applicant and interviewer when a referral is made.

All other offices will telephone Job Order Control to request permission to refer. While the interviewer is on the phone, a Job Order Control staff member will perform the referral request on a terminal at the control site.

Thus, all referral activity will take place on-line, either directly or indirectly. (See Figure 9.)

Employer Development

Over the past several years, employers have felt that their relations with the Employment Service have become depersonalized. A new procedure to integrate employer-visit information with the order-taking process was previously described. It will require employment service job developers to build up occupational descriptions profiles of employers likely to list with the ES.

To facilitate the strategy for employer visits, employment forecasts will be made by occupation, industry, and firm. On the basis of these forecasts, employers will be selected for more or less intensive employer development. Data on job orders will be matched with

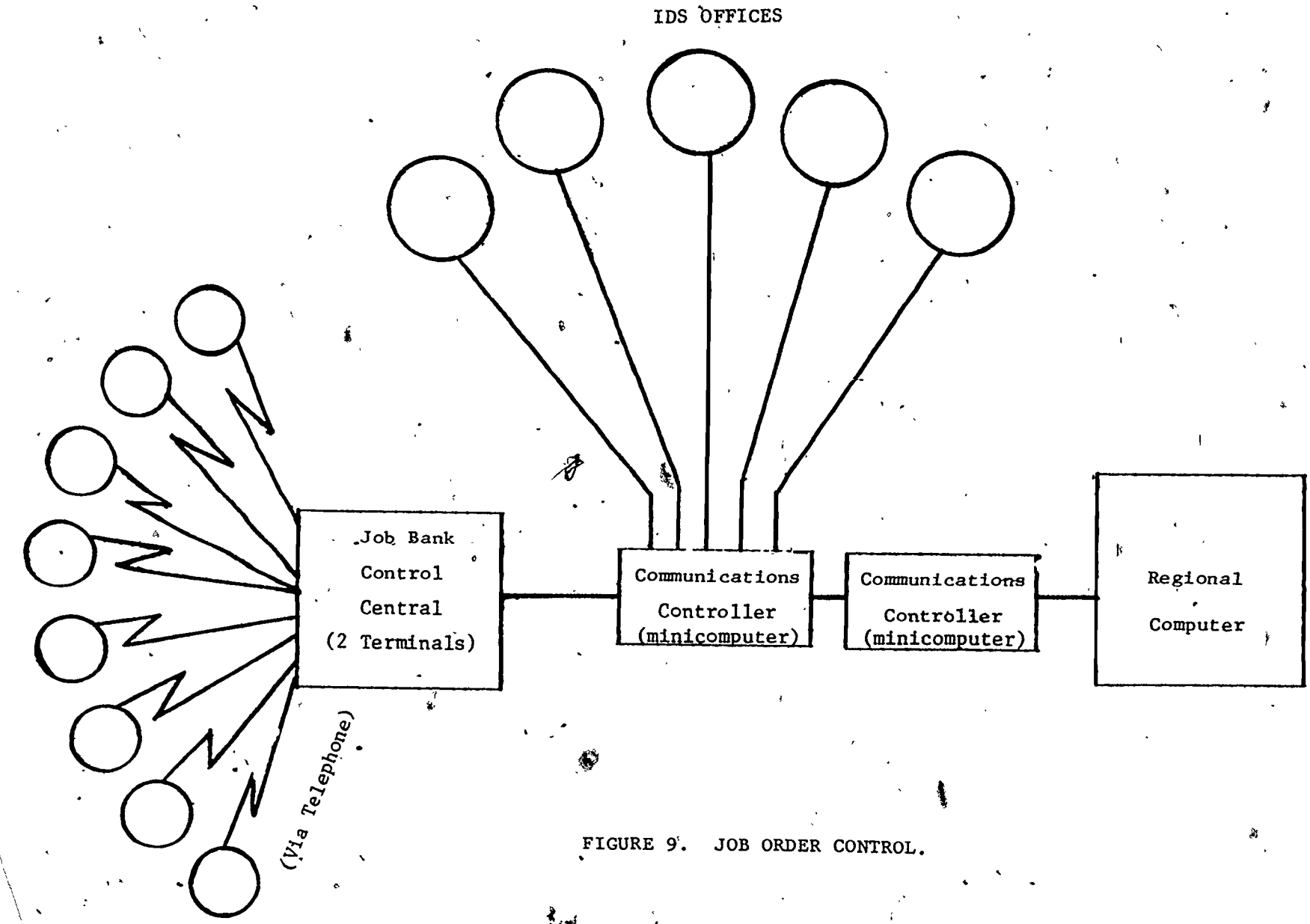


FIGURE 9. JOB ORDER CONTROL.

other employer data such as total hires by existing wage-record data. Goals will be set for job order development, and the success of various job developers will be monitored.

Timing Considerations

There is much overlap in the periods of execution of the eight phases in this system. A minimum of one year is required to start the project. The following phases are envisioned:

1) Forms design - 2 months.
2) Systems development to point of testing at first office - 8 months.
3) Systems expansion to additional offices and initial training - 4 months.

Although the steps will overlap somewhat, delays in one phase can delay subsequent phases. Delays may or may not affect the total cost of the project.

Evaluation

Evaluation of alternative matching strategies is an important aspect of the proposed system. This evaluation will require the collection of detailed management information on applicants and jobs; and as a by-product of this project, very detailed management information on the performance of the Employment Service will be provided to local office managers, area managers, and state, regional, and national offices.

The following search strategies illustrate the types of strategies to be tested and compared.

1) Employment Service officers will use a flexible retrieval language to match applicants and jobs. They will query the applicant file; and the number of applicants selected will be sequentially reduced until, in the judgment of the employment officer or terminal oeprator, an optimal match occurs.
2. Character descriptors such as the DECAL vocabulary will be used.

3) Different factors such as pay and location will be weighted; and a match will be based on these weighted factors, which will be preset for all applicants.

4) Weights will be recorded for each applicant at the time of application.

Groups of employment officers will be trained in alternative strategies and will be moved from office to office to make it possible to use different strategies over time in each office. Since detailed data will be collected on each applicant, it should be possible to separate out applicant characteristics, search strategies, and seasonal and economic factors affecting placement.

Some differences in strategies do not require that the employment officer learn a different procedure. For example, the computer can select one of the three matching algorithms on a stratified random basis and record the one selected. In one instance, the computer might search six-digit DOT; and finding no match, it might then match on Worker Trait Group. In another instance, it might match on three-digit DOT.

As enough information is collected to evaluate a procedure, refinements and eliminations can be made continuously in an effort to achieve the best matching algorithm(s).

Factors affecting placement success include duration of job, wage paid by job, and average hours of job per week. The number of successful placements and the number of applicants sent to jobs and determined by employers to be unqualified are other criteria.

In a wage-record state, a continuous wage history file is maintained to provide data on the earnings of every person employed in the state by every employer covered by the law. Thus, it is possible to match the applicants served by the Employment Service against their wage records before and after placement to determine the earnings of persons placed in most jobs.

It is also possible to match job orders against total new hires to determine the penetration of job orders into various occupations and industries.

Costs and Benefits of Proposed System

The cost of the proposed system would depend on the size of state or states served in the system, the equipment used in the state, the software and operating system used, the amount of research actually carried out relative to operations, the number of years for which the development is undertaken, the use made of software already developed by the Department of Labor, the other uses of the machine, and constant changes in the price of computer hardware and telecommunications costs. Such things as the availability of a microwave communications network, for example, can drastically lower the costs of telecommunication.

However, assuming a new system were written for a regional center operating in the Denver region, meeting the approximate description of the system described in this chapter, designed over three years and serving the states except Utah in the region, the development cost would be about $300,000, evaluation would cost about $200,000, training would cost about $200,000, and operations would cost about $500,000/year.

Since the system could also accomplish many of the objectives of existing programs, the net cost would be smaller.

Table 20 illustrates the current operations performed in a local office in a manual mode and the time that could be saved in an automated office. Table 21 gives more detail on the manual operations and shows a deficit in time required to perform them.

The computer would not save much money by replacing existing staff, however, for two reasons.

1) Many of the functions suggested in Table 21 are not currently adequately performed in most local offices.
2) The performance of these functions could increase job placements which would prevent the new technology from leading to layoffs in staff.

The system is sufficiently costly that unless it is eventually adopted on a regional basis as suggested in this proposal or unless the development costs can be amortized among a large enough number of centers (say five), it is probably not cost justifiable as compared with hiring more ES officers. Permitting each state to develop its own matching system would be very expensive.

