DATA BASES AND VOCATIONAL DECISION MAKING

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Abstract

As vocational assessment and evaluation become increasingly sophisticated and computerized, many professionals are turning to a variety of software based on or derived from data obtained from the U.S. Department of Labor's Dictionary of Occupational Titles and related publications. There are numerous problems with the continued usage of the DOT as the sole data base: (1) DOT data collected between 10 and 15 years ago; (2) lack of quality in the job analyses, (3) lack of consistent data collection methods; (4) not enough job analyses of provide adequate coverage; (5) sampling problems in selecting jobs for study; (6) serious problems with structure of worker trait profile; and (7) problems with transferrable skills.

Evaluators, placement specialists, vocational experts, and disability determination personnel need a dynamic data base. The specific needs include the following: (1) a flexible data base that is constantly being updated; (2) a flexible structure to interface this data base with users; and (3) the availability of locally developed data bases.

There is no projected date for a revised DOT, let alone an interactive data base. Because not much is being done in this area, now is the right time to rethink some basic concepts that we have all accepted and to prepare for the future. It is time that the following steps be taken: (1) make users aware of the problems with the data base, this includes the legal community, industrial psychologists, vocational guidance counselors as well as rehabilitation professionals. (2) Organize a national conference to discuss what to include in any data base. For example, expanded sets of physical demands and environmental conditions would be very useful in vocational rehabilitation and disability determination. (3) Enlist the aid of the three national administrations that use the DOT the most: Social Security Administration, Veterans Administration and the Department of Labor. (4) Organize a small task force of consumers of data and job analysis experts to consider the real needs. (5) Develop practical methods for collecting job analysis data, and (6) Develop local job banks.

Today I want to talk with you about data bases in general, the data base for the fourth edition of the Dictionary of Occupational Titles (DOT) in particular, and the relationship of these two factors to vocational decision making; especially vocational decision making using one of the computerized job matchings systems.[1]

As vocational evaluation and assessment become increasingly sophisticated and the provision of services more competitive, many evaluators and vocational experts have started using one or more of the various computerized job matching systems that have recently become available. Unlike Athena being born fully armored from the head of Zeus, these computerized job matching systems did not suddenly appear fully developed. Nor were they totally new concepts. I remember when first coming to Stout in 1972, Dr. Darrell Coffey was teaching client-job matching with a set of forms he developed while employed as an evaluator at Omaha Goodwill Industries in the late 1950's.

There were at least three published manual job matching systems available by the late 1970's and early 1980's, two American and one Canadian. The most popular was the VDARE system initially developed by Drs. Timothy Field and Jack Sink (1979) at the University of Georgia. A graduate student of theirs, Dr. Billy J. McCroskey and Dr. Eugene Perkins, at St. Cloud State in Minnesota, developed the McCroskey Vocational Quotient System, copyrighted in 1981. Both of these systems published large volumes (i.e., The Classification of Jobs (Revised Edition) and The Encyclopedia of Job Requirements) containing listings of Worker Traits and Job Classification codes for each job in the fourth edition DOT. These data, obtained from U.S. Department of Labor tapes of the job analyses used to develop the DOT, became the first readily available information on the job characteristics of individual occupations as defined in the fourth edition of the DOT. It is interesting to note that these two publications were developed privately, without DOL cooperation or funding. Although more a career exploration system than a strict

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job matching, the Canadian Employment and Immigration Service developed a very sophisticated guidance device titled "Index to Canadian Occupations" (Occupational and Career Analysis and Development Branch, 1979). It must be mentioned that there are presently computerized versions of these three systems available: the Job Search Program, Datamaster, and CHOICES, respectively.

If you have even spent two or three hours performing a manual job matching search using either VDARE or the McCroskey process, you know what boredom is. It was no wonder that when these processes as well as others were placed on computers, they were initially very popular and continue to be popular. By early 1983 there were about eight systems on the market; today there are somewhere around 15. The development and spread of these systems is, if anything, greater than the expansion of commercial work samples in the middle 1970's.

