INFORMATION PROCESSING AND SOME IMPLICATIONS
FOR MORE EFFECTIVE MANPOWER PROGRAMS

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This brief paper will focus on the tremendous potential which now exists for the development of a more rational and effective technique for dealing with problems of manpower utilization. This topic should call for a far more detailed and sophisticated treatment than it is about to receive from me. For this, I must apologize, both to this audience and my own conscience. I feel, however, that the opportunity should be taken to outline to this particular audience the sort of information processing system which I feel must be developed if we are to have a more effective means for dealing with the growing manpower problem in the U.S.

In discussing the implications of information processing for manpower problems, what I am really concerned with are the two major problems, unemployment and underemployment. At the present time, our nation would appear to have an embarrassment of riches in both of these areas. At the rate we are going, I'm somewhat pessimistic about our becoming less wealthy with respect to these two surpluses. Aside from the fact that insufficient levels of demand for goods and services necessary to increase the demand for labor would appear to be on the horizon, there is an increasingly difficult problem of an inadequate amount of information to guide both potential employers and employees in the match-making process we call the "labor market." Before indicating the deficiencies of our labor market and what the implications of information processing may be, let me briefly describe what the economist sees as the functions of the market.

One of the major assumptions of economic theory is that of the "market place" and its function of establishing contact between the forces of supply and demand. In the market place those with a product or service to sell meet those who may be interested in the purchase of the product or service, and in the bargaining process establish the "market price" and consummate the economic transaction. In this way, the needs of the consumer and the products of the suppliers lead to the pricing and production decision policies which ensure that the economy is functioning in an optimal manner—at least with respect to supplying what the market indicates is needed.

Obviously, I have not yet included a factor of major importance regarding the function of the market—that of communication. In the case of many products and services, we are all aware of the consummate and skillful use of the various news media in apprising us of their qualities. There is not only very little of a lag between the entrance of new products into the market and the public information through television, newspapers and magazines of these new items—but many of us are very frequently informed months ahead of the imminent introduction into the market of the new, completely revolutionary "widget" without which no home, car, person, or society can be complete. Indeed, we are
even made aware of those types of items which are available for the person “who has everything.”

But in one all-important sector of our economic life, the paucity of information and the turtle-like movement in the direction of the development of a communication system to connect the forces of supply and demand represents what is tantamount to an unpardonable sin. I refer to our labor market and the theoretical mechanism for matching available and projected job needs with the unemployed or those whom we can foresee as being unemployed.

As you undoubtedly know, the unemployment situation in the United States has been one of increasing concern since the mid-1950's. In the past 10 years, we have not been at a level of unemployment which even the most conservative economists can view with equanimity. Though the present rate of 5.6 per cent is far above the 3 per cent we usually view as the maximum desirable level, there are many economists who feel that the real rate of unemployment is much higher. The bulk of this is concentrated among the young, the old, and the minorities—chiefly the negroes. There is currently raging an argument between economists as to the reasons for this rate of unemployment, which, in an unprecedented manner, continues to hang on like a summer cold during the sunny seasons of apparent prosperity. Some claim this results from structural changes in our economy which throw large numbers of people into the category of the unemployable, while the other group contends that the real culprit is too low a level of economic growth. For our purposes today, which is the culprit, or whether it is both, as I believe, has relatively little significance. In either situation, there is an increasingly major role which computers must begin to play if we are to move in a direction of an optimal utilization of manpower. Several factors would lend a sense of the imperative to the application of a more scientific system for the acquisition, storage, retrieval and dissemination of labor market information.

Increasing rates of technological change produce a shorter lead time between the potential of the innovation and the innovation itself and its possible resulting labor displacement. Consequently, the amount of time in which society can anticipate retraining needs and methods for increasing worker mobility is shortened severely. With an ever-increasing labor force, the numbers are far from inconsequential. I might also add that along with the obvious economic facet of the unemployment problem, given the age and minority group characteristics of this unemployment population, the stimulus for dealing with this problem in a more logical manner would seem to increase rapidly.