TABLE 20. ILLUSTRATIVE EXAMPLE OF OPERATIONS IN MANUAL AND COMPUTERIZED MODES

	Ideal Manual Operation	Proposed Automated Operation
Accepting Repeat Job Order	10 min	2 min
Accepting New Job Order	10 min	5-10 min
Initial Interview With Applicant	15 min	IDS: 25 min
Search Applicant File For New Job Order	30 min	JIS: 10 min
Search Job File For Applicant		
Applicant's DOT Matches Job DOT.	2 min	30 seconds if criteria on applicant is prerecorded else 10 min
Applicant's DOT Does Not Match	25 min	
Screen Applicants for Referral and Request Permission to Refer	10 min	1 min
Fill Out Referral Card and Perform Follow-up	10 min	5 min
Daily Purge of Applicant File	30 min	1 min
Work on Applicant Caseload and Job Development	60 min	15 min
Referral "Short-Order" Job Actuary	10 min	10 min
Other Paperwork	4 hrs/day	1 hr/day

Source: Estimates based on observations in Boulder, Colorado, and discussions with ES staff, not on formal time study.

TABLE 21. COST MODEL: ILLUSTRATIVE EXAMPLE

STAFFING OF PLACEMENT OPERATIONS IN HYPOTHETICAL LOCAL OFFICE

MANUAL SYSTEM

FTE	
1/2	Manager/Assistant Manager
1	Counselor
5	Employment Officer

	Activity	Frequency	Time Per Transaction	Time Required Per Day
1	Job Orders Taken	30	10	300
2	Applicant Interviews	50	15	750
3	Search Applicant File For New Job Orders	20	30	600
4	Short Orders Taken & Referred	10	9	90
5	Screening & Referral of Job Applicants	40	10	400
6	Employment Officer Aided Job Search	20	25	500
7	Case Load/Counseling	6	60	360
8	Job Development (Visit)	2	60	120
9	Phone	10	5	50
10	Follow-up & Paperwork	60	10	600
11	Daily Purge of Applicant File	1	30	30
12	Training	-	120	120
13	Vacation/Sick Leave	-	240	240
14	Other Work	-	240	240
				4400 min/day
			available minutes/day	2925 min/day
			deficit	1475 min/day
			or	50%

Source: See Table 20.

CHAPTER SIX
LIMITATIONS OF THE STUDY

The site selected had some disadvantages:

1) Computer searches are most likely to be beneficial when the metropolitan area in question is very large. Boulder is not as large as Denver and is somewhat removed from the Metropolitan Denver job market by its distance from the city.
2) The city of Denver has a more typical labor market than Boulder does. Moreover, since the University of Colorado is located in Boulder, Boulder has many of the special labor market characteristics of a college town.
3) The Boulder local office makes many short-term placements for jobs of short duration (1-3 days).
4) Even before the experiment began, the employment officers complained that they had little time to perform job searches for applicants. Therefore, they might not use an on-line system in the job search process because they spent very little time performing this activity.
5) An applicant self-service system was installed in the Boulder office just before training for computer-aided placement began. As a result, the effect of the computer system could not be adequately evaluated through comparisons of placements in the Boulder office with placements in other offices.
6) The manager and assistant manager were transferred during the training period. The terminal operator left during the training period.

The design and operation of an optimal matching system for Colorado would cost several million dollars over a 3- to 4-year period. Such a system was described in Chapter 5. The system used in the experiment took existing reporting forms and modified them for use in a matching system.

During about one-fourth of the experimental period, the on-line system could not be fully used, because:

1) The Employment Service computer in Denver did not transmit data to Michigan.
2) The University of Michigan computer was not operating.
3) The computer terminal was not operating.

When any one of these problems arose, the experiment could not be fully carried out that day. None of these failures are related to the remote location of the computer. In an actual large-scale, multi-site implementation, several terminals might be used in each local office, a back-up computer might be available, and a higher priority might be given to the transmission of data than could be given by the Colorado Division of Employment.

Assuring a higher degree of reliability in a one-office experiment would have doubled the cost of this experiment. On the other hand, in a full-scale operation the same increased reliability might have resulted in only a fractional increase in costs.

When analyzing comparisons of placements made with or without the on-line system, it should be remembered that terminal placement could be made during only about three-quarters of the number of days the experiment ran.

APPENDIX A

Abridged Version of Users Guide Used in Training of Employment Officers and Terminal Operator[1]

[1]The original guide was written by Michael A. Kahn and Paula H. Harbison.

DOCUMENTATION A-1: JOB ORDER FILE DESCRIPTION

THE JOB BANK DATA SET

JOB DATA SET
USE COUNT: 1

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
F(1)	JOBORDERNUM	JOB#		JOB ORDER NUMBER
F(2)	DOT1T06	DOT		OCCUPATION CODE - DOT 1ST THRU 6TH DIGITS
F(3)	DOT1T01	DOT1		OCCUPATION CODE - FIRST DIGIT ONLY
F(4)	DOT1T02	DOT2		OCCUPATION CODE - DOT 1ST AND 2ND DIGITS
F(5)	DOT1T03	DOT3		OCCUPATION CODE - DOT 1ST THROUGH 3RD
F(6)	DOT4T06	DPT		OCCUPATION CODE - DOT 4TH THROUGTH 6TH DIGITS (DATA-PEOPLE-THINGS)
F(7)	DATA	DATA		OCCUPATION CODE - DOT 4TH DIGIT (DATA)
F(8)	PEOPLE	PEOP		OCCUPATION CODE - DOT 5TH DIGIT (PEOPLE)
F(9)	THINGS	THNG		OCCUPATION CODE - DOT 6TH DIGIT (THINGS)
F(10)	DURATION	DURA		DURATION OF JOB
	CATEGORIES			
	NOREPLY		0	NO REPLY
	PERMANENT		1	MORE THAN 150 DAYS
	DAYS1T03		2	1 TO 3 DAYS
	DAYS4T0150		3	4 TO 150 DAYS
	SEASONAL		4	SEASONAL
F(11)	HOURS	HRS		NUMBER OF HOURS OF WORK PER WEEK: ZERO MEANS NOT AVAILABLE
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(12)	WORKWEEK	WKWK		IS JOB PART-TIME OR FULL-TIME?
	CATEGORIES			
	FULL		1	HOURS TO BE WORKED ARE 35 OR MORE
	PARTIAL		2	HOURS TO BE WORKED ARE LESS THAN 35
	NOREPLY		0	NO REPLY
F(13)	EDUCATION	EDUC		EDUCATION LEVEL COMPLETED
	CATEGORIES			
	UNSPECIFIED		0	NOT APPLICABLE OR NO REPLY
	FIRST		1	COMPLETED FIRST GRADE
	SECOND		2	COMPLETED SECOND GRADE
	THIRD		3	COMPLETED THIRD GRADE

JOB DATA SET

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES (CONTINUED)			
	FOURTH		4	COMPLETED FOURTH GRADE
	FIFTH		5	COMPLETED FIFTH GRADE
	SIXTH		6	COMPLETED SIXTH GRADE
	SEVENTH		7	COMPLETED SEVENTH GRADE
	EIGHTH		8	COMPLETED EIGHTH GRADE
	NINTH		9	COMPLETED NINTH GRADE
	TENTH		10	COMPLETED TENTH GRADE
	ELEVENTH		11	COMPLETED ELEVENTH GRADE
	HIGHSCHOOL		12	HIGH SCHOOL GRADUATE
	COLLEGE1		13	COMPLETED 1 YEAR OF COLLEGE
	COLLEGE2		14	COMPLETED 2 YEARS OF COLLEGE
	COLLEGE3		15	COMPLETED 3 YEARS OF COLLEGE
	BACHELOR		16	RECEIVED BACHELOR'S DEGREE
	MASTERS		17	RECEIVED MASTERS DEGREE
	MASTERS+		18	DOING ADVANCED WORK
	PHD		19	RECEIVED PHD
F(14)	EXPERIENCE	EXP		EXPERIENCE REQUIRED IN MONTHS
F(15)	TRAINEE	TRNE		TRAINEE ACCEPTED?
	CATEGORIES			
	YES		1	YES
	NO		2	NO
F(16)	ZIPCODE	ZIP		ZIP CODE OF EMPLOYER
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(17)	COUNTY	CNTY		COUNTY CODE OF EMPLOYER
	CATEGORIES			
	NOREPLY		0	NO REPLY
	ADAMS		1	ADAMS CO.
	ALAMOSA		3	ALLAMOSA CO.
	ARAPAHOE		5	ARAPAHOE CO.
	ARCHULETA		7	ARCHULETA CO.
	BACA		9	BACA CO.
	BENT		11	BENT CO.
	BOULDER		13	BOULDER CO.
	CHAFEE		15	CHAFEE CO.
	CHEYENNE		17	CHEYENNE CO.
	CLEAR CREEK		19	CLEAR CREEK CO.
	CONEJOS		21	CONEJOS CO.
	COSTILLA		23	COSTILLA CO.
	CROWLEY		25	CROWLEY CO.
	CUSTER		27	CUSTER CO.
	DELTA		29	DELTA CO.
	DENVER		31	DENVER CO.
	DOLORES		33	DOLORES
	DOUGLAS		35	DOUGLAS CO.
	EAGLE		37	EAGLE CO.
	ELBERT		39	ELBERT CO.

