

A WORK MEASUREMENT APPROACH TO FUNCTIONAL ASSESSMENT

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ABSTRACT: The work oriented human service industry has grown out of the current emphasis on projects with industry, transition programs, economic pressures on facilities to develop work oriented client programming, supported work and job placement. These developments have required evaluators to place a high priority on the relationship of assessment results to external work placement. Thus, there is need for evaluators to have techniques and skills in Work Measurement and Functional Assessment.

This paper will examine an industrial engineering approach to Work Measurement (MODAPTS) and its functional assessment component (Workability). It will present a method in which a precise approach to the following questions can be utilized.

1. What is the handicapped person's performance in relationship to employer requirements?
2. What is the degree of deficit in various work tasks?
3. What is the most efficient method of performance for the person doing the task?
4. What are task performance requirements for jobs in the workshop and/or community?
5. How does the evaluatee's performance profile compare to industrial requirements?

Since 1909 (Maynard, 1971) engineers have utilized stopwatch time study and predetermined time standards to measure work. Engineers have used work measurement to determine:

1. reasonable time for a person to carry out a defined task;
2. a reasonable amount of output for the person performing the task;
3. the most efficient method of performance for the person doing the task.

A predetermined motion time standards system (PMTS) (i.e. MODAPTS, MTM, Work Factor, Standard Data) is an advanced work measurement technique whereby established standard data for basic human motions are calculated, resulting in standard time required for the performance of various operations. As an alternative to traditional stopwatch time studies, the PMTS approach reduces subjectivity in evaluating an individual's performance relative to that of a trained, experienced worker.

During the past decade rehabilitation professionals and industrial engineers have recognized the value of work measurement techniques in the assessment of handicapped individuals workplace capabilities. Shinnick and Black (1983) proposed the use of work measurement and methods engineering techniques in vocational evaluation process. In Australia the founder of MODAPTS (Modular Arrangement of Predetermined Time Standards) published Workability, (Heyde, 1974), the functional assessment system examined in this paper. In 1975 the International Methods Time Measurement (MTM) Directorate suggested that a project be undertaken to develop a system to aid the rehabilitation of handicapped and disabled people. This effort resulted in the Mast System (Wilcock, 1984). These developments strongly indicate the perceived need for the application of work measurement to evaluation.

Throughout the world evaluators have accepted MODAPTS and Workability

as a valid and useful PMTS and work capability assessment tool (Shervington, 1978; Yokomozo, 1980; Bootle, 1978; Brolin, 1981). For many of the same reasons industrial engineers and the world industrial and commercial communities have accepted and utilized MODAPTS. They have found the 21 motion elements in MODAPTS and the 69 motion elements for clerical and transit work in MODAPTS Plus (Heyde, 1983) to be quicker and easier to learn than the 400 elements of Methods-Time-Measurement (MTM) and the 150 elements of Master Standard

