

A Reexamination of "Transferability of Skills"—Part II

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EDITOR'S NOTE.—*The first half of this article appeared in the July issue. It examined some of the difficulties behind the assumptions about transferability of skills that constitute much of manpower thinking.*

TRANSFERABILITY of skills—the continuous use of acquired knowledge and abilities when moving from one job to another—presents problems from several points of view, as indicated in the first part of this article. First, is the need for a method of recognizing transferability possibilities when similarity rather than identity of jobs or elements of jobs is involved and for distinguishing transferability from other kinds of mobility. Second, neither worker nor employer appears to be particularly receptive to the mobility implicit in the concept of transferability, nor does the nature of the labor market appear to accommodate it. Third, the dominant rationale of transferability, saving time and resources in training and conserving skill, has not been demonstrated to be a realizable objective in the limited research undertaken. At any rate, the most pressing problem is the first; its solution is fundamental to attempts at

resolving the other two problems. A systematic approach to the recognition of transferability per se is presented here; it is based on current work of the occupational research program of the United States Employment Service (USES). An attempt is also made to construct a model which can be used to quickly and effectively determine the feasibility and practicality of certain transfers. Some applications of the techniques to current manpower problems are also explored.

Current USES Research

The objective of the current USES research—the Functional Occupational Classification Program—is to “make available to employers the largest number of workers who will qualify, and make available to workers all possible jobs for which they are suitable.”¹ Realization of this objective in practice would effect the ultimate in transferability, i. e., “maximum utilization of skills.”

To this end, the USES set out to characterize 4,000 jobs, an 18-percent sample of the 23,000 defined in the Dictionary of Occupational Titles,² in terms of all requirements and qualifications that were relevant to the “skills, knowledges, and abilities” aspect of the placement problem. The requirements and qualifications components used in the analysis were selected on the basis of USES experience in classifying and placing workers. The source materials for the ratings of the components were mainly the definitions in the Dictionary. These components, the number of factors in each, and the number rated for each job were as follows:

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¹ W. S. Studdiford, *New Occupational Classification Structure* (in *Employment Security Review*, September 1953, p. 37).

² Vols. I and II, revised edition, 1949, U. S. Department of Labor.

Component	Number of factors	Number of degrees per factor	Number of ratings per job
Work performed			
Worker functions in 3 hierarchies: Things, data, people.	About 8 in each hierarchy.	Each choice weighted 1 to 8; total always 16.	1 function from each hierarchy.
Work fields	About 100	1	1 or 2.
Materials, products, subject matter, and services.	About 500	1	1 or 2.
Industrial classification	About 250	1	1.
Training time:			
General educational development (e. g., reasoning and mastery of language and numbers).	1	7 levels	1.
Specific vocational preparation (in terms of amount of time required).	1	9 levels	1.
Aptitudes (learning capacities)	11	5	11.
Interests (individual preferences)	10	1	2 most important.
Temperament (situations calling for specific adjustments)	12	1	2 most important.
Physical capacities	5	2	As many as critical.
Strength	1	5	1.
Working conditions	6	2	As many as critical.
Location inside, outside, or both	1	1	1.

Source: Sidney A. Fine, *Matching Men and Jobs—A New Look* (in *Labor Market and Employment Security*, May 1956, pp. 7-12).

From 25 to about 30 ratings (the number varying with the number of critical factors under physical capacities and working conditions) made up a "profile" for each job. This level of detail made identities among jobs very rare, of course, and emphasized the problem of establishing similarity. A simpler approach needed to be found and was found in the work performed and training time components.

Work Performed and Training Time Components

Work Performed. The work performed component is organized around the idea that it is essential in describing a job to distinguish between *what the worker does* and *what gets done* on the job. This distinction is particularly important where a worker acts through machines, tools, equipment, and work aids. Too often, the actions or functions of the machines, etc., are ascribed to the worker. Thus, both an automatic screw machine operator and a turret lathe operator may turn metal fittings; however, the former may only feed and offbear a machine set up by another worker, whereas the latter may set up the machine, adjust its controls, and feed it.