JOB DATA SET

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES (CONTINUED)			
	EL PASO		41	EL PASO CO.
	FREMONT		43	FREMONT CO.
	GARFIELD		45	GARFIELD CO.
	GILPIN		47	GILPIN CO.
	GRAND		49	GRAND CO.
	GUNNISON		51	GUNNISON CO.
	HINSDALE		53	HINSDALE CO.
	HUERFANO		55	HUERFANO CO.
	JACKSON		57	JACKSON CO.
	JEFFERSON		59	JEFFERSON CO.
	KIOWA		61	KIOWA CO.
	KIT CARSON		63	KIT CARSON CO.
	LAKE		65	LAKE CO.
	LA PLATA		67	LA PLATA CO.
	LARIMER		69	LARIMER CO.
	LAS ANIMAS		71	LAS ANIMAS CO.
	LINCOLN		73	LINCOLN CO.
	LOGAN		75	LOGAN CO.
	MESA		77	MESA CO.
	MINERAL		79	MINERAL CO.
	MOFFAT		81	MOFFAT CO.
	MONTEZUMA		83	MONTEZUMA CO.
	MONTROSE		85	MONTROSE CO.
	MORGAN		87	MORGAN CO.
	OTERO		89	OTERO CO.
	OURAY		91	OURAY CO.
	PARK		93	PARK CO.
	PHILLIPS		95	PHILLIPS CO.
	PITKIN		97	PITKIN CO.
	PROWERS		99	PROWERS CO.
	PUEBLO		101	PUEBLO
	RIO BLANCO		103	RIO BLANCO CO.
	RIO GRANDE		105	RIOGRANDE CO.
	ROUTT		107	ROUTT CO.
	SAGUACHE		109	SAGUACHE CO.
	SAN JUAN		110	SAN JUAN CO.
	SAN MIGUAL		113	SAN MIGUAL CO.
	SEDGWICK		115	SEDGWICK CO.
	SUMMIT		117	SUMMIT CO.
	TELLER		119	TELLER CO.
	WASHINGTON		121	WASHINGTON CO.
	WELD		123	WELD CO.
	YUMA		125	YUMA CO.
F(18)	PAY/YEAR	YRS		ESTIMATE OF YEARLY MINIMUM PAY
F(19)	PAY/MONTH	MOS		ESTIMATE OF MONTHLY MINIMUM PAY
F(20)	PAY/WEEK	WKS		ESTIMATE OF WEEKLY MINIMUM PAY
F(21)	PAY/HOUR	HRS		ESTIMATE OF HOURLY MINIMUM PAY IN

DOCUMENTATION A-1. Continued

JOB DATA SET

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
				DOLLARS AND CENTS (WITH DECIMAL POINT)
F(22)	ORDERDATE	DATE		DATE JOB ORDER WAS PLACED (YRMODA)
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(23)	PROCESSDATE	JUL		JULIAN DATE OF DENVER PROCESSING

EXAMPLE A-1.

THE JOB BANK DATA SET

Sam S, a young man, comes in seeking work as a truck driver. He is young and has no experience driving a truck. Since the first DOT digit for jobs in the transportation area is nine, you might start with that as a criterion for a FIND:

```
*READY:
-find in jobs where dot1 is 9.
* 202 (8.58%) RECORDS FOUND
* 202 RECORDS IN RESULT SET
```

Since that produces too many jobs, the list can be narrowed by adding the second DOT for more detail:

```
*READY:
-find is result where dot2 is 90.
* 50 (24.75%) RECORDS FOUND
* 50 RECORDS IN RESULT SET
```

Now the range of jobs can be further restricted by searching for those requiring limited experience:

```
*READY:
-find in result where exp<9.
* 25 (50.00%) RECORDS FOUND
* 25 RECORDS IN RESULT SET
```

Note that the percentages refer to the previous set and not the original set. For example, 25 out of 50 or 50% of all jobs where dot2 is 90 require under 9 months' experience.

EXAMPLE A-1. Continued

Now you can find out how much experience each job requires and which will accept trainees;

```
*READY:
-name result t.


*READY:
-x in t exp and trne.
* 05 RECORDS IN RESULT SET
* 25 RECORDS REPRESENTED


*READY:
-p it.
*EXPERIENCE        TRAINEE          COUNT
*          0       YES                  9
*          0       NO                   2
*          3       YES                  2
*          6       YES                  1
*          6       NO                  11

*END OF DATA SET
```

EXAMPLE A-1. Continued

Now you can further narrow the job list down to those which will accept trainees and those which require no experience. Then you can find the starting pay range of these jobs and how many there are at the top pay level.

```
*READY:
-find in t where trainee is yes.
* 12 (48.00%) RECORDS FOUND
* 12 RECORDS IN RESULT SET


*READY:
-find in result where exp=0.
* 09 (75.00%) RECORDS FOUND
* 09 RECORDS IN RESULT SET


*READY:
-p in result hr$.
*PAY/HOUR
*       2.00
*       2.25
*       1.75
*       2.00
*       2.25
*       2.50
*       2.00
*       2.50
*       2.36

*END OF DATA SET


*READY:
-find in result where hr=2.50.
* 02 (22.22%) RECORDS FOUND
* 02 RECORDS IN RESULT SET
```

EXAMPLE A-1. Continued

Now that you have narrowed the available jobs down to a workable number meeting as many of the applicant's criteria as possible, you can print the job descriptions.[1]

```
*READY:
-display job desc.
*
*

* *** JOB NUMBER 572442 ***
*905.883 03/18/74     TRUCK DRIVER          60HR DUR=SEASONAL      TRNE=OK
*
                                           REQ:
*                                                                 SIC=0714
*                     PAY=00002.50-00003.00 /HOUR  NO TEST REQD   LO=
*EDUC=RW   EXP=00MOS  BENEFITS=                                   SD=
*      HOURS OF WORK FROM 9-10:00AM TO 8-9:00PM DEPENDING ON WEAT
       HER. WORK TO START ABOUT THE MIDDLE OF MAY & RUN THROUGH D
       ECEMBER.  START COMBINING WHEAT IN VERNON, TEX & WORK KS,
       COLO. & NEB. COMBINE BARLEY IN SAN LUIS VALLEY & END UP IN
        GARDEN CITY COMBINING MAIZE.  APPLY SAP-WORK TO START ABOU
       T ABOUT MIDDLE OF MAY.

* *** JOB NUMBER 577569 ***
*906.883 03/29/74     TRUCK DRIVER LIGHT   44HR DUR=PERMANENT    TRNE=OK
*                                          REQ:
*                                  CALL FIRST                   SIC=5065
*                     PAY=00100.00-00125.00 /WEEK  NO TEST REQD  LO=
*EDUC=12YRS EXP=00MOS BENEFITS=                                   SD=
*      8:00 5:30 MON-SAT 1/2 DAY EVERY OTHER SATURDAY TO WORK AS
*      A TRUCK DRIVER AND STORE CLERK.  PICK UP AND DELIVER ELECTR
*      ONIC PARTS IN THE DENVER METRO AREA.  MUST HAVE SOME KNOWLE
*      DGE OF ELECTRONIC AND MUST KNOW THE DENVER METRO AREA
```

[1]Some fields have been suppressed to protect confidentiality of employers.

EXAMPLE A-2.

THE JOB BANK DATA SET

Jerry R comes in looking for a job as a waiter. You might give the following commands, beginning by using the first three digits of that occupation's DOT:

```
* READY:
-find in jobs where county is boulder.
* 144 (6.12%) RECORDS FOUND
* 144 RECORDS IN RESULT SET


*READY:
-find in result where dot3 is 311.
* 02 (1.36%) RECORDS FOUND
* 02 RECORDS IN RESULT SET


*READY:
-disp job desc.

* *** JOB NUMBER 565900 ***
*311.878 03/11/74     WAITRESS/WAITER        38HR DUR=PERMANENT  TRNE=OK
*                                           REQ:
*                                                              SIC=5812
*                    PAY=00001.00-00001.10 /HOUR NO TEST REQD LO=0400
* EDUC=RW   EXP=03MOS BENEFITS=                                SD=
*       2 SHIFTS. AVAILABLE: 10:30 AM TO 5 PM AND 5 PM TO 8 PM.-6
        D P W. OFF MONDAY.  SALARY PLUS TIPS, PLUS MEALS. MUST HAVE
          TRANSPORTATION.  PREFERS EXP. BUT WILL TRAIN RIGHT PERSON.

* *** JOB NUMBER 565907 ***
*311.878 03/13/74     BUS PERSON             30HR DUR=PERMANENT  TRNE=OK
*                                           REQ:
*                                                              SIC=5812
*BOULDER              PAY=00001.60-     /HOUR   NO TEST REQD  LO=0400
*EDUC=00YRS  EXP=00MOS BENEFITS=                               SD=
*      HOURS VARIED - ANYTIME BETWEEN 9AM TO 1 AM. SALARY IS START
*      ING ONLY. WILL GET RAISES. FOOD AT 1/2 COST. WILL START PA
*      RT TIME.
```

EXAMPLE A-3.