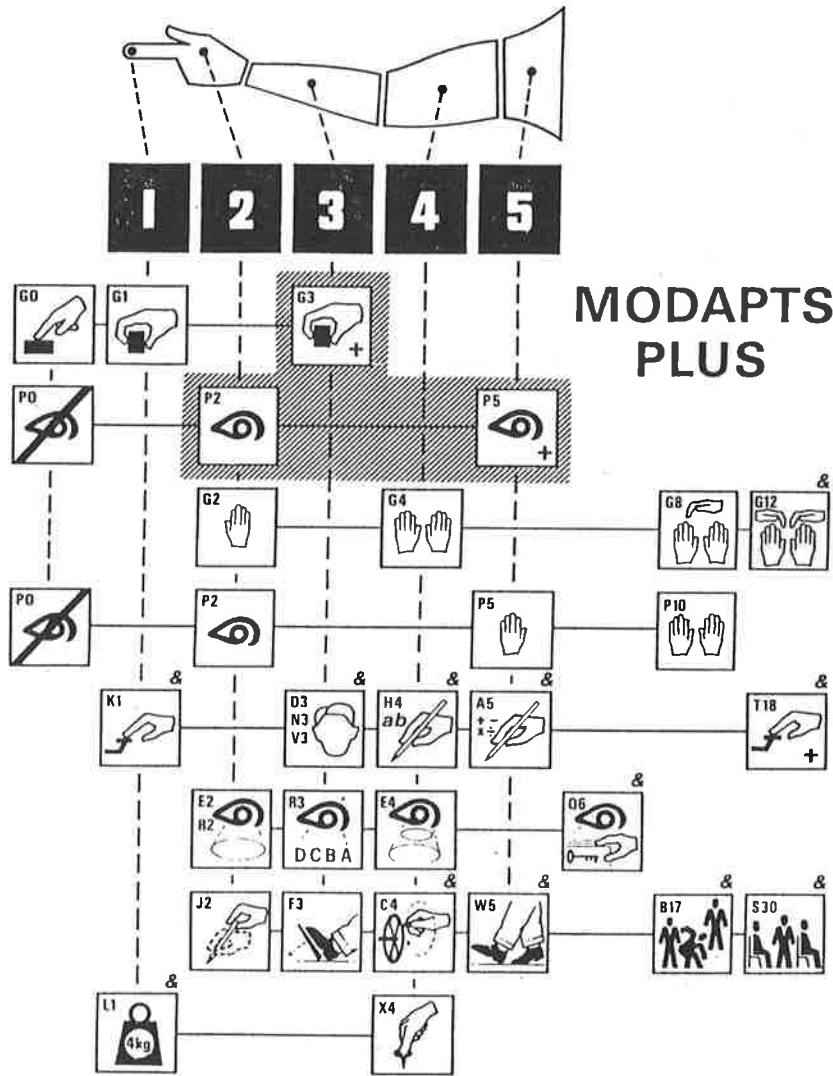
Data (MSD). According to Shervington (1978):

"Most of the consumers of our work assessment services: direct (patients and clients), indirect, (doctors, lawyers, and insurance assessors), are able to understand the jargon of this workplace and body-part method of assigning values to elements that make up tasks expected of people at work."

The most obvious feature of MODAPTS is its fundamental simplicity. MODAPTS is based on the principle

Figure 1

*The MODAPTS PLUS Card



*The figure originally appeared on the cover of:
Heyde, G.C. (1983) MODAPTS PLUS. Sydney: Heyde Dynamics, Pty. Ltd.

that all body movements can be expressed in terms of multiples of a simple finger movement. The units of time adopted for use in MODAPTS are called MODS. The value of a mod is 129 milliseconds, which is also the same as a 0.129 finger move (coded M1). A hand move becomes an M2 (2x0.129 seconds), a forearm move is an M3 (3x0.129), and a whole arm move an M4 (4x0.129). Likewise, a foot move is F3 (3x0.129), an eye use is E2 (2x0.129), and a bend and rise is B17 (17x0.129).

The elements in MODAPTS Plus (Heyde, 1983), represented by boxes with pictures of body parts, alphabets and integers, encompass nearly all of the physical activities by which people carry out work. The MODAPTS Plus card in Figure 1 depicts rows and columns of boxes. Each column has the same integer value such that the first column has zero value, column two has a value of one, etc. Likewise, the lines across have some "family" connection. The boxes on the first line are "gets"; on the second line "puts", and on the sixth line of boxes are elements not elsewhere included, where eye use is a major factor.

Users of the system identify the body part(s) used to carry out some action or series of actions. If they are fluent in the system they recall what the elements are, write them down, add them up, multiply by the frequency, divide by 7, and give the standard time in seconds. In many cases a simple standard can be produced by a fluent individual in a few minutes.

Users who are less fluent have to look up the definitions of some of the elements, hence, writing a standard takes longer. Learning the system takes four days, two 2- 1/2 day training programs is ideal. After learning the system, another forty hours is required to develop fluency.

Workability with MODAPTS (Heyde, 1974) provides a series of comparatively simple assessment tasks that measure the functional capabilities of workers

(particularly those with some known impairment) and then compares them against the standard performance of a "normal" person. The assessment battery consists of 21 work tasks that are related to the MODAPTS elements. The Workability assessment tasks can be administered in approximately two hours.

