

THE ULTIMATE PERSON-JOB MATCH: A KEY TO FUTURE WORKER PRODUCTIVITY

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ABSTRACT

Given current trends of decreasing budgets, reduced manpower, and escalating personnel benefits and training costs, it is imperative that the military services consider human resource policy alternatives that will enhance individual productivity and optimize personal growth and development. In the long run, a highly effective approach would be to focus on improving the match between job incumbents skills and job requirements. This approach begins with the enhancement of the kinds of information available about the jobs and the people as they enter occupations. New technologies are under development to improve the definition of what skills, knowledges, and abilities are required for each occupation; such technology could easily be extended to be job- or position-specific. Using this new technology, a better job requirements data base could be developed as the Base Training System (BTS, formerly the Advanced On-the-job Training System or AOTS) is implemented. Advanced utilization and training models, such as those developed in the Training Decisions Support Technology line of research, could be integrated as well, to help functional managers anticipate future changes in jobs and plan for possible career field transitions. Given recent developments in computers and modeling systems, the merging of all these technologies into an integrated human resources management system becomes both possible and practical. The ultimate system should be able to optimize on multiple functions so as to produce improvements in a variety of outcome variables, such as individual productivity, organizational goal achievement, personal growth and development, and classification structure stability.

INTRODUCTION

A great deal has been written and said in recent years about the declining productivity of the American worker, and many solutions have been proposed and tried. Deming, one of the pioneers in this area, emphasized the need to examine organizational processes with the view of maintaining and enhancing quality; he advocated the use of statistical process controls, planning for quality, extensive training of personnel, and the removal of impediments to workers' pride in their work (Deming, 1982). Feigenbaum stressed the need for a new philosophy of management, one which focused on the quality of products and

customer satisfaction (Feigenbaum, 1983). Others, such as Juran (1988) and Kanji (1990) have advocated the establishment of task teams to improve product quality. Many others have also spoken out or written in the same theme which has led to a very active and visible movement encouraging productivity enhancement through formal Total Quality Management (TQM) programs.

These and similar quality improvement programs have tended to focus almost exclusively on organizational solutions to the problems of productivity, and have generally ignored the individual worker except as a source of ideas for improvements and as a contributing member of a

quality improvement team. Kirsch, Fisher, & Melkunas maintain that TQM is quite different from other approaches in that "it seeks to create an organization of employee teams that are self-managed, self-improving and highly flexible" (1991:221). Yet the key to individual productivity has to be, in great measure, a focus on the individual worker and helping that worker do a job more efficiently and effectively. Such a focus should be aimed at optimizing the personal growth and development of each individual worker since it is only through such individual growth and development that the quality of the work to be done can be improved. One major thrust in this direction needs to be in better definition of the work to be done; another is to improve the match of individual workers with the available jobs.

Today, people are typically matched to occupations or job categories, rather than to specific jobs. For example, within the Air Force, airmen are classified into Air Force Specialties (occupations) and into six major skill level categories. Airmen are assigned to specific jobs. However, that assignment process makes very little use of specific job requirements or job-oriented personnel information beyond occupation and skill level. Advances in assessing specific job requirements and personnel characteristics, coupled with modern computer technology, make possible a much more sophisticated process for putting individual workers in the specific jobs for which personal productivity and growth can be maximized across an entire organization. The theoretical and mathematical tools for such an optimized person-job matching system have been available for a long time; they are currently being used within the Air Force to assign airmen entering the AF to occupations. With recent advances in job assessment technology, the time is right to consider application of these tools to match individuals to specific jobs. This paper presents an approach for the ultimate, optimized person-job match. First, some key advances in job assessment technology are described. Then an "ultimate" person-job matching approach is presented which makes use of these new job assessment technologies to maximize personal productivity and growth for an entire organization.