THE JOB BANK DATA SET

Michael L comes in looking for a job as a mechanic's helper. Since that is a specific category, a search on the DOT alone should be sufficient:

```
*READY:
-find in jobs where dot is 620884.
* 01 (0.04%) RECORDS FOUND
* 01 RECORDS IN RESULT SET

*READYL
-disp job desc.

* *** JOB NUMBER 565551 ***
*620.884 04/01/74     AUTOMOBILE MECH HELPER 40HR DUR=PERMANENT   TRNE=OK
*                                            REQ: UN,    PHYS,
*                                                                SIC=4911
*                     PAY=00003.13-        .   /HOUR   NO TEST REQD LO=
*EDUC=12YRS EXP=00MOS BENEFITS=IN HO SL VA     PN                 SD=
*     HOURS ARE 3:00PM TO 11:30PM, M-F. WILL ASSIST MECHANICS IN
*       MAINTENANCE AND REPAIR OF FLEET CARS, TRUCKS, AND HEAVY
*     EQUIPMENT. MUST HAVE OR BE ACTIVELY WORKING TOWARDS H.S. DIP
*     LOMA OR G.E.D., AS WILL LATER ENTER FORMAL MECHANIC APPREN
*     TICESHIP PROGRAM.
```

EXAMPLE A-4.

THE JOB BANK DATA SET

Sandra K, an experienced auto mechanic, was recently laid off and is looking for a new job. Since she is the sole support of her family, she is most interested in the pay rate and would prefer a job that pays $3.00/hour or more. You search first on the DOT3 for auto mechanics and then for jobs paying more than $2.99/hour:

```
*READY:
-find in jobs where dot3 is 620.
* 51 (2.16%) RECORDS FOUND
* 51 RECORDS IN RESULT SET

*READY:
-find#
-name result mech.

*READY:
-find in mech where hrs$> 2.99.
* 21 (41.17%) RECORDS FOUND
* 21 RECORDS IN RESULT SET
```

EXAMPLE A-4. Continued

Then you could cross-tabulate to find out the range of pay/month and the number of jobs at each pay:

```
*READY:
-x in result mo$.
* 12 RECORDS IN RESULT SET
* 21 RECORDS REPRESENTED

*READY:
-p it.
*PAY/MONTH          COUNT
*        520            6
*        541            1
*        542            1
*        563            1
*        606            3
*        693            1
*        747            1
*        780            1
*        797            1
*        866            3
*        953            1
*       1191            1

*END OF DATA SET
```

Since Sandra is primarily interested in a high rate of pay, you could now find all the jobs where the rate of pay is greater than $1000 and, since the number is not too large, display the descriptions for those jobs:

```
*READY:
-find in mech where mo$ > 1000.
* 01 (1.96%) RECORDS FOUND
* 01 RECORDS IN RESULT SET
```

EXAMPLE A-4. Continued

```
*READY:
-disp job desc.


* *** JOB NUMBER 570901 ***
*620.281 03/15/74     MECHANIC TRUCK        45HR DUR=PERMANENT   TRNE=NO
*                                           REQ:
*                                 CALL FIRST                MM  SIC=4212
*DENVER     CO         PAY=00275.00-     .   /WEEK  NO TEST REQD LO=
*EDUC=RW    EXP=60MOS BENEFITS=                                   SD=
*      5 1/2 DAYS FULLY QUALIFIED JOURNEYMAN MECHANIC FOR DIESEL
*      AND GASOLINE TRUCKS OWN TOOLS APPLY IN OFFICE DO NOT ENTER
*      SHOP
```

EXAMPLE A-5.

THE JOB BANK DATA SET

Ken J comes in looking for a part-time job for a few months a year (he is on Social Security). He is willing to do any kind of work. You might ask for part-time, seasonal work.

```
*READY:
-find in jobs where duration is seasonal and wkwk is partial.
* 05 (0.21%) RECORDS FOUND
* 05 RECORDS IN RESULT SET
```

The five jobs could then be displayed.

EXAMPLE A-6.

THE JOB BANK DATA SET

Margaret C is looking for a part-time job. Before a recent illness, she had been employed full time as a bookkeeper/clerk. You might set criteria such as a partial work week and a DOT3 of 210:

```
*READY:
-find in jobs where dot3 is 210 and wkwk=partial.
* 02 (0.08%) RECORDS FOUND
* 02 RECORDS IN RESULT SET
```

Since there are only two jobs, you can go directly to displaying job descriptions.

EXAMPLE A-7.

THE JOB BANK DATA SET

Mildred M is interested in going back to work full time. She was employed as a bookkeeper before the birth of her last child. She says that she must make at least $3.00/hour if she is to clear a reasonable salary after babysitting expenses, bus fare, etc. You might ask for bookkeeping jobs paying more than $2.99/hour:

```
*READY:
-find in jobs where dot3 is 210 and hr$>2.99.
* 02 (0.10%) RECORDS FOUND
* 02 RECORDS IN RESULT SET

*READY:
-disp job desc for apps.

* *** JOB NUMBER 562742 ***
*210.388 04/21/74     FULL CHARGE BOOKKEEPER 40HR DUR=PERMANENT  TRNE=NO
*DENVER     CO        PAY=00550.00-00600.00 /MNTH PROF TEST REQD LO=
*EDUC=12YRS EXP=12MOS BENEFITS=                   TESTED BY E S  SD=
*      8:00-4:30 M-F ACCOUNTS PAYABLE, ACCOUNTS RECEIVABLE. GENER
*      AL LEDGER THROUGH TRIAL BALANCE. NORTHEAST. MUST ALSO BE A
*      VERY PROFICIENT TYPIST.

* *** JOB NUMBER 567716 ***
*210.388 02/25/74     FULL CHARGE BOOKKEEPER 44HR DUR=PERMANENT  TRNE=NO
*DURANGO    CO        PAY=00700.00-      .   /MNTH   NO TEST REQD LO=
*EDUC=12YRS EXP=36MOS BENEFITS=         VA                        SD=
*      FULL CHARGE BOOKKEEPING-WILL DO MONTHLY FINANCIAL STATEMEN
*      T.HRS:8:00-5:00M-F AND 8:00-12:30 ON SAT
```

Note: Display for APPS gives a printout the applicant can look at.

EXAMPLE A-8.

THE JOB BANK DATA SET

Martin B is a high school drop out with a sixth grade education. He has minimal educational skills (read-write) and a very limited knowledge of the job market. He is interested in a full time job in Boulder. He has no previous work experience. You might ask:

```
*READY:
-find in jobs where educ=rw and exp=0 and trne=yes and cnty=boulder
+ and wkwk=full.
* 12 (0.51%) RECORDS FOUND
* 12 RECORDS IN RESULT SET
```

EXAMPLE A-8. Continued

Then you might try to give him a realistic picture of the types of jobs and levels of pay available.

```
*READY
-name result yep.

*READY:
-find in yep where hr$> 2.00.
* 02 (16.66%) RECORDS FOUND
* 02 RECORDS IN RESULT SET

*READY:
-disp job desc.

* *** JOB NUMBER 537960 ***
*599.885 04/04/74     TIRE RECAPPER          44HR DUR=PERMANENT  TRNE=OK
*                                            REQ:
*                                                                SIC=7534
*LONGMONT    CO        PAY=00002.50-      .   /HOUR   NO TEST REQD
*EDUC=RW     EXP=00MOS BENEFITS=
*      TEND MACHINES THAT RECAP AND RETREAD TIRES FOR REUSE. WILL
*      ACCEPT TRAINEE. M-F 8 AM TO 5 PM. SATS 8 AM TO 12 NOON. TI
*      ME & 1/2 OVER 40 HOURS. 18+.

* *** JOB NUMBER 538004 ***
*739.887 03/13/74   ASSEMBLER OIL FILTER   40HR DUR=PERMANENT  TRNE=OK
*                                          REQ: UN,    PHYS,
*                                                        MM   SIC=3599
*                   PAY=00002.38-      .   /HOUR   NO TEST REQD
*EDUC=RW     EXP=00MOS BENEFITS=
*      VARIOUS ASSEMBLY LINE WORK IN PLANT MANUFACTURING OIL AND
*      AIR FILTERS FOR AUTOMOBILES. TRACTORS & TRUCKS.
*      M-F 4:15 PM - 12:45 AM (MANDATORY)
```

EXAMPLE A-9

KEY WORDS IN THE JOB DATA SET

Margaret Teacher comes in and requests a job as an English teacher. Since there is not a separate DOT for English Teacher, you might use a key word for searching.

```
*READY:
-st for engl.
```

The above command scans all job titles for words containing Engl. An alternative might be:

```
*READY:
-sd for engl.
```