How can computers be of importance in dealing with this situation? To begin with, computers and the development of a labor market communication system will not create jobs, at least not in the numbers necessary to put a serious dent in the unemployment population. But a communication system can begin to provide a much more effective means of establishing linkages between those possessing specific skills and those possessing the jobs for which these skills are needed. Those of us who have been involved in labor market analysis are more and more aware of jobs for which there are no takers because the takers are unaware of the job openings. Logically, one asks, what about the use of such agents of communication as the newspapers, private employment agencies and the United States Employment Service. In examining these major possibilities, several “necessaries” for an optimal solution should be kept in mind. To begin with, the description of the available job and the matching skill must be fairly detailed; second, there must be a formalized network which brings together the parties most interested logically in each other's potential; third, there must be the maximum coverage by industry and geographical area, of all job and skill-matching potential; and fourth, there must be a minimal delay in sending the message to the logical parties, both on the supply, or employee, side and the demand, or employer side.

Now what is the situation with respect to newspapers, private employment agencies, and the U.S. Employment Service? If we begin with newspapers, I think we immediately see that on the employer's side, there is a real opportunity for advertising in ample description. With regard to the unemployed individual, however, it is difficult to envision a situation where the
individuals who have been laid off, many of whom are in the unskilled or semi-skilled categories, will be in a position to advertise. This is so, firstly, because of the financial problem. With very limited financial means it is impossible for an unemployed individual to be able to advertise in sufficient length so that an adequate background description can be given. Aside from this, many of the items and characteristics which we have mentioned above could not possibly be contained in the advertisement which an unemployed individual might conceivably place in a newspaper. Secondly, the newspaper is hardly a formalized network which can bring together the parties most interested logically in the potential of each other; that is, the potential employer and the unemployed individual who may have the characteristics being sought by the employer. It is a very informal source of information with no compulsory or systematic feature about it. As a matter of fact, in a study done in 1962 by Eva Mueller and Jay Schiedeskamp, supported by funds from the Upjohn Institute, it was found that only between 5 and 10 per cent of the unemployed who were able to locate new jobs had been able to locate the jobs as a result of their use of newspaper advertisements. The newspaper very seriously lacks the potential of a network which can be institutionalized and which can continuously and in an exhaustive manner bring together all of the sources of information which we need for the network system we must begin to envision. Since it is also completely voluntary, there is no real opportunity for an extensive coverage either by industry or by geographical area.

If we look at the private employment agencies, we immediately see that there is the major hurdle for many of the unemployed of a substantial fee or part of their salary which would be deducted upon placement. Private employment agencies also lack the tremendous scope of coverage in terms of industry and geographical areas which we have set forth as one of the major criteria for a successful system. One of the objectives which the system we are beginning to formulate should have is that of being capable of directing the unemployed to positions available outside of the immediate areas in which they reside. Another problem of the private employment agency is that very frequently they tend to choose those sorts of individuals whose skills represent a higher probability of placement rather than a lower probability of placement. The very practical reason for this has to do with the high cost of continuing to attempt to place individuals whose skills are such that they represent a higher cost rather than a lower cost problem with respect to placement. The job placement success of employment agencies can be commented upon quickly by alluding to the Mueller-Schiedeskamp study, where it was found that only between 7 and 14 per cent of those unemployed who finally found work found the job as a result of the use of an employment agency, public or private.