BETTER DEFINED JOB REQUIREMENTS

Over the last decade, there has been a growing recognition that it is imperative that we develop a better understanding of the tasks that we ask workers to perform. Fleishman and Quaintance have recently noted that:

There is a need to conceptualize tasks and their characteristics to resolve central problems in the study of human behavior. If we are going to generalize about conditions affecting human performance, it is necessary to consider the properties of tasks as important constructs in psychological research and theory as well as in our conceptions of human work and achievement. Such constructs may help to address many common concerns in basic and applied psychology and to integrate concepts and research in a number of seemingly diverse fields. (1984:1)

Cognitive psychologists have also been drawn to this area. Recently, the American Psychological Association's Science Directorate has been working with the U.S. Department of Labor in a joint project to specify the requirements of occupations to be listed in the next revision of the *Dictionary of Occupational Titles* (DOT). The DOL's Advisory Panel on the Review of the DOT "has concluded that the increasingly cognitive nature of work in the 90's has spurred the need to better understand the mental processes involved in work performance, and to document them as part of the job domain" (APA, 1992:12). This type of approach may, in the long term, provide a much better specification of the kinds of mental skills and abilities required to perform various occupations. In the short term, however, more expeditious methods are needed to gather and process information about the requirements of specific types of work.

Fleishman has recently developed a survey methodology (Fleishman-Job Analysis Survey or F-JAS) to assess the knowledge, skills and abilities (KSA) requirements of jobs, where experienced employees use behaviorally-anchored rating scales to determine how relevant each KSA is to their job (Fleishman and Reilly, 1992). The abilities identified as job requirements using the F-JAS can be directly linked to appropriate ability tests, thus assuring content validity for organizational selection procedures.

In a different approach aimed at generally the same objective, Moon, Driskill, Weissmuller, Strayer, Fisher, & Kirsh (1991) assessed the KSA requirements of Internal Revenue Service jobs by having modules of tasks rated by a panel of subject matter experts (SMEs). Task modules, derived from CODAP statistical clustering based on the co-performance by varying groups of job incumbents, are "excellents units of analysis for determining job requirements" and defining training (Moon, et al., 1992:244). In this study, task module-level KSA

linkages provided the framework for assessing content validity of entry-level training and selection tests. Such linkages ensure job relevance of both tests and training as well as ensuring adequate job coverage.

Task modules have also been used experimentally for gathering ratings of KSA requirements using three different taxonomies, for a sample of Air Force occupations (Driskill, Weissmuller, & Dittmar, 1992). These ratings proved to be generally reliable, as assessed by interrater agreement indices, and appeared to realistically differentiate among the specialties. A follow-on project has been planned which will expand this process to a much larger sample of enlisted specialties; if the process continues to be successfully applied, it will eventually lead to a much more systematic approach to establishing Air Force specialty requirements, which could lead to more sophisticated selection and placement testing, as well as more effective training programs.

Advanced occupational analysis software has been developed to assist analysts in the identification and interpretation of both case and task clusters (Phalen, Mitchell, and Hand, 1990). Work continues on refining and testing these programs. The task clustering programs have proved particularly useful, as a way to order the extensive task data base, and make the information more useful to managers and decision makers.

[see: <http://www.ijoa.org/papers/index.html> for reports of these developments]

BUILDING A BETTER JOB REQUIREMENTS DATABASE

Once the new technology for collecting job requirements data has been refined, and a systematic approach developed for linking task modules and KSA requirements, we will need to operationalize these methodologies so as to develop a comprehensive job requirements data base for all specialties. Such a data base should include active duty enlisted, civilian, and officer jobs as well as National Guard and Reserve positions. One approach to the development of such a data base is to integrate this requirement with some other new manpower, personnel, and training (MPT) technology being implemented as a way to expedite and systematize the process. One candidate system might be the new base-level system for managing on-the-job training; the Base Training System (BTS; formerly the Advanced On-the-Job Training System or AOTS) which is now being tested by the Human Systems Division (HSD/YARD) for possible Air

Force-wide implementation (Blackhurst, et al, 1991). By integrating the requirement for a new job requirements data base with a system such as BTS which is being implemented, several things can be achieved simultaneously. Since the BTS is designed to provide local supervisors with generic position task lists as a starting point for the development of position-specific OJT programs, the system is oriented toward recognizing major variations in jobs within an occupational field (Air Force specialty). Thus, it will permit the easy identification of those technical supervisors most capable of providing ratings of job requirements for the recognized generic positions, and will therefore facilitate the assessment of variations in such requirements among jobs. When consolidated with data from other locales and units, this permits the systematic evaluation of such job requirements in a way not possible in the past. By obtaining job requirements ratings on task modules, the unit of analysis is shifted from the specialty (AFS) as a whole to the task modules, which can then be reorganized into new jobs as the classification structure changes or as new systems are introduced into the inventory. This provides much greater flexibility to the system, and overcomes some of the major problems inherent in studying job requirements at the specialty level.