The above command scans the job description for the word containing Engl. This could, of course, retrieve words such as England as well, and retrieve occupations requiring English. To avoid this, an initial screening could be done to find jobs for secondary school teachers, followed by the SD command:

```
-find in jobs where dot3=sd for engl.
```

DOCUMENTATION A-2. APPLICANT FILE DESCRIPTION

THE APPLICANT DATA SET

APPLICANT DATA FILE DESCRIPTION
USE COUNT: 1

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
F(1)	SOCSECNUM	SSN		APPLICANT'S SOCIAL SECURITY NUMBER
F(2)	NAME	NAME		APPLICANTS NAME
F(3)	BIRTHDATE	BRTH		DATE OF BIRTH YYMM, IF MM=00 THEN MONTH OF BIRTH IS UNKNOWN
F(4)	APPTYPE	TYPE		APPLICANT TYPE
	CATEGORIES			
	NOREPLY		0	NO REPLY
	REGISTERED		1	REGISTERED
	PART.REG		2	PARTIALLY REGISTERED
	RENEWAL		3	RENEWAL APPLICATION
F(5)	SUMMER	SUM		SUMMER YOUTH
	CATEGORIES			
	NOREPLY		0	NO REPLY
	YES		1	YES
	NO		2	NO
F(6)	SEX	SEX		SEX OF APPLICANT
	CATEGORIES			
	NOREPLY		0	NO REPLY
	MALE		1	MALE
	FEMALE		2	FEMALE
F(7)	EDUCATION	EDUC		HIGHEST GRADE OF SCHOOL COMPLETED
	CATEGORIES			
	NONE		0	NONE
	FIRST		1	FIRST GRADE
	SECOND		2	SECOND GRADE
	THIRD		3	THIRD
	FOURTH		4	FOURTH GRADE
	FIFTH		5	FIFTH GRADE
	SIXTH		6	SIXTH GRADE
	SEVENTH		7	SEVENTH GRADE
	EIGHTH		8	EIGHTH GRADE
	NINTH		9	NINTH GRADE
	TENTH		10	TENTH GRADE
	ELEVENTH		11	ELEVENTH GRADE
	HIGHSCHOOL		12	HIGH SCHOOL GRADUATE OR G.E.D.
	COLLEGE1		13	ONE YEAR OF COLLEGE
	COLLEGE2		14	TWO YEARS OF COLLEGE
	COLLEGE3		15	THREE YEARS OF COLLEGE
	BACHELORS		16	COLLEGE GRADUATE
	MASTERS		17	MASTERS DEGREE
	MASTERS+		18	POST-MASTERS GRADUATE WORK (BUT NOT A PH.D.)
	PHD		19	PH.D. DEGREE OR EQUIVALENT
F(8)	DOT1TO6	DOT		ALL SIX DIGITS OF APPLICANT'S DOT

APPLICANT DATA FILE DESCRIPTION
(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
				CODE
F(9)	DOT1T01	DOT1		FIRST DIGIT OF APPLICANT'S DOT CODE
F(10)	DOT1T02	DOT2		FIRST TWO DIGITS OF APPLICANT'S DOT CODE
F(11)	DOT1T03	DOT3		FIRST 3 DIGITS OF APPLICANT'S D.O.T. CODE
F(12)	DOT4T06	DPT		LAST 3 DIGITS OF APPLICANT'S D.O.T. CODE
F(13)	DATA	DATA		FORTH DIGIT OF DOT CODE (DATA)
F(14)	PEOPLE	PEOP		FIFTH DIGIT OF DOT CODE (PEOPLE)
F(15)	THINGS	THNG		SIXTH DIGIT OF DOT CODE (THINGS)
F(16)	DOTSUFFIX	SUF		DOT SUFFIX
F(17)	APPDATE	DATE		DATE OF APPLICATION (YMMDD)
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(18)	ETHNIC	RACE		ETHNIC GROUP
	CATEGORIES			
	NOREPLY		0	NO REPLY
	WHITE		1	WHITE
	NEGRO		2	NEGRO
	AMERIND		3	AMERICAN INDIAN
	ORIENTAL		4	ORIENTAL
	OTHER		5	OTHER
	INA		6	INFORMATION NOT AVAILABLE
F(19)	SPANISH	SPAN		APPLICANT HAS SPANISH SURNAME
	CATEGORIES			
	NOREPLY		0	NO REPLY
	MEXICAN		1	MEXICAN
	PUERTORICAN		2	PUERTO RICAN
	OTHER		3	OTHER SPANISH
	NO		4	NO SPANISH SURNAME
F(20)	VETERAN	VET		VETERAN STATUS
	CATEGORIES			
	NONVETERAN		0	NON-VETERAN
	RS		1	RECENTLY SEPERATED
	RSD		2	RECENTLY SEPARATED DISABLED VET
	RSS		3	RECENTLY SEPARATED SPECIAL DISABLED VET
	VIETNAM		4	VIETNAM ERA VETERAN

[redacted]LICANT DATA FILE DESCRIPTION
(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES (CONTINUED)			
	VED		5	VIETNAM ERA VET DISABLED
	VES		6	VIETNAM ERA VET,SPECIAL DISABLED
	OTHERVET		7	OTHER VETERAN
	OVD		8	OTHER VETERANS DISABLED
	OVS		9	OTHE VETERANS SPECIAL DISABLED
F(21)	HANDICAPS	HDCP		APPLICANT'S MOST SIGNIFICANT HANDICAP, IF ANY
	CATEGORIES			
	NONE		0	NO HANDICAPS
	ORTHO		1	ORTHOPEDIC HANDICAP
	VHS		2	VISION, HEARING OR SPEECH HANDICAP
	LEGAL		3	LEGAL OFFENDER
	NEUROPSY		4	NEUROPSYCHIATRIC HANDICAP
	EPILEPSY		5	EPILEPSY
	ALCOHOL		6	ALCOHOLISM
	DRUGS		7	DRUG ADDICTION
	MR		8	MENTAL RETARDATION HANDICAP
	OTHER		9	ANY OTHER HANDICAP
F(22)	WELFARE	WELF		APPLICANT'S WELFARE STATUS
	CATEGORIES			
	NOREPLY		0	NO REPLY
	WINVOL		1	WIN VOLUNTARY REGISTRANT
	WINVOLCERT		2	WIN VOLUNTEER (CERTIFIED)
	WINREQ		3	WIN REQUIRED (MANDATORY REGISTRANT)
	WINREQCERT		4	WIN REQUIRED CERTIFIED
	OTHER		5	OTHER WELFARE
	NONE		6	NO WELFARE
	OTHER		7	OTHER WELFARE FROM OLD ESARS
	NONE		8	NO WELFARE FROM OLD ESARS
F(23)	POOR	POOR		FAMILY INCOME CLASSIFICATION ACCORDING TO POVERTY GUIDELINES
	CATEGORIES			
	NOREPLY		0	NO REPLY
	DISADV		1	DISADVANTAGED
	OTHERPOOR		2	OTHER POOR
	OTHER		3	OTHER (NON-DISADVANTAGED)
F(24)	CLAIMANT	CLAI		APPLICANT'S CLAIMANT STATUS
	CATEGORIES			
	NOREPLY		0	NO REPLY
	STATE		1	STATE
	UCX		2	UCX, UCFE, OR DUA
	TEA		3	TEA
	UCX13+		4	UCX BENEFITS FOR 13 OR MORE WEEKS
	NO		5	NO
F(25)	FOODSTAMP	F(X)D		FOOD STAMP APPLICANT

DOCUMENTATION A-2. Continued

APPLICANT DATA FILE DESCRIPTION
(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES			
	NOREPLY		0	NO REPLY
	YES		1	YES
	NO		2	NO
F(26)	TRANSPORTATION	TRAN		DOES APPLICANT HAVE TRANSPORTATION
	CATEGORIES			
	UNKNOWN		0	UNKNOWN
	NO		1	NO TRANSPORTATION
	YES		2	HAS TRANSPORTATION
F(27)	DRIVERSLICENSE	DLIC		TYPE OF APPLICANT'S DRIVER'S LICENSE
	CATEGORIES			
	NONE		0	NO LICENSE
	AUTO		1	AUTOMOBILE LICENSE
	CHAUFFEUR		2	CHAUFFEUR'S LICENSE
F(28)	STATION/DESK	S/D		STATION/DESK NUMBER OF INTERVIEWING COUNSELOR
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(29)	XENTRY	XNT		APPLICANT X-ENTRY STATUS
	CATEGORIES			
	YES		1	YES, APPLICANT HAS AN X ENTRY
	NO		0	NO, THE APLICANT DOES NOT
F(30)	PAY/HOUR	HRS		MINIMUM PAY APPLICANT WILL ACCEPT PER HOUR
	CATEGORIES			
	NOREPLY		0	NO REPLY
F(31)	LOCATION	LOC		LOCATION WHERRE WORK IS DESIRED
	CATEGORIES			
	EITHER		0	NO REPLY OR EITHER CITY
	DENVER		2	DENVER
	BOULDER		1	BOULDER
F(32)	WORKWEEK	WKWK		TYPE OF WORKER FULL OR PART TIME
	CATEGORIES			
	UNKNOWN		0	UNKNOWN
	FULL		1	FULL TIME
	PART		2	PART TIME
F(33)	STUDENT	STUD		STUDENT STATUS
	CATEGORIES			
	UNKNOWN		0	UNKNOWN
	NOT		1	NOT A STUDENT
	PARTIAL		2	PART TIME STUDENT
	FULL		3	FULL TIME STUDENT
F(34)	AGEGROUP	AGE		AGE GROUP OF APPLICANT FROM ESARS