Finally, let us look at the United States Employment Service. The job description information and the matching skill information developed by the U.S.E.S. may or may not be fairly detailed, depending on the efficiency or the employment service officer or interviewing personnel in the individual state agencies which make up the U.S. Employment Service. Like private employment agencies, between the states we have an erratic-behavior pattern with respect to the adequacy of the job description information. However, the U.S. Employment Service does have the skeleton of a formalized network which can bring together parties most interested in each other's potential. This is so because it is organized with a central focus coming from the Federal Government with employment services located in and controlled by the individual states. This is a very important potential with respect to our envisioned communication system. By virtue of this distribution of officers, there is the potential coverage of each of the industries and geographical areas in the United States. However, the U.S. Employment Service, like the other sources of information, lacks in the ability to have a minimal delay in sending messages to the logical parties both on the supply—or employee—side and on the demand—or employer—side. Of great importance, however, is the fact that within the present unemployment placement services of the U.S. Employment Services, there is the seed from which can grow a major automated computer operations system which is calculated to provide the basis for matching information on
available jobs with available individuals for these jobs. Under the original Wagner-Peyser Act, which authorized the establishment of the U.S. Employment Service, there was authorized a system of job-clearances between the states, and during World War II this activity was of tremendous importance in achieving a greater degree of mobility of the labor force and moving scarce skills to defense industries. This activity has continued as part of the employment service and has been recently improved. Its most effective recent operation has to do with the professional office network. This particular plan deals with making potential jobs available to professional people and potential workers available for the consideration of employers needing their services on a nationwide basis. This program was begun in March of 1956 after a number of pilot projects and experiments in 8 states and the District of Columbia and Puerto Rico. At the outset, the plan was to provide for a flow of unfilled orders and unmatched applications for the local office to a central “key city” office in each one of the individual states concerned with attempting a state-wide effort to find openings or recruit applicants. Beyond that there was an exchange of still unmatched orders and applications among the various key cities which were defined. This was expanded so that by 1963 there were 121 professional network offices located in key parts of all sections of the United States. This precedence could perform an important function in that it begins to indicate a prototype on the basis of which a larger automated massive acquisition, storage, retrieval and dissemination system could be developed. As I would envision the system toward which we hope to move, every individual unemployed in the United States who registers either for a job at the U.S. Employment Service or at a private employment service, or for unemployment insurance would have information filed on the nature of his particular skill, educational background, work experience, age, and other social and economic characteristics of importance for job location. Such information would be coded in terms of a number, such as the Social Security number, so that in the event that such an individual was able to obtain a job for which he was qualified, that individual’s availability for a job would be dropped from the storage system. In addition, all graduates of high schools, whether or not they were seeking jobs, would also be listed in the same manner on the assumption that they might possess skills for which jobs would be available in the United States.

On the employer side, all job vacancies would have to be reported to the U.S. Employment Service indicating the expected duration of the vacancy, the nature of the skills indicated as necessary to fill the vacancy, and other social and economic characteristics of the individual for whom the vacancy might be a possible source of work. In addition, all expected vacancies within a 12-month period would have to be listed by employers, thus providing an early-warning system of expected unemployment in a specific industry and community. This information would be gathered at each of the local U.S.E.S. offices in each of the states. Each state would then have a central collection agency which would then put all of this information, coded properly for identification purposes, on tapes from which the information would be brought together in a central skill-job-locator system. This locator system would quickly match jobs available—no matter where the job may be found in terms of geographical area and industry—with the skills which have been posted for each of the individuals seeking work. The matches which fall out of comparisons of skills and job openings would then provide a means for communication without delay to the concerned individuals. Communication would take place simultaneously, as a matter of fact, in order to permit both the employer and the prospective employee to make contact with each other. Depending on the scarcity of the skill and the proximity of the employer to the employee, there might be indicated the provision of mobility funds, either from industry or from the government. But in any case, at least there will have been achieved a matching of a job opening and the individual who is seeking that particular sort of job, or for which his skills provide him with a basis for doing the job. This second point is important because more and more we have begun to recognize the need for transfer from one particular occupational skill to another. In some cases, the skill
is such that we can move quite easily between industries; hence it's important that the information which is stored is of such a fundamental or generic nature that the language of the job description itself does not fall into folkways or traditional terms which might limit placement on the basis of a restrictive job description "cliché" rather than on the basis of skill descriptors which may qualify an individual for a number of jobs with completely different titles.