COMPUTER-BASED CAREER FIELD MODELING

Once the more comprehensive data base of job requirements is developed, it can be used for a variety of purposes beyond the development and management of OJT programs. Such data could also be used as another source of information for evaluating possible changes in how an occupation is organized. Advanced utilization and training models, such as those developed in the Training Decisions Support Technology line of research (Vaughan, et al., 1989; Mitchell, et al., 1992), can be adapted to make use of such an advanced job requirements data base to help functional managers plan for career field changes. Recent Air Staff initiatives mandate greater responsibility for functional managers in planning and budgeting for all of the training required in their specialties. They are charged with the development of career field training management plans (CFTMPs) to systematize expected transitions based on changes in how career fields are organized, the equipment and systems they operate or maintain, and the training programs needed to make their specialist proficient on the job.

To assist functional managers in making decisions on training and developing CFTMPs to implement their decisions, they may call on representatives of all of the functional areas (by Major Command, base or unit) by convening a Utilization and Training Workshop (U&TW). This type of cooperative effort insures that all major areas of concern can be discussed, and various alternative solutions can be proposed. The Training Decisions Support Technology is designed to assist functional managers and U&TWs in evaluating alternative career field structures and various configurations of training (Mitchell, et al., 1992). This technology is being extended in an attempt to also assist in the development and drafting of CFTMPs (a report on a pilot project for such a purpose is being presented in another session at this conference).

Given the very rapid development of computer technology over the last few years, it has now become feasible to consider merging many of these technologies into an integrated human resources management system (Mitchell & Driskill, 1986). Most of these various technologies have been developed using tasks (or task modules) as their basic unit of analysis; with that common foundation, integration and interaction is not only feasible but highly effective. The challenge is to develop appropriate interfaces so that data (at some level of abstraction) can be moved easily from one system to another, and to have appropriate checks and balances to insure comparability of results. In this way, the integrity of the basic data can be maintained while various output products are moved from system to system to be used to meet a variety of needs (analysis or restructuring of jobs, definition of training requirements, assessment of the impact of proposed changes, etc.).

THE ULTIMATE PERSON-JOB MATCH

The basic theoretical and mathematical tools for optimized person-job matching have been available for some time and are now being used to make initial assignments for Air Force guaranteed enlistment personnel in the Procurement Management Information System or PROMIS (Ward, 1983; Ward, Haney, Hendrix, & Pina, 1978). The difficulties have been in assembling the detailed person and job data bases and in the sheer magnitude of the computations required for person-job matching. As discussed above, much more sophisticated and detailed data are becoming available concerning job requirements, including data concerning specific tasks and task modules that job incumbents will need to perform. Similarly, much more detailed data are becoming available

concerning personnel characteristics, including specific task/task module proficiency data. These person and job data bases, coupled with modern computer technology, make possible the ultimate person-job matching system.

The first step in building the ultimate person-job matching system is to define an objective function. This mathematical function quantifies the relative value or utility of placing a given person into a specific job. Its independent variables will be person and job characteristics that predict or lead to the relative value of an assignment. A given person-job match may have different values, when viewed from different perspectives. One type of value relates to a person's productivity in a given job. This value would probably be maximized by improving the match between a person's current task proficiencies and a job's required tasks. Another type of value might relate to a person's preference for a particular job or assignment. This might involve such variables as geographic location, which are unrelated to job task performance requirements. A third type of value might relate to expansion of personal experience and skill, to prepare for future jobs.