APPLICANT DATA FILE DESCRIPTION
(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES			
	NOREPLY		0	NO REPLY
	UNDER20		1	UNDER 20
	20T021		2	20 TO 21
	22T024		3	22 TO 24
	25T029		4	25 TO 29
	30T039		5	30 TO 39
	40T045		6	40 TO 45
	45T054		7	45 TO 54
	55T064		8	55 TO 64
	OVER65		9	OVER 65
F(35)	EXPERIENCE	EXP		MONTHS OF EXPERIENCE APPLICANT HAS IN THE GIVEN DOT
	CATEGORIES			
	UNKNOWN		255	UNKNOWN

EXAMPLE A-10.

THE APPLICANT DATA SET

A job comes in for a loan counselor (169.268) at a local bank. At least a high school education is required, and the starting pay is $2.50/hour. To find the applicants who are potential candidates for this job, you might start by specifying three-digit DOT, education, and pay:

```
*READY:
-find in apps where dot3 is 169 and educ=>12 and hr$>2.75.
* 03 (9.67%) RECORDS FOUND
* 03 RECORDS IN RESULT SET

*READY:
-name result loan.
```

To give veterans a preference, you could specify veteran status and ask for a printout:

```
*READY:
-find in loan where vet is not nonveteran.
* 02 (66.66%) RECORDS FOUND
* 02 RECORDS IN RESULT SET

*READY:
-name result vet.
```

Note that there is no space in nonveteran.

EXAMPLE A-10. Continued

```
*READY:
-print in vet name and hr$ and xentry.
*NAME              PAY/HOUR          XENTRY
*JONES S                2.35         YES
*SMITH H                2.35         YES

*END OF DATA SET


*READY:
-find in vet where xentry=no.
* 00 (0.00%) RECORDS FOUND
* 00 RECORDS IN RESULT SET
```

Since that condition cannot be met, go back and look at all of the records using VET. A macro called LOOK is useful in printing information needed to locate the applicant form for the possible applicant(s). To use LOOK in this example:

```
*READY:
-look-up all using vet.
*DOTITO6          NAME          SOCSECNUM      VETERAN      PAY/HOUR
*169381           SMITH H       123456789      RS           2.35
*169878           JONES S       987654231      RSD          2.35
```

EXAMPLE A-11.

THE APPLICANT DATA SET

Another job has come in for a car hop (311.878) at a fast food chain in Boulder. The job is full time, and the hourly pay rate is $1.85. You could ask: will employer accept someone with no experience?

```
*READY:
-find in apps where loc is boulder and dot2 is 31 and
+ wkwk is full and xentry=yes and hr$<=2.00.
* 03 (9.67%) RECORDS FOUND
* 03 RECORDS IN RESULT SET

*READY:
-sort in result vet and name.
* 03 RECORDS IN RESULT SET

*READY:
-p in result name and vet.
*NAME              VETERAN
*HART A            NONVETERAN
*HUMPHREY H        VED
*KENNEDY T         OVD

*END OF DATA SET
```

Since there are so few applicants, you can go directly to a display:

```
*READY:
-look.
*DOT1T06    NAME          SOCSECNUM    VETERAN      PAY/HOUR
*311878     HART A        111111111    NONVETERAN     2.00
*311887     HUMPHREY H    222222222    VED            1.50
*319878     KENNEDY T     333333333    OVD            1.95
```

EXAMPLE A-12.

THE APPLICANT DATA SET

You have received a job opening for a swimming instructor (153.228). The job is just for the summer and is part-time. The job is to start on May 1, and the applicant must be 18 as of that date. The pay is $1.85-2.00/hour for an inexperienced instructor and $2.50-$3.00/hour for an experienced instructor.

You might type:

```
*READY:
-find in apps where dot3=153 and summer=yes and wkwk=part
+ and birthdate<=5605.
* 05 (16.12%) RECORDS FOUND
* 05 RECORDS IN RESULT SET

*READY:
=name result jock.

*READY:
-find in jock where xentry=no and hr$<=3.00
+ also where xentry=yes and hr$<=2.10.
* 03 (60.00%) RECORDS FOUND
* 03 RECORDS IN RESULT SET

*READY:
-p in result name and xentry and hr$ and vet.
*NAME          XENTRY          PAY/HOUR          VETERAN
*FISH A        NO                2.15            NONVETERAN
*GOLDA FISH    NO                2.00            OTHERVET
*MER MAID      YES               1.95            RSS

*END OF DATA SET

*READY:
-find in result where name='GOLDA FISH' also where name='MER MAID'.
* 02 (66.66%) RECORDS FOUND
* 02 RECORDS IN RESULT SET

*READY:
-look.
*DOT1T06      NAME          SOCSECNUM      VETERAN      PAY/HOUR
*153884       MER MAID      124842100      RSS            1.95
*153878       GOLDA FISH    900000009      OTHERVET       2.00
```

EXAMPLE A-13.

THE APPLICANT DATA SET

A job comes in for a night watchman (372.868). The education requirements are minimal (read/write). It is required that the applicant have a driver's license. The pay is $1.85/hour, and the relationship with people is speaking-signaling.

The DOT digits 4, 5, and 6 refer to the job's requirements of skills in dealing with data, people, and things. The field PEOPLE refers to skills in dealing with people, and the digit 6 refers to speaking-signaling. You might start by typing:

```
*READY:
-find in apps where educ>=3 and dlic=auto and people=6
+ and hr$=<1.85 and dot3=372.
* 06 (19.35%) RECORDS FOUND
* 06 RECORDS IN RESULT SET
```

```
*READY:
-sort in result vet.
* 06 RECORDS IN RESULT SET
```

```
*READY:
-p in result name and educ and hr$ and vet.
*NAME          EDUCATION       PAY/HOUR        VETERAN
*FRICK W       SEVENTH         1.55            NONVETERAN
*BRONSON C     COLLEGE1        1.40            NONVETERAN
*RUMELHART E   TENTH           1.40            RS
*COHEN N       THIRD           1.80            VIETNAM
*KAHN N        HIGHSCHOOL      1.75            VED
*HARRIS R      FIFTH           1.85            VES

*END OF DATA SET
```

EXAMPLE A-14.

THE APPLICANT DATA SET

A job opening is received for a computer programmer (020.188). The starting pay is $800-$1,000/month, at least a bachelor's degree is required. The job is full time; an experienced person is preferred, but not required. You might type:

```
*READY:
-find in apps where dot3 is 020 and hr$>=4.69 and
+ educ>=bachelors and wkwk=full.
* 05 (16.12%) RECORDS FOUND
* 05 RECORDS IN RESULT SET

*READY:
-name result pro.

*READY:
-sort in pro vet.
* 05 RECORDS IN RESULT SET

*READY:
-p in pro name and educ and hr$ and xentry and vet.
*NAME          EDUCATION   PAY/HOUR      XENTRY      VETERAN
*FORD J        MASTERS       5.20        YES         VED
*TRUMAN H      PHD           7.83        NO          NONVETERAN
*HOOVER H      MASTERS+      7.00        NO          RS
*KENNEDY J     MASTERS+      7.50        YES         NONVETERAN
*NIXON R       BACHELORS     5.75        YES         RS

*END OF DATA SET
```

EXAMPLE A-14. Continued

```
*READY:
-find in result where hr$<=5.93 and xentry=no.
* 01 (20.00%) RECORDS FOUND
* 01 RECORDS IN RESULT SET


*READY:
-lock up all.
*D0T1T06      NAME          SOCSECNUM      VETERAN      PAY/HOUR
*020878       FORD J        100000000      VED           5.20
```

EXAMPLE A-15.

THE APPLICANT DATA SET

MICRO, however, cannot find applicants who are not there. Suppose, for example, a job has come in for a strip-tease artist. You could ask:

```
*READY:
-find in apps where dot=159848.
* 00 (0.00%) RECORDS FOUND
* 00 RECORDS IN RESULT SET
```

You will note, there are no takers.

EXAMPLE A-16.