The analysis of what the worker does indicated that, in all jobs, workers carry out in some degree functions which are peculiar to things, others

peculiar to data, and still others peculiar to people. It was found that the content of all jobs studied could be described by using 26 functions systematically arranged in hierarchies from the simple to the complex, as shown in the following tabulation:

Functions peculiar to—		
Things	Data	People
Observing	Observing	Observing
Learning	Learning	Learning
Handling	Comparing	Taking instructions
Feeding-offbearing	Copying	Serving-helping
Tending	Computing	Speaking-signaling
Manipulating	Compiling	Persuading,
Operating-controlling	Analyzing	diverting
Driving-controlling	Coordinating	Supervising, in-
Precision-working	Synthesizing	structing
Setting-up		Negotiating
		Mentoring

¹ Each successive function reading down includes all those that precede it and excludes all that follow. The indented items in the first column represent specialization within the more comprehensive function listed immediately above them.

The hyphenated factors are single functions; the factors separated by a comma are separate functions. The latter are on the same level because, although excluded from the function listed above them, usually one or the other but not both is included in the function listed below them.

Source: Sidney A. Fine, *A Structure of Worker Functions* (in *Personnel and Guidance Journal*, Washington, October 1955, pp. 66-73).

For each job analyzed, one function was selected from each of the three hierarchies to describe what the worker does, and these three functions were appropriately weighted. The weights, ranging

from 1 to 8 for each of the three functions and totaling 10 for each job, represented estimates of the relative importance of things, data, and people in the job. The functions themselves represented the relative complexity of the tasks in each of the three areas.

Thus, the job of turret lathe operator was described as: Operating-controlling (7), computing (2), and speaking-signaling (1). The listed functions indicate that this job encompasses feeding-offbearing and tending, comparing and copying, and taking instructions and serving-helping, as well as observing and learning, and that it excludes the more complex functions in each of the hierarchies, and the weights show that the job is primarily involved with things. The implication here is not that a particular turret lathe operator necessarily performs all of the simpler functions but that, in order for the indicated function to be performed, the simpler ones must be performed or accounted for, if not by him, by other workers. Nor is any implication intended as to the quality of the performance.

What gets done in jobs, the second element of work performed, was classified into about 100 work fields which define the methods and objectives of technologies. They vary from such specific categories as screwing-bolting, nailing, shearing-shaving, and soldering, to such general categories as machining, accommodating, recording, and healing-caring.

The third element of work performed—the materials, products, subject matter, and services classification—comprised about 500 items³ within these four categories, also ranked from the specific to the general.

The classification system employed in the work-performed area has significance from several standpoints:

1. By classifying and defining in advance the significant elements of work performed, the language for describing jobs is controlled. The observer, although free to use whatever words are convenient, must ultimately convert his observations to the predetermined nomenclature of these classifications. Language thus becomes a more precise instrument for analyzing job content.

2. By assigning weights to the worker's involvement with things, data, and people, the observer indicates the emphasis placed on the worker's assigned functions.

3. The distinction between what the worker does and what gets done results in a relatively precise picture of the worker's role in the technological situation of which he is a part.

4. The various classifications within each of the three major elements of work performed make available to the observer an enormous number of combinations (only a few of which are actually needed) to describe the many variations that occur in jobs.

Training Time. Training time was also a crucial factor in this analysis, as previously indicated, because the practicality of transferability is determined by training time and resources saved. In the USES research, training time was defined as comprising general educational development and specific vocational preparation.

General educational development encompassed "those aspects of education which contribute to the worker's (a) reasoning development, adaptability to the social environment, and ability to follow instructions; and (b) acquisition of 'tool' knowledges such as language and mathematical skills."⁴ Thus, it is education of a general nature which does not have a recognized, fairly specific occupational objective. A threefold scale (reasoning, mathematical, and language development) with seven levels in each category was provided for evaluating either job requirements or worker qualifications.