What I have discussed thus far would be an ambitious program to get under way immediately on a national level. However, a great deal can be done at the local level. By local level, I would begin within the confines of a major metropolitan area rather than on a larger regional basis. By starting at the local level, there are several assets. To begin with, the local U.S. employment services does, to some degree, although a limited one, know the local labor market. It does avail itself of a certain limited number of information inputs from employers with regard to contemplated changes in the labor force. It also, to some degree, makes use of what information is available on the nature of forthcoming graduates from vocational education programs and the nature of the skills which they may possess. Building on this rather primitive basis, we can begin to design at the local level a more formalized system of information acquisition, storage, retrieval and dissemination with respect to labor market structure and needs, both on the supply and demand sides. An additional asset, if we start at the local level, results from the fact that co-operation between employment services of the individual states varies rather widely and in most instances we find that the individual U.S. employment services within a state act on an autonomous basis. In some instances there is a bonus which results from the fact that some school systems have already begun to develop formal and standardized procedures for storing information on graduates. This is done with the objective of following up on graduates after their departure from the school system in order to determine what the nature of their work in the job world was after leaving school and the degree to which the training, especially vocational, affected their success in finding work as well as the nature of the work which they found. These information systems can be taken over and utilized for some of the initial information inputs which will be necessary on graduates as well as non-graduates coming from the school system and entering into the labor force.

In addition to the use of computer systems for providing a means of communication between the demand and supply sides of the labor market, there is also a fascinating opportunity to utilize the computers as a current analytical tool for determining the relationships between various economic, social, and educational characteristics of the employees or unemployed labor force in the population and the degree to which these characteristics affect mobility, job-seeking patterns, ease of placement, labor turnover, and other factors which are of prime consideration in the development of manpower policies. At the present time, we know very little concerning these sorts of factors and the degree to which there are correlations between these factors and other behavioral characteristics and placement possibilities of the unemployed as well as the employed in the labor force. By use of computers, we may also be in a far better position to determine the degree to which individuals with a broad array of skills may be underemployed in our economy. Once having established the basis for gathering information and communicating this information on individuals seeking jobs as well as employers seeking skilled individuals for jobs which are available; there is the potential for continuing to gather information which can be coded on the basis of Social Security numbers with regard to types of skill, hours of work, units of output or productivity, and other such economic and social characteristics while the individual is actually employed. This information can be collected, collated and analyzed on a current basis and, with such information being available, there is the possibility of our being able to move away from the rather limited sample which we now use to measure unemployment in the United States. Further, it presents us with the intriguing possibility of being able to put a tracer on individuals who have been displaced for various reasons from an industry, the degree to which they find new employment, the nature of the new employment which they find and the
levels of wages which these individuals are able to obtain in these new forms of employment. This is particularly intriguing because, at the present time, the major argument raging between economists concerning whether or not unemployment is due to structural factors, including technological unemployment, or too low a level of aggregate demand has been subjected to no truly rigorous research treatment. Each side of the argument obtains major support from deduction, logic, and scanty data rather than from large-scale analytical research procedures involving survey techniques and directly relevant primary data. Before closing, I would like to suggest one additional fascinating potential application of computer technology to a difficult manpower problem—that of designing more effective training systems. Among these systems I would include both vocational training at the high school level and adult re-training at the post high school level. If we regard this sort of training as a scheduling of a mix of sequential, overlapping and concurrent phases, where the optimal situation is one where we can forecast time “bottlenecks” and choose options which shorten or eliminate these bottlenecks, we are really considering the application of PERT and critical path method techniques for training and curricula design problems. The scheduling of education, very much like the scheduling of a Polaris project, calls for the same awareness of the trade-off potential between time and money and the development of PERT network or critical paths which permit the design of a system more concerned with producing an end product in less time rather than being concerned with a marginal savings of funds. This is not only of significance with respect to scientists and engineers but also with regard to potential juvenile delinquents and heads of families who, without work or meaningful job roles, represent serious personal and social costs with which we are already becoming familiar.