The results of Workability are reported in a profile that compares the evaluatee's performance against the MODAPTS standard for that task or set of tasks. The results can be further verified through the use of simulated tasks and job trials (Shervington, 1974). Workability can be utilized to assist with the following:

1. Placement of people on tasks that maximize their strengths;
2. Training of workers in areas of identified performance deficiencies;
3. Job redesign to minimize worker deficiencies or maximize strengths;
4. Job modifications to increase worker performance;
5. Determination of performance loss due to injury through the MODAPTS analysis of tasks or jobs performed prior to impairment compared to Workability assessment post-injury.

Assets and Current Limitations of Workability

Workability may be considered a form of functional assessment, which has been defined by Miller and Mulkey (1983) as "a systematic process of identifying and quantifying an individual's rehabilitation potential for a given occupation." Functional assessment can be distinguished from a physical capacity evaluation which has been defined by Harrand (1982) as "a systematic assessment of physical performance and performance potential by a qualified and medically educated professional." Workability measures functional skills that reflect actual

components and movements of work which can relate to a specific job. By measuring specific skills required for successful industrial performance, Workability provides functional information that can be generalized to many work areas, but particularly production oriented work. This can allow the identification of functional skills that need improvement or possible job modification.

Workability has many assets which favor its usage as an evaluation tool. Workability can provide a quick (2 hour), inexpensive (under \$500) and easily learned system for the initial screening or measurement of the degree of progress of clients, particularly those clients with physical disabilities. Due to the short testing time, Workability would work well as an assessment of learned skills or physical improvement of a client while in a rehabilitation center or work center.

A primary advantage of Workability has been the assessment of functional skills that reflect actual components and movements of work. By evolving from an original work measurement system (MODAPTS), Workability assures that it is directly related to skills that are involved with work.

Workability also has the potential to establish a cooperative and productive relationship between production and evaluation. By being based on a work measurement system, and measuring motions of work, there is greater face validity for production staff (particularly compared with psychometric testing). This can encourage the involvement of production staff in the evaluation process and provide a common language for information exchange between evaluation and production. This can also encourage the evaluator to develop a greater awareness of production standards and work skills.

A unique aspect of Workability involves the measurement of physiological effects (pulse) of heavy work activity and the concept of work capability. Physiological measurement can provide an estimate of energy expenditure

which may be required for heavy work and suggest possible job restrictions or medical follow-up. An additional concept which is unique to Workability has been termed capability. This compares an individual's performance on an unskilled activity with the performance of a normal worker. Since the activity is unskilled, the individual's performance can be assumed to measure his/her physical capability and the resulting percentage will reflect that person's capability to do the task provided the individual is motivated.

Workability concentrates primarily on the screening of dexterity related, repetitious tasks, it also includes components such as motivation, clerical skills and reading which are related to a broader range of jobs. The tests of reading, math and writing are limited in scope, but can serve as screening tests until more diagnostic tests are administered. As a screening device, it serves to complement the more thorough evaluation tools such as work samples, situational assessments and job tryouts.

The Workability system could be improved by modifying the manual. Currently, the instructions and interpretations of results are not explicit and leave considerable room for evaluator speculation. This is particularly evidenced by the norms which provide only the "expected time" for completion of the task. With fluency in MODAPTS, the percentage of normal time can be determined for norms, but this could be supplied in tables for the evaluator's convenience. The use of terminology such as "good" time on some tests increases this difficulty in interpretation.

Workability primarily emphasizes speed of work and not quality. Quality of work and scoring of errors are discussed on several tests, but this reasoning is vague and for most tests it is an "all or none" proposition for quality scoring. Quality and speed scoring are also combined such as in the math test in which 5% is

added to the time score for each incorrect digit. This again decreases the emphasis on quality by not separating the two scores.

The shortness of many of the tests also leads to some questions concerning reliability. Of particular concern are the tests which may involve considerable learning after one administrator. This is demonstrated in Test 18 in which the client is timed on looking up one telephone number. Retesting may be significantly influenced by the previous administration, but the manual does not mention any concern and interpretation is again difficult.