All of these job matching systems have one thing in common: their data bases are either directly or indirectly taken from the U.S. Department of Labor computer tapes containing job analysis data used in the fourth edition of the DOT. Even those systems having the option for developing local data bases still require the user to enter local job analysis data using the standard DOL variables (e.g. General Education Development, physical demands, and temperaments). With the exception of the new Isabel System (Florida Occupational Information Coordinating Committee, 1984), I cannot think of any job matching system that is not based on DOL terminology, if not on DOL data. Although all of these systems have at least slightly different logic and each is unique in its own way, they all share the same set of variables and in many cases the same data base. It is this data base that I want to focus on today.

Most of us have been trained to use the DOT and related documents, such as the Guide for Occupational Exploration (Harrington and O'Shea, 1984), in graduate school; many of us use these documents daily in evaluation planning, occupational information, vocational counseling, report writing and testimony. Although the DOT is a very useful document, or is the only nationally available source of job definitions, there are numerous problems with the continued use of the DOT as the only data base. Remember that I am using the word "DOT" as a shorthand for both the publication and the job analysis data base that produced the publication. Most of the following discussion was taken from Miller et al. (1980) and Elliott (1983).

1. Much, if not most, of the data base is dated. The collection of job analyses for the fourth edition began in 1966, after the publication of the third edition in 1965. Data collection continued until 1976. The fourth edition was published in 1977. It is now 1986, this makes the job analyses that are the basis of the DOT between ten and twenty years old. All of us know from our own personal experiences how much job duties and requirements have changed in the past ten to twenty years.

2. There is a considerable lack of quality in the job analyses making up the DOT data base. Some years ago the Materials Development Center attempted to obtain copies from the North Carolina Occupational Analysis Field Center of the job analyses used in the development of the fourth edition. After being refused, we contacted our Senator who reminded the field center director of the Freedom of Information Act. Several weeks later 300 job analyses arrived at Stout. They were of such poor quality that we could not use them. The tasks and element statements were not complete, the worker trait profiles were not rated, and most of the job classification codes were missing. Had a graduate student handed in one of these as an assignment, he or she would been told to start over again. Miller, et al. (1980) reported the same findings on a much larger sample of job analyses: "Job analyses were often incomplete and were most often verifications of third edition descriptions rather than new analyses" (Elliott, 1983, p. 89).

3. The job analyses procedures used by the Occupational Analysis Field Centers were not consistent. The Handbook for Analyzing Jobs (U.S. Department of Labor, 1972) was not printed until data collection was almost completed. Miller, et al. (1980) reported that many of the procedures used prior to the publication of the Handbook were not defined or disseminated to field centers in a consistent manner. However, the most serious change occurred from 1974 to 1976:

> ...analysts were directed to concentrate their efforts on verifying jobs against existing job schedules for similar jobs in other establishments or against the DOT definition if the job could be converted to a third edition code. In this way much of the time-consuming writing entailed in completing the job analyses schedule was eliminated. (Miller, et al., 1980, p. 140)

4. There simply were not enough job analyses completed to provide adequate coverage of the over 12,000 job definitions in the DOT. Sixty percent of the job definitions were based on two job analyses or less. Apparently, reviewers attempted to compensate for this weakness by using, without modification, occupational definitions from the third edition. A random sample of 307 DOT base title occupations, revealed that 81 or 26% of the fourth edition definitions were identical to those in the third edition (Booz, Allen and Hamilton, Inc., 1979). Finally, 16% of the occupational definitions were based on no new job analysis.