Specific vocational preparation was defined strictly in terms of time spent in obtaining such training (for example, on-the-job training, apprenticeship, or institutional or vocational training). The training times for the various jobs were arranged into 9 categories—from a short demonstration period (level 1) to more than 10 years (level 9).

The distinction between general educational development and specific vocational preparation is vital in determining potential transferability. The former defines the level of learning ability and qualifications usually necessary for acquiring the vocational skills in the time period specified by the latter.

Grouping jobs by like worker function patterns and training time thus far has proved to be the

³ Each item is a *group* of entities, not a unitary entity.

⁴ Estimates of Worker Trait Requirements for 4,000 Jobs as Defined in Dictionary of Occupational Titles (U. S. Department of Labor, Bureau of Employment Security, 1956), p. 110.

most practical way of grouping them by common patterns of aptitudes, interests, and temperaments. These 5 items thus permit dropping 15 others (see p. 939), simplify our problem of establishing similarity, and in effect, define the horizontal "skill" group in which transferability is properly considered. Thus, from the standpoint of transferability, the extent to which the remaining work performed elements (the work fields and the materials, products, etc.) vary will determine the degrees of similarity between jobs. For example, where worker function patterns, training time, and the other elements of work performed are all the same for a group of jobs, then this can be considered the beginning of our measurement, or first order of similarity.

Balancing Work Performed Against Training Time.

Every element of work performed does not contribute a constant value to the determination of practical similarity between jobs. Take one extreme of the problem, low skilled jobs involving the 3 lowest levels of general educational development, where the instructions involve a common-sense reaction to no more than a few tangible or easily illustrated variables, and where no more than 3 months' specific vocational preparation are required. Because of homogeneity of trait requirements and small amount of specific vocational preparation, workers on these jobs, as far as job duties are concerned, are easily transferable regardless of how different work fields or materials may be. Thus, worker function similarities here have a greater practical importance to transferability than other work performed elements. Transferability of skills, however, is not usually thought of in relation to these low skilled jobs, because even inexperienced workers could be trained for them in such a short time. However, it may be worthwhile under certain conditions to vastly simplify the selection problem and thereby save even 1 or 2 weeks of specific vocational preparation among the many low skilled, low training time jobs.

Now let us consider the other extreme of the problem. A research biologist and a research chemist both have the same worker functions and work field pattern. The difference is subject matter, and therefore it must receive greatest consideration in determining whether there is transferability of skills between two jobs. This element

is likely to have so much weight that transfer from either job into other subject-matter fields would be considered impracticable. The worker has invested much time in learning the subject matter and acquiring functional skill; transfer to other subject matter would require the worker to sacrifice both for a considerable period. More is likely to be lost than gained as far as skill is concerned. For workers in such occupations, then, the transfer that is best considered, in terms of maximum utilization, is not to other work fields or subject-matter areas but to other functions, as from synthesizing to coordinating in the data area and from speaking-signaling to negotiating in the people area. Transfers among jobs of this kind have to be considered in terms of the individuals involved, however; some good scientists have been converted—both willingly and unwillingly—into poor administrators.

These two extremes help define the practical limits of our problem. Transfer, to be worthwhile must involve a continuous use of skills without undue loss and with significant saving of training time. A balance must be maintained between the various elements of work performed. If a change in one element would seriously reduce the worker's ability to function on the desired level of skill for an unreasonable length of time, then it is questionable whether transferability would serve its purpose. We must then consider whether a qualified but less experienced worker is not a better bet for the job.

Establishing Orders of Similarity

Table 1 provides some selected groups of jobs derived by applying the foregoing analysis. The jobs were grouped first according to their primary involvement with things, data, or people or a combination of these. Second, they were grouped by common worker function patterns within the areas of primary involvement. And third, they were grouped by length of training time. Thus, job group D-1 signifies jobs in which the worker functions are related predominantly to data and for which the training time is low; T-2, jobs related predominantly to things and requiring medium training time; and P-3, jobs involving predominantly people and calling for high training time. The use of only three levels of training time will oversimplify the problem somewhat, but at least it may indicate what is possibly its true nature.