THE APPLICANT DATA SET

A job comes in for an experienced headwaiter at a restaurant between Boulder and Denver. It is a full-time, year-round job requiring a high school education and paying $2.50/hour. You might type:

```
*READY:
-find in apps where dot3=350 and xentry=no and wkwk=full
+ and summer=no and hr$<=2.50.
* 03 (9.67%) RECORDS FOUND
* 03 RECORDS IN RESULT SET

*READY:
-name result hw.

*READY:
-sort in hw vet.
* 03 RECORDS IN RESULT SET

*READY:
-p in result name and hr$ and vet.
*NAME          PAY/HOUR          VETERAN
*COOK ABE        1.75            NONVETERAN
*FOOT BOB        2.50            NONVETERAN
*KID BILL        2.10            RS

*END OF DATA SET

*READY:
-find in result where vet is not nonveteran and hr$<2.00.
* 01 (33.33%) RECORDS FOUND
* 01 RECORDS IN RESULT SET

*READY:
-look.
*DOT1T06     NAME          SOCSECNUM     VETERAN     PAY/HOUR
*350887      KID BILL      640000000     RS            2.10
```

EXAMPLE A-17.

THE APPLICANT DATA SET

MICRO can also be used to find hard-to-place applicants for jobs for which they might be qualified. For example, a job comes in for a camera repairman. The camera shop is willing to train someone with a natural aptitude for this kind of work. (Data/People/Things-Code 281). The starting pay is $2.50/hour, and the work is sedentary, so the employer would accept a handicapped applicant. You type:

```
*READY:
-find in apps where handicaps=ortho and dot4=281 and hr$=<2.50.
* 03 (9.67%) RECORDS FOUND
* 03 RECORDS IN RESULT SET


*READY:
-name result kodak.


*READY:
-sort in kodak vet.
* 03 RECORDS IN RESULT SET


*READY:
-p in result name and vet.
*NAME              VETERAN
*PICTURE A         NONVETERAN
*FILM A            RS
*FLASH A           VES

*END OF DATA SET
```

APPENDIX B

Referral Status File Description

Used in Analysis in Chapter 3

REFERRAL STATUS FILE DESCRIPTION

REFERRAL DATA FILE
USE COUNT: 1

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
F(1)	KEY	K		
F(2)	ORDERDESK	ODSK		STATION DESK OF ORDER TAKER
F(3)	INDUSTRY	SIC		STANDARD INDUSTRIAL CLASSIFICATION NUMBER
F(4)	DURATION	DURA		DURATION OF JOB
	CATEGORIES			
	PERMANENT		1	PERMANENT
	DAYS1TO3		2	1-3 DAYS
	DAYS4TO150		3	4 - 150 DAYS
	SEASONAL		4	SEASONAL
F(5)	HOURS	HRS		HOURS WORKED PER WEEK
	CATEGORIES			
	NOT-APPL		0	NOT APPLICABLE
F(6)	WORKWEEK	WKWK		WORK WEEK: FULL OR PART
	CATEGORIES			
	FULL		1	FULL TIME
	PART		2	PART TIME
F(7)	EDUCATION	EDUC		EDUCATION
	CATEGORIES			
	NOT-APPLIC		0	NOT APPLICABLE
	RW		20	READ AND WRITE ONLY
	FIRST		1	FIRST GRADE
	SECOND		2	SECOND GRADE
	THIRD		3	THIRD GRADE
	FORTH		4	FORTH GRADE
	FIFTH		5	FIFTH GRADE
	SIXTH		6	SIXTH GRADE
	SEVENTH		7	SEVENTH GRADE
	EIGHT		8	EIGHTH GRADE
	NINTH		9	NINTH GRADE
	TENTH		10	TENTH GRADE
	ELEVENTH		11	ELEVENTH GRADE
	HIGH		12	HIGH SCHOOL EDUCATION
	COLLEGE1		13	FIRST YEAR COLLEGE
	COLLEGE2		14	SECOND YEAR COLLEGE
	COLLEGE3		15	THIRD YEAR COLLEGE
	BACHELOR		16	BACHELOR DEGREE
	MASTER		17	MASTERS DEGREE
	DOCTORATE		19	DOCTORATE
F(8)	EXPERIENCE	EXP		NUMBER OF MONTHS OF EXPERIENCE REQUIRED
F(9)	TRAINEE	TRNE		WILL EMPLOYER ACCEPT A TRAINEE?

DOCUMENTATION B-1. Continued

REFERRAL DATA FILE

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES			
	YES		1	EMPLOYER WILL ACCEPT A TRAINEE
	NO		2	EMPLOYER WILL NOT ACCEPT A TRAINEE
F(10)	EMPLOYER-NAME	FIRM		EMPLOYER'S NAME
F(11)	EMP-ADDRESS	ADDR		EMPLOYER'S ADDRESS
F(12)	CITY	CITY		CITY OF EMPLOYER
F(13)	STATE	ST		STATE OF EMPLOYER
F(14)	ZIP-CODE	ZIP		EMPLOYER'S ZIP CODE
F(15)	COUNTY	CNTY		COUNTY OF EMPLOYER
F(16)	TELEPHONE	TELE		EMPLOYER'S TELEPHONE NUMBER
F(17)	PAY-UNIT	UNIT		PAY PERIOD UNIT
	CATEGORIES			
	HOUR		1	HOURLY
	DAY		2	PAID BY THE DAY
	WEEK		3	PAID BY THE WEEK
	BI-WEEK		4	PAID BI-WEEKLY
	MONTH		5	PAID MONTHLY
	SEMI-MO		6	PAID SEMI-MONTHLY
	YEAR		7	PAID YEARLY
	OTHER		8	OTHER (SUCH AS COMMISSION)
F(18)	MIN-PAY	MINS		MINIMUM PAY OF JOB
	CATEGORIES			
	COMMISSION		0	PAY ON COMMISSION BASIS
F(19)	JOB-DOT	JDT		JOB OCCUPATION CODE
F(20)	JDT1TO1	JDT1		OCCUPATION CODE - FIRST DIGIT ONLY
F(21)	JDT1TO2	JDT2		OCCUPATION CODE - DOT 1ST AND 2ND DIGITS
F(22)	JDT1TO3	JDT3		OCCUPATION CODE - DOT 1ST THROUGH 3RD
F(23)	JDT4TO6	JDPT		OCCUPATION CODE - DOT 4TH THROUGTH 6TH DIGITS (DATA-PEOPLE-THINGS)
F(24)	JDATA	JDAT		OCCUPATION CODE - DOT 4TH DIGIT (DATA)
F(25)	JPEOPLE	JPEO		OCCUPATION CODE - DOT 5TH DIGIT (PEOPLE)
F(26)	JTHINGS	JTHG		OCCUPATION CODE - DOT 6TH DIGIT

DOCUMENTATION B-1. Continued

REFERRAL DATA FILE

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
				(THINGS)
F(27)	JOBORDERNUM	JOB#		JOB ORDER NUMBER
F(28)	SS-NUM	SSNO		SOCIAL SECURITY NUMBER
F(29)	APP-NAME	NAME		APPLICANT'S NAME
F(30)	APP-DOT	ADT		APPLICANT'S OCCUPATION CODE
F(31)	ADT1T01	ADT1		FIRST DIGIT OF APPLICANT'S DOT CODE
F(32)	ADT1T02	ADT2		FIRST TWO DIGITS OF APPLICANT'S DOT CODE
F(33)	ADT1T03	ADT3		FIRST 3 DIGITS OF APPLICANT'S D.O.T. CODE
F(34)	ADT4T06	ADPT		LAST 3 DIGITS OF APPLICANT'S D.O.T. CODE
F(35)	ADATA	ADAT		FORTH DIGIT OF DOT CODE (DATA)
F(36)	APEOPLE	APEO		FIFTH DIGIT OF DOT CODE (PEOPLE)
F(37)	ATHINGS	ATHG		SIXTH DIGIT OF DOT CODE (THINGS)
F(38)	BIRTH-YR	BRTH		YEAR OF BIRTH
F(39)	SEX	SEX		SEX OF APPLICANT
	CATEGORIES			
	MALE		1	MALE
	FEMALE		2	FEMALE
F(40)	ETHNIC	ETHN		APPLICANT'S ETHNIC GROUP
	CATEGORIES			
	WHITE		1	WHITE
	NEGRO		2	NEGRO
	AM-INDIAN		3	AMERICAN INDIAN
	ORIENTAL		4	ORIENTAL
	OTHER		5	OTHER
	INA		6	INFO NOT AVAILABLE, PROHIBITED BY STATE LAW, OR CANNOT BE ASCERTAINED
F(41)	SPAN-SURNAME	SPAN		SPANISH SURNAME
	CATEGORIES			
	YES		1	APPLICANTS SURNAME IS SPANISH
	NO		2	APPLICANTS SURNAME IS NOT SPANISH
F(42)	FAM-INCM	INCM		APPLICANT'S FAMILY INCOME LEVEL