5. A considerable number of questions can be raised about the sampling procedures used. The population from which the individual jobs were selected potentially included every competitive position in the American economy. Sample selection occurred at three points in the data collection: the industry level, the establishment level and the job level. At the industry level sampling procedures were based on industrial designations; these were not applied in a uniform manner. Second, at the establishment level the only consistent finding of Miller, et al. (1980) was that Field Center personnel selected establishments geographically close to the field center. Finally, "no attempt was made to observe certain types of jobs, including some professional jobs, seasonal jobs, and jobs involving a wide variety of tasks spread over long periods of time" (Miller, et al., 1980, p. 141). A critical review of the sampling procedures clearly demonstrated that retail trade and services were underrepresented; manufacturing was overrepresented. My experience with the DOT agrees with these findings; I have found that personal services, the helping professions, and business services are really underrepresented. Electronics manufacturing and repair are also underrepresented.

6. The five criticisms listed above deal mostly with procedural problems; these could be solved through the use of more careful management and consistent processes. These would not require fundamental changes in our thinking. The sixth criticism, however, lies at the heart of the DOL job analysis system. As you know, a key part of the job analysis is developing a Worker Trait Profile containing about 44 variables: DPT codes, GED, SVP, Aptitudes, Interest, Temperament, Physical Demands, and Environmental Conditions. Most of these were developed in the early 1950's and were derived from the General Aptitude Test Battery, and the work of Strong and Cottle. This has resulted in a considerable amount of overlap between these variables. A factor analysis study reported in Miller, et al. (1980) using principle components with the varimax rotation method found six clearly definable factors:

   a. Complexity of Work (49% of shared variance) - High loadings on: GED, SVP, Data, People, General Intelligence, Numerical, and Verbal aptitudes and the temperaments of VARCH and REPCON.

   b. Motor or Sensory Skills (23% of shared variance) - High loadings on: Finger and Manual Dexterity, Reaching, Things, and the Machine Interest.

   c. Physical Requirement (10% of shared variance) - High loadings on: Inside/Outside/Both, Stoop, Climb, and Strength.

   d. Organizational or Administrative (5% of shared variance) - High loadings on: Dealing with People, People, and DIRECTING. This factor is related to the first factor.

   e. Interpersonal Skills (5% of shared variance) - Working with FEELINGS, INFLUENCING, and Sensory criteria.

   f. Undesirable Working Conditions (3% of shared variance) - Hazards and Atmospheric Conditions.

   My opinion is that most of these variables were developed at a time when blue collar jobs in manufacturing predominated; our switch to a service and information economy requires developing new factors centering on the interaction of people with other people and people with machines. Physical demands must also be expanded to include a greater emphasis on precise finger and hand movements, vision, and hearing. Although the A Guide to Job Analysis (U.S. Department of Labor, 1982) may contain the beginning of a new system, a much more basic reassessment of job factors is needed. The high factor loading on Job Complexity forces one to ask: how much of the job analysis ratings are really a halo effect for social status or General Intelligence (i.e. Spearman's "g").

7. The final problem deals with transfer of skills, a key element in vocational

decision making. Here I will quote from Elliott (1983) at length:

> There does not appear to be a single way of combining DOT variables that is appropriate for transfer of skill for workers of all vocational backgrounds. Using MPSMS and work fields as ways of limiting a search and transferring skill may be appropriate for a blue collar worker, but would be inappropriate for a person with a college degree (page 93).

Because the transfer of skills is both a vocational evaluation concern and legal concern, this criticism is extremely important. Although one workable approach may lie in the use of the Guide for Occupational Exploration codes, other methodologies must be developed.

These seven critical problems have undermined the usefulness of a document and data base that we all rely on; a data base used by individual evaluators, vocational specialists, vocational experts, and others to make decisions having major effects on the lives and futures of our clients. To make this even more important, it is the only available national data base of occupations.