TABLE 1.—Selected jobs classified by work performed elements and grouped by training time, as defined in the Functional Occupational Classification Program of the United States Employment Service

Job titles ¹	Worker functions ² and weights assigned to each			Work fields	Materials, products, subject matter, and services
	Things	Data	People ³		
PREDOMINANTLY THINGS JOBS					
<i>Group T-1—Low Training Time</i>					
Swaging machine operator.....	Tending (6).....	Comparing (3).....	Taking instructions (1).....	Pressing-forging.....	Small arms ammunition.
Peanut packer.....	do.....	do.....	do.....	Filling.....	Confections.
Corn cutting machine operator.....	do.....	do.....	do.....	Shearing-shaving.....	Grain.
Ordering machine operator.....	do.....	do.....	do.....	Saturating.....	Tobacco.
Picker attendant.....	do.....	do.....	do.....	Filtering-straining-separating.....	Coal.
Coffee sacker.....	do.....	do.....	do.....	Filling.....	Coffee, tea, and spices.
<i>Group T-2—Medium Training Time</i>					
Open-hearth door liner.....	Manipulating (6).....	Computing (3).....	Taking instructions (1).....	Masonry.....	Industrial furnaces and ovens and mechanical stokers.
Asbestos worker, cork insulation.....	do.....	do.....	do.....	Laying.....	Plumbing and heating equipment.
Backer cutter, hand.....	do.....	Comparing (3).....	do.....	Shearing-shaving.....	Leather, footwear.
Cripple cutter.....	do.....	do.....	do.....	do.....	Do.
Asphalt-mastic-floor layer.....	do.....	do.....	do.....	Troweling.....	Paved floors.
Cement finisher.....	do.....	do.....	do.....	do.....	Structures.
Concrete rubber.....	do.....	do.....	do.....	do.....	Do.
<i>Group T-3—High Training Time</i>					
Pipefitter, gas pipe.....	Precision-working (6).....	Computing (3).....	Taking instructions (1).....	Structural fabricating-installing.....	Plumbing and heating equipment.
Pipefitter, maintenance.....	do.....	Analyzing (3).....	do.....	do.....	Do.
Plumber.....	do.....	Computing (3).....	do.....	do.....	Do.
Patternmaker.....	do.....	do.....	do.....	do.....	Molds, dies, patterns, not elsewhere classified.
PREDOMINANTLY DATA JOBS					
<i>Group D-1a—Lowest Training Time</i>					
Grid inspector.....	Handling (4).....	Comparing (5).....	Taking instructions (1).....	Appraising.....	Electrical machinery, equipment, and supplies, not elsewhere classified.
Yarn weigher.....	do.....	do.....	do.....	Weighing.....	Yarn.
Checker, II.....	do.....	do.....	do.....	Stock checking.....	Laundry and dry-cleaning services.
Gatherer.....	do.....	do.....	do.....	Folding-fastening.....	Books and pamphlets.
Glove pairer.....	do.....	do.....	do.....	Stock checking.....	Apparel, not elsewhere classified.
<i>Group D-1—Low Training Time</i>					
Work-order-sorting clerk.....	Handling (2).....	Copying (7).....	Taking instructions (1).....	Recording.....	Utilities and sanitation.
Merchandise-transfer-order clerk.....	do.....	do.....	do.....	Stock checking.....	Business correspondence, records, and reports.
Spinning checker.....	do.....	do.....	do.....	do.....	Yarn.
Weaving checker.....	do.....	do.....	do.....	do.....	Fabrics.
Abstractor.....	do.....	do.....	do.....	do.....	Business accounting.
Advance-payment clerk.....	do.....	do.....	do.....	Accounting-recording.....	Do.
Bank-ledger clerk.....	do.....	do.....	do.....	do.....	Do.

See footnotes at end of table.