The objective function reflects trades among these various (possibly conflicting) types of values associated with a person-job match. While this trade can be mathematically reflected in a variety of ways, perhaps the simplest involves a weighted linear function of measures for the different values. Weights may also be required within a single value measure. For example, some tasks in a job may be more important for overall job productivity than other tasks. These tasks should receive more weight in scoring the match between a person's task proficiency and a job's task requirements. Similarly, achieving a good match may be more important for some jobs than for other jobs; these jobs can be weighted more heavily in the overall value measure.

A key aspect in the success of a person-job matching system involves determining a set of weights that is acceptable to all affected parties. These weights are ultimately subjective in nature and reflect a compromise between several different points of view. These weights can be determined using policy capturing/policy specifying methods (Ward, 1977).

The next step in building the ultimate person-job matching system involves defining constraints that an acceptable organization-wide set of person-job matches must meet. One constraint, for example, is that exactly one person be placed in each job. Constraints may also be related to personnel

policies and processes. For example, each person who is currently in an overseas assignment might be required to be matched to a CONUS assignment. Exceptions to constraints can be made as appropriate. For example, if an individual who is currently overseas wanted to stay overseas, the CONUS assignment constraint could be voided for that individual.

The information on individuals currently maintained in the Personnel Data System has been in very general terms (e.g., only the last three training courses taken, only job title and duty AFSC for assignment history, etc.). The development of the BTS will help solve the latter problem in that an individual training record (ITR) will be maintained which documents the jobs and individual was assigned and the training received OJT to prepare the individual to perform that job. The individual's record will include very specific information in terms of proficiency achieved in accomplishing specific tasks or groups of tasks. The ITR will provide a wealth of information for the individual supervisor, as a basis for specifying the required OJT program. We will need, however, some system to periodically pull ITR data into a central AFS-specific data base, if such information is to be used for AFS modeling or person-job match application.

The needs of the Air Force, in terms of priorities (or criticality) for manning some positions, can be weighted into the equation, as can the preferences of the individual (in terms of an ordered list of preferred assignments). Given that the right kinds of information are available, and some priorities established (in terms of which needs or requirements should be more heavily weighted), there is no reason that multiple functions cannot be used in an optimization algorithm. The mathematics required for such a system have been available for many years; the data bases needed, however, are just now being formulated. Such data bases are complex in terms of many variables and many data points, but are generally straightforward once the requirements have been defined.

With data bases of person and job data and with appropriate objective and constraint functions defined, computer algorithms can be applied to match people to jobs in order to optimize the objective function and meet the constraints. In large occupations, this computational problem may be large. Another significant implementation issue concerns the time window within which people and jobs are collected for matching. If this time window is too narrow, few people and jobs will be collected.

This will limit the degree of match that can be achieved.

The other missing link in the past has been a question of computing power; the capability to manipulate large data bases in a variety of ways to achieve multiple objectives. Recent advances in computers and minaturization have solved this problem. Today, micro-computers are available at reasonable cost which can accomplish large data base manipulations which used to consume days and weeks of computer time on large mainframe systems. Even some Personal Computers (PCs) now have the computing power which used to reside only on mainframes. Software systems, such as typical regression programs or CODAP, are rapidly being modified so that they can be used on several different size systems, from the largest mainframes to the top-of-the-line PCs. Given this kind of capability, computing power is no longer an excuse for delaying implementation of advanced person-job match technology.

CONCLUSIONS

As these new support technologies (e.g., BTS, TDS, CFTMPs, U&TWs, etc.) are operationalized, the new job requirements and training data bases will rapidly become available for research and development of needed interfaces and creation of an integrating system. This opportunity is one which should not be missed, for it will aid functional and MPT planners and decision makers in creating better job specifications and better training programs for the reduced work force. If we apply the basic concepts of person-job match technology in future Air Force and DoD MPT operations, the result will be a highly trained, proficient work force; people who know what and where they are, and where they are going. In its penultimate application, person-job match technology (philosophy) will lead to substantially enhanced individual productivity and professionalism. This is, after all, the basic principle inherent in the PJM system as well as the whole TQM movement. A realistic PJM implementation is needed for full TQM success.

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