A revised manual that provides more explicit instructions, norm tables, scoring sheets and performance quality guidelines will be available through Auburn University in Winter, 1985. The manual will be a companion piece to a portable Workability Kit that will include all of the equipment required for the 22 tests.

Utilization of Workability in Service Delivery

Predetermined time standards used in assessing individual capabilities offer the vocational rehabilitation specialist quantitative and objective information to serve as benchmarks in comparing client performance and job task requirements. The 22 tests within Workability provide data which assists in identifying the ability range of the client. This performance data can provide valuable input to the rehabilitation team in improving specific functions, redesigning tasks for the individual and comparing the individual's functional movement capabilities with the analysis of available employment opportunities.

Applications of Workability in Australia have demonstrated that the information gained from these workplace capability tests is enhanced when used in conjunction with other methods of assessment. Specifically, situational assessment, work simulation and community work trials have been found to effectively

complement the Workability tests (Shervington, 1978). Because the elements measured in the assessment tasks can be readily compared to the different activities of piecework or other repetitive tasks, production impediments can often appear clearer resulting in more likely remediation. For example, a client capable of achieving 75% of standard time in a Workability test measuring certain manual movements may be performing tasks in a facility work center utilizing the same movement patterns, yet only achieving 50% in actual production. Program staff and production personnel, after reviewing the client's Workability profile, may be better prepared to advise the client toward maximizing this 75% capacity. Individuals may likewise be assigned to work tasks which emphasize programmatic gain and accelerate production output thereby alleviating a source of internal conflict common to many production oriented rehabilitation programs. Implicit in the Workability assessment approach is this positive focus on worker strengths. Increase in wages resulting from individual productivity gains subsequently reinforce work motivation for the great majority of clients.

Another notable advantage to staff performance lies in the development of a basic orientation to industrial engineering concepts through an understanding of Workability and MODAPTS. Counselors and other adjustment personnel quickly demonstrate greater familiarity with underlying principles of tasks analysis, job analysis and vocational exploration activities.

Benefits derived from the adoption of MODAPTS techniques in concert with Workability assessments are perhaps most obviously relevant to the concerns of work supervisors and production managers. The MODAPTS system, upon which Workability is founded, allows for more accurate (Riesel & Roll, 1977) and less time consuming establishment of work standards in contrast to traditional stopwatch

time study methods. Research conducted by Price Waterhouse in industrial situations demonstrated that standards for normal work operations can be produced at the rate of 20 or more daily (Colbert, 1970). Computerization of standard setting through MODAPTS further expedites the process through availability of "user friendly" software for IBM, Apple and Radio Shack micro-computers. One exceptional software feature is a program that yields rest and recovery allowance information for work tasks. This eliminates subjective allowance factors or across-the-board ratings which do not consider other fatiguing conditions that may be inherent to the task. The process thereby lends a more accurate estimate of direct labor costs and the establishment of fair wage rates.

Awareness of the time values associated with each element fosters sound thinking in work layout practices as well as the design of jigs and fixtures to minimize difficulty of task and energy expenditure. By analyzing the overall profile of facility caseload capabilities, production staff can more effectively focus on specific sub-contracting and prime manufacturing endeavors. In general terms, the techniques and philosophy of the MODAPTS/Workability approach to rehabilitation production management can serve to maximize overall work center productivity levels on existing tasks and expand production capacities for new tasks.

Finally, in consideration of the potential enhancement of rehabilitation service, attention is directed toward a growing Federal-State priority for job placement. The objective verification of job readiness through proven performance in like tasks increases the client's prognosis for a successful outcome when placed in community employment.

Hence, the MODAPTS/Workability approach to work measurement can provide assistance to a spectrum of facility personnel including evaluators, adjustment staff, production personnel and placement specialists. Perhaps the most salient

contribution to be derived from our profession's potential evolution toward this advanced system of analyzing work will be the development of a common language among different roles in vocational service delivery (Shinnick, 1985). The reader should note that Workability is not only a system for the rehabilitation of clients with physical disabilities, albeit the possibilities for new horizons in this area are promising, it is also an approach to planning, measuring and describing work which affords a new dimension in functional assessment of work capabilities regardless of disability.

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