TABLE 1.—Selected jobs classified by work performed elements and grouped by training time, as defined in the Functional Occupational Classification Program of the United States Employment Service—Continued

Job titles ¹	Worker functions ² and weights assigned to each			Work fields	Materials, products, subject matter, and services
	Things	Data	People		
<i>Group D-2—Medium Training Time</i>					
PREDOMINANTLY DATA JOBS—Continued					
Inspector.....	Manipulating (3)....	Analyzing (6)...	Taking instructions (1)	Appraising; structural fabricating-installing.	Optical instruments, lenses and ophthalmic goods.
Electrical tester.....	Precision-working (3).....	do.....	do.....	Appraising; electrical fabricating-installing.	Wireless, communication equipment.
Radio and electrical inspector.....	do.....	do.....	do.....	do.....	Electrical machinery, equipment, and supplies.
Wood inspector.....	do.....	do.....	do.....	Appraising; structural fabricating-installing.	Aircraft and parts.
Cloth tester.....	do.....	do.....	do.....	Appraising.....	Fabrics.
Dairy tester.....	do.....	do.....	Contacting (speaking-signaling) (1).	do.....	Dairy products.
<i>Group D-3—High Training Time</i>					
Ceramic engineer.....	Precision-working (3).....	Synthesizing (6).....	Contacting (speaking-signaling) (1).	Engineering.....	Clay, ceramic, and refractory minerals and products.
Factory layout man.....	do.....	do.....	do.....	do.....	Production management.
Arranger.....	do.....	do.....	do.....	Composing.....	Music.
Bacteriologist.....	do.....	do.....	do.....	Researching.....	Domestic and building services.
Chemist, physiological.....	do.....	do.....	do.....	do.....	Chemistry.
<i>Group P-2—Medium Training Time</i>					
PREDOMINANTLY PEOPLE JOBS					
Nurse, clinic.....	Precision-working (2).....	Compiling (3).....	Serving-helping (5).....	Healing-caring.....	Nursing services.
Nurse, office.....	do.....	do.....	do.....	do.....	Medical services.
Nurse, private.....	do.....	do.....	do.....	do.....	Nursing services.
Nurse, staff.....	do.....	do.....	do.....	do.....	Do.
Physical therapist.....	Precision-working (3).....	do.....	Serving-helping (4).....	do.....	Medical services, not elsewhere classified.
Dental hygienist.....	Precision-working (4).....	do.....	Serving-helping (3).....	do.....	Dental services.
<i>Group P-3—High Training Time</i>					
Prison warden.....	Handling (1).....	Coordinating (5).....	Supervising (4).....	Protecting.....	Police protection.
Police commissioner, II.....	do.....	do.....	do.....	do.....	Do.
Manager, station.....	do.....	do.....	do.....	Transporting.....	Air transportation and terminal services.
Manager, institution.....	do.....	do.....	do.....	Administering.....	Public services.
Manager, office.....	do.....	do.....	do.....	do.....	Business correspondence, records, and reports.
Editor, city.....	do.....	do.....	do.....	Writing.....	Newspapers.
Principal, school.....	do.....	do.....	do.....	Teaching.....	General education.

¹ For definitions, see Dictionary of Occupational Titles, vols. I and II, revised edition, 1949 (U. S. Department of Labor).
² Some liberties have been taken with the worker function patterns because of the known limitations of the source of information (the Dictionary of

Occupational Titles). However, although some leeway is possible in interpreting "sameness" of worker function pattern, this should be within narrow limits. There may be some room here for at least another order of similarity.

TABLE 2.—Degrees of similarity among occupations grouped on basis of work performed and selected illustrative jobs

Order of similarity	Component of work performed			Selected jobs having specified order of similarity	
	Worker functions	Work fields	Materials, products, subject matter, and services	Job group ¹	Job titles ²
First	Same	Same	Same	D-1 T-2	Advance-payment clerk. Bank-ledger clerk. Cement finisher. Concrete rubber.
Second	Same	Same	Different but related.	T-1 D-2 P-3	Coffee sacker. Peanut packer. Electrical tester. Radio and electrical inspector. Manager, institution. Manager, office.
Third	Same	Same	Different and unrelated.	D-1 D-3	Abstractor. Weaving checker. Bacteriologist. Chemist, physiological.
Fourth	Same	Different but related.	Same or related.	D-1 P-3	Abstractor. Advance payment clerk. Manager, institution. Principal, school.
Fifth	Same	Different and unrelated	Different and unrelated.	D-1a T-3	Entire group exclusive of glove pairer and checker. Pipefitter, maintenance. Stonemason, jewelry.