The problems mentioned above require two separate solutions: the first is managerial and technical; the second is a critical rethinking of the basic assumptions of the DOL job analysis system. One of the most serious problems is the turn around time between a job analysis study and its incorporation into a data base. The present DOT is really a static data base that is supposed to be updated every ten to fifteen years. In a time of fast changing occupational demands and employment patterns, this is hardly adequate. A dynamic data base, kept up to date by an ongoing process of data entry and data analysis, would help to solve this problem. This data base could be used by evaluators, placement specialists, vocational experts and disability determination personnel. The specific needs are as follows:

1. Procedures for Constant Updating - As stated above, one of the most serious problems is the timeliness of the data. This could be solved by changing the DOT from a static document to a dynamic data base available to a wide variety of users. This is no dream, the technology already exists. Many of the programs needed are very close to those used by the Ability Information Systems. Based on sampling requirements, data could be entered from various segments of the economy to satisfy the sampling requirements. Although data could be entered either by direct access or mail, procedures to insure quality would have to be developed. One quality control method would be to insist that only persons trained in job analysis could submit job analyses for entry. Perhaps a panel of job analysis experts assisted as needed by advisors from various industries who know materials, procedures, subject matter, and services for their respective industries could be used. This expert panel could also request that specific jobs be analyzed.

2. A Flexible Structure for Use - Data are not useful if no one can access this information. The second requirement is that the system be user friendly and flexible. Once again, the technology already exists. Access by terminal, computer and modem, or even mail would be available for a user fee.

3. Availability of Local Data Bases - The Social Security Administration's Disability Determination Program is perhaps the only body making vocational decisions on the basis of the national employment statistics. In legal proceedings involving personal injury, workers compensation, medical malpractice, etc. vocational experts need regional, state or local data bases of existing and available jobs, not national listings. Likewise, the placement of disabled persons is usually a local matter. In order to accommodate these uses, any national system would need carefully defined subsystems for states and other geographic distinctions. Data bases combining DOT data with census codes, zip codes, Standard Industrial Classification Codes are presently available. Once again technology has increased more rapidly than our organization, administrative, and decision making skills to use this technology.

In summary, the development of a dynamic data base with local options in not a dream, the technology already exists and is already being used in a limited way. What is required is a critical rethinking of the basic concepts of the DOL job analysis methods and the political skills to make it a reality.

I will suggest specific actions that need to be taken in a few minutes, but first I must make you aware of the present status of U.S. Department of Labor job analysis activities. At the time of

completion of the fourth edition DOT, there were eleven Occupational Analyses Field Centers. A few years later, the number of Field Centers was reduced from eleven to one -- only the North Carolina Field Center was left and this one functioned mostly as a repository for data. In addition, the Division of Occupational Analysis that produced the DOT's had been disbanded with most of the older employees retiring.

From this low point, the Division of Planning and Operations has reestablished four Field Centers: Massachusetts, Michigan, Missouri and Salt Lake City. The occupational analysis operations are presently budgeted for 1.8 million. The present priorities are the retraining of staff and, of more interest, the collection of job analysis in the high tech fields, for example in computer chip manufacture and robotics. Some of the anticipated changes are sampling jobs by SIC codes instead of Industrial Designations, concentration of data collection efforts on jobs either with high turnover rates or high growth. DOL plans a two prong approach to occupational analysis: (1) data collection is to be conducted on 14 year cycles and (2) basic research on improving job analysis methodologies will be started.

Although I am very pleased for this increased concern for updating an national occupational data base, I seriously question how much can be done by the present small staff and low level of funding. However, this rather slow redevelopment of the Field Center system gives us the opportunity to rethink the entire occupational analysis procedures that most of us have used, have never questioned, and have always assumed would always be there. Because our needs as practitioners cannot wait, it is time that the following steps be taken:

1. The first step is to make all users of job analysis data aware of this problem and of its potential impact on our professional lives. This includes the legal community, industrial psychologists, vocational guidance counselors, software developers, other federal agencies, as well as rehabilitation professionals. The Social Security Administration's Office of Disability is already aware of the impact of this problem on their disability determination system and is presently studying the problem. This action could be political as well as professional; in other words, if you use these data let your federal representatives know the importance of current occupational data. Just because the Labor Department has funded four more Field Centers does not imply that a new DOT will be published in the next five or even ten years. After sufficient awareness of the issue occurs, the second step can begin.