REFERRAL DATA FILE

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES			
	DISADVANTAG		1	DISADVANTAGED
	POOR		2	OTHER POOR
	POVERTY		3	NEAR POVERTY
	OTHER		4	OTHER
F(43)	VETERAN	VET		VETERAN STATUS
	CATEGORIES			
	NON-VET		1	NON-VET
	SEPARATED		2	RECENTLY SEPARATED
	OTHER		3	OTHER VET
F(44)	APP-EDUC	APED		NUMBER OF HIGHEST GRADE COMPLETED
F(45)	HANDICAPPED	HDCP		IS APPLICANT HANDICAPPED
	CATEGORIES			
	YES		1	YES, APPLICANT IS HANDICAPPED
	NO		2	NO, APPLICANT IS NOT HANDICAPPED
F(46)	PLACEMENT-DATE	PLDT		DATE OF PLACEMENT OF APPLICANT
F(47)	REFERRALDATE	DATE		DATE OF REFERRAL
F(48)	SOURCE	SORC		SOURCE OF REFERRAL
	CATEGORIES			
	WALK-IN		1	WALK-IN
	LETTER		2	LETTER OR CALL-IN CARD
	TELEPHONE		3	TELEPHONE
	INTRA-STATE		4	INTRA-STATE REFERRAL
	INTER-STATE		5	INTER-STATE REFERRAL
F(49)	CLAIMANT	CLA		IS APPLICANT AN UNEMPLOYMENT INSURANCE CLAIMANT?
	CATEGORIES			
	YES		1	YES
	NO		2	NO
F(50)	LOCAL-OFFICE	LOFF		LOCAL OFFICE NUMBER
F(51)	SEARCH-METHOD	METH		METHOD OF JOB (APPLICANT) SEARCH
	CATEGORIES			
	JOBDEV		0	JOB DEVELOPMENT
	WALK-IN		1	WALK-IN; NO FICHE OR COMPUTER USED
	JIS-WI		2	WALK-IN; USED JIS FICHE ONLY
	FICHE-WI		3	WALK-IN; INTERVIEWER USED FICHE
	CALL-IN		4	CALL-IN AS A RESULT OF MANUAL APPLICANT SEARCH
	TERM-WI:JIS		5	WALK-IN; USED JIS TERMINAL OUTPUT ONLY
	TERM-WI:APP		6	WALK-IN; INTERVIEWER DID APPLICANT SEARCH ON TERMINAL.
	TERM-WI:JOB		7	WALK-IN; INTERVIEWER DID JOB

REFERRAL DATA FILE

(CONTINUED)

F(#)	FIELD NAME	ABBR	VALUE	DESCRIPTION
	CATEGORIES (CONTINUED)			
	TERM-CI:APP		8	SEARCH ON TERMINAL CALL-IN AS A RESULT OF APPLICANT SEARCH ON TERMINAL
	TERM-CI:JOB		9	CALL-IN AS A RESULT OF JOB SEARCH ON TERMINAL
F(52)	REFER-DESK	RDSK		STATION DESK OF PERSON MAKING REFERRAL
F(53)	NOT-QUALIFIED	NQ		NOT QUALIFIED ON REFERRAL.
	CATEGORIES			
	QUALIFIED	Q	0	QUALIFIED
	NOTQ	NOTQ	1	NOT QUALIFIED
F(54)	RESULTS	RSLT		RESULT OF REFERRAL
	CATEGORIES			
	HIRED		1	HIRED
	REFUSE-JOB		2	REFUSED JOB
	NO-INTER		3	FAILED TO REPORT FOR INTERVIEW
	NO-SHOW		4	FAILED TO REPORT TO WORK
	JOB-FILLED		5	JOB FILLED
	NOT-QUAL		6	NOT QUALIFIED
	FAILED-PHYS		7	FAILED PHYSICAL
	FAILED-TEST		8	FAILED EMPLOYER TEST
	ANOTHER		9	TOOK ANOTHER REFERRAL
	NO-CALL-IN		10	FAILED TO RESPOND TO CALL-IN
	REFUSE-REF		11	REFUSED REFERRAL
F(55)	HIRE	HIRE		HIRE
	CATEGORIES			
	NOT-HIRED	NH	0	NOT HIRED
	HIRED	H	1	HIRED

APPENDIX C

Regressions Used in Chapter 4

TABLE C-1. REGRESSION RELATING TENURE

ON JOB TO SIGNIFICANT VARIABLES AND SEARCH METHODS

(See Chapter 3)

ANALYSIS OF VARIANCE OF DIF N= 431

SOURCE	DF	SUM OF SQRS	MEAN SQUARE	F-STATISTIC	SIGNIF
REGRESSION	6	.16965 +6	28274.	10.974	.0000
ERROR	424	.10924 +7	2576.5		
TOTAL	430	.12621 +7			

MULTIPLE R= .36663 R-SQR= .13442 SE= 50.759

VARIABLE	PARTIAL	COEFFICIENT	STD ERROR	T-STATISTIC	SIGNIF
CONSTANT		11.375	8.2531	1.3783	.1688
HIGHSCH	.20171	22.207	5.2366	4.2407	.0000
WAGE	.24972	15.867	2.9879	5.3102	.0000
EOFICHE	-.09007	-12.249	6.5779	-1.8621	.0633
MANAPSER	.04575	6.9491	7.3683	.94311	.3462
CAS	.08323	19.110	11.111	1.7199	.0862
CJS	.01218	3.8220	15.242	.25074	.8021

Where:

HIGHSCH = 1 if job requires a high school education

0 otherwise

WAGE = hourly rate of job in dollars

The remaining variables measure the difference between average tenure of a particular placement method and self-service.

EOFICHE = Employment Officer uses fiche

MANAPSER = Manual Applicant Search

CAS = Computer Applicant Search

CJS = Computer Job Search

TABLE C-2. REGRESSION RELATING TENURE

ON JOB TO ALL VARIABLES OF POSSIBLE INTEREST

ANALYSIS OF VARIANCE OF DIF N= 429

SOURCE	DF	SUM OF SQRS	MEAN SQUARE	F-STATISTIC	SIGNIF
REGRESSION	11	.16907 +6	15370.	5.8968	.0000
ERROR	417	.10869 +7	2606.5		
TOTAL	428	.12560 +7			

MULTIPLE R= .36689 R-SQR= .13461 SE= 51.054

VARIABLE	PARTIAL	COEFFICIENT	STD ERROR	T-STATISTIC	SIGNIF
CONSTANT		7.2042	17.805	.40461	.6860
HIGHSCH	.19363	22.042	5.4690	4.0304	.0001
WAGE	.22787	15.234	3.1876	4.7790	.0000
EOFICHE	-.08386	-11.971	6.9658	-1.7185	.0864
MANAPSER	.04132	6.6976	7.9305	.84454	.3989
CAS	.08303	19.227	11.301	1.7014	.0896
CJS	.01459	4.5751	15.355	.29795	.7659
EXP	.01579	1.6922	5.2467	.32253	.7472
VET	.00555	.71495	6.3100	.11330	.9098
NONWHITE	.04020	10.417	12.679	.82158	.4118
SPANISH	.01783	3.5635	9.7871	.36410	.7160
APED	.01316	.33272	1.2384	.26867	.7883

Where:

EXP = 1 if job requires experience

VET = 1 if applicant is a veteran

NONWHITE = 1 if applicant is nonwhite

SPANISH = 1 if applicant has Spanish surname

APED = applicants grade of education completed

Other variables - see Table C-1

TABLE C-3. REGRESSION RELATING TENURE

ON JOB TO VARIABLES INCLUDING OCCUPATION OF JOB

LEAST SQUARES REGRESSION

ANALYSIS OF VARIANCE OF DIF N= 431

SOURCE	DF	SUM OF SQRS	MEAN SQUARE	F-STATISTIC	SIGNIF
REGRESSION	10	.22456 +6	22456	9.0908	.0000
ERROR	420	.10375 +7	2470.2		
TOTAL	430	.12621 +7			

MULTIPLE R= .42182 R-SQR= .17793 SE= 49.702

VARIABLE	PARTIAL	COEFFICIENT	STD ERROR	T-STATISTIC	SIGNIF
CONSTANT		12.065	8.1336	1.4833	.1387
HIGHSCH	.08527	10.957	6.2473	1.7539	.0802
WAGE	.22124	13.899	2.9896	4.6492	.0000
EOFICH	-.10983	-15.974	7.0531	-2.2646	.0240
MANAPSER	.01164	1.8169	7.6164	.23855	.8116
CAS	.06013	13.529	10.958	1.2346	.2177
CJS	-.00369	-1.1373	15.043	-.75605 -1	.9398
PROF	.11373	35.335	15.062	2.3460	.0194
CLERSALE	.17428	29.915	8.2475	3.6272	.0003
FARMING	.10028	43.128	20.880	2.0655	.0395
BNCHWK	.12391	17.149	6.7013	2.5591	.0108

Where:

PROF = 1 if job is a professional job

CLERSALE =1 if job is clerical or sales

FARMING = 1 if job is agriculture or landscape

BNCHWK = 1 of job is a benchwork occupation

Other see Table C-1