2. Second, there should be a national conference to consider this problem, bringing together users of occupational data. During the initial stages, funding would have to obtained to cover the expense of a national conference. Prior to this conference, the assistance of a professional organization, such as the American Psychological Association, federal agencies using job analysis data, or a combination of several organizations would have to be obtained. While part of this conference would be to explore the political and legal ramifications of this problem, it would also be a forum for open discussion on the needs and specifications for a national data base. For example, should the physical demands sections be revised?

3. Sometime during the first phases of this process, attempts should be made to establish a nonthreatening working relationship with the three governmental agencies that have used the DOT the most: Social Security Administration's Office of Disability, Veterans Administration, and, of course, the Manpower Administration of the Department of Labor. I'm pressing this point because these agencies are the largest single consumers of occupational analysis data.

4. As a result of the conference and with possible federal assistance, a small task force of consumers of job analysis data and job analysis experts would be organized to consider the real needs and to develop practical solutions to these problems. This task force would begin by determining the needs of consumers of job analysis data and by relating these needs to practical solutions. This task force could act as an advisory committee to the Employment Service and the Field Centers. Whatever changes might be needed in the present system or the development of a totally new system, any system must be workable and be able to provide accurate data in a relatively short period of time. I expect that many compromises between the data to be included and job analysis methods would be made. Obviously, time and cost factors would have to be considered. Another major task would be the serious rethinking of some very basic concepts, such as:

   a. Should job analysis be replaced with a task analysis approach, such as used by the U.S. Air Force? This could result in a job-task matrix system, very

useful for training and possibly for transfer of skills.

b. It is possible that the Data-People-Things concept is overly simple? Can three scales that were never designed as rating scales realistically represent all jobs in the national economy?

c. Should the Occupational Group Arrangement, MPSMS, and Work Fields be considerably expanded to reflect changes in the national economy? How can we plan for future classification as new jobs and new industries, business and services come into existence?

d. Are the present crosswalks between DOT codes and SIC, SOC and Census Codes adequate? Are these present coding system needed at all? What would be the ramifications of having all jobs coded only in the present nine digit code, thus eliminating the other codes entirely?

e. Can a realistic method of transfer of skills be developed that would cover all jobs?

5. The product of the task force would be a set of specifications or the variables that need to be included in a job analysis. The next step involves the development of practical methods for collecting data. It is expected that several potentially useful data collection methods would be developed and then rigorously field tested. Although this research and development process could take several years, it is absolutely necessary for the long range usefulness of any system that is developed. It is entirely possible that more than one method would prove viable. By the end of the research phase, one or more data collection methods would be developed. These would have to be practical and flexible. Extramural funding and the cooperation of the Labor Department would be necessary during this phase.

6. Plans for national data collection would be developed. Because it would be impossible to develop a data base to represent the entire country at once, priorities would have to be assigned. For example, job analyses of unskilled and semiskilled sedentary and light jobs needed by the Social Security Administration for disability determination, could be analyzed first. Another good method is the one presently being considered by the DOL, i.e., concentrating on high turnover and high demand jobs. Job analysis data would be constantly revised, new jobs added, nonexistent jobs deleted, and job descriptions and requirements changed as the jobs themselves change. Beginning at this point a user fee would start to be charged; the goal is to make the entire operation self-sufficient as soon as possible.

7. Finally, using identical procedures and obtaining information for a national organization, local data banks would be developed to meet the unique needs of many users. As with the national data bank, there would be a fee for service.

This process would take several years and would require a considerable amount of either public and/or private funding and assistance to get started. The goal would be a national center, most likely a non-profit corporation or governmental agency, that would be responsible for all data collection and updating. Given current political realities, we could not expect federal help beyond a certain point. The way to avoid this problem is to establish a fee for service that would insure the update of the data base.

I hope I have presented you with a real problem that all of us will have to face up to soon. I also hope I have given you some realistic methods for solving this problem.

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