¹ For explanation, see p. 941.

² For definitions, see Dictionary of Occupational Titles, Vols. I and II, revised edition, 1949 (U. S. Department of Labor).

These groups of jobs can now be examined objectively on the basis of the other work performed elements to establish relative orders of similarity among specific jobs. In this process, two jobs will be considered as more closely related than two others if they have more work performed elements in common. Other considerations involve the degree of relatedness within the work fields and the materials, products, subject matter, and services areas. Thus food staples will be considered as different from but related to food specialties but both as different from and not related to textile fibers or rubber and rubber products. Also, sawing will be considered as different from but related to shearing-shaving but both will be considered as different from chemical processing-

compounding. With these considerations in mind, five orders of similarity can be established; these are defined and exemplified in table 2. By following the criteria for the orders of similarity, the reader can develop other examples from table 1.

It is entirely possible to generate some additional orders of similarity on the basis of finer delineations of some of the relationships within categories. The worker function dimension, after some experience, might provide the basis for another order. However, for purposes of present analysis these five orders are sufficient to outline the areas of feasibility of transfer and it may be that more are not practical.

Similarity and Transferability

The practicality of transfer can now be examined in terms of the objectives of maximum skill utilization and saving of time and resources in training. Practicality here is defined as a decision based on an evaluation of what is likely to be gained in time and resources and continuous use of skills, as compared with what is likely to be lost where a transfer is effected. Practicality also assumes freedom of choice. Where no choice is available, standards of practicality change, as will be noted. These feasibilities and practicalities can be organized into a model, as shown in table 3. The rationale of the judgments represented by this model follows.

First Order Similarity. Transfer is feasible and practical between jobs shown to have the first order of similarity. Continuous use is likely in abilities, techniques, and knowledges in all three areas of worker functions: things, data, and people, and probably on all three major levels of training time.

Second Order Similarity. Transfer is most feasible between jobs having the second order of similarity in the T-1, D-1, and D-1a job groups; the T-2, D-2, and P-2 job groups also appear to present no significant deterrent to transfer. In the case of the P-3 group, there should be careful inquiry into the details, for although time and cost savings might be realized, would maximum utilization of specialized skills be achieved?

An interesting recent comment on this second order of similarity type of transfer comes from M.

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Justice Frankfurter of the Supreme Court of the United States:

The notion that prior judicial experience is a prerequisite for the Supreme Court, . . . deserves closer scrutiny . . . Apart from meaning that a man has sat on some court for some time, judicial service tells nothing that is relevant about the qualifications for the functions exercised by the Supreme Court.

* * * * *

For someone to have been a judge on some court for some time, . . . may have some abstract relation to the Supreme Court conceived of as an abstract judicial tribunal. It has no significant relation whatever as such to the kinds of litigation that come before the Supreme Court, to the types of issues they raise, to qualities that these actualities require for wise decision.

The significance of the greatest of judges with prior judicial experience, Holmes and Cardozo, derived not from that judicial experience but from the fact that they were Holmes and Cardozo. They were thinkers, and more particularly legal philosophers.⁵

Thus, so-called successful transfer involving high training time may be successful not because of continuous use of developed skills and abilities but because it involves outstanding individuals who have personal resources and maturity far beyond some specific developed skill.

Third Order Similarity. Jobs in the D-1 group which represent the third order of similarity, still seem acceptable for transfer in view of the low training time. P-2 group jobs definitely present likely prospects even though the training time is greater; although transfer between these jobs involves a change in specialty, there is enough overlap in general knowledge and technological objectives to make transfer worth considering. The same analysis makes D-3 group transfers of questionable practicability; the specialties are so intensive that it appears more would be lost than gained by transfer.

Fourth Order Similarity. Approximately the same considerations hold for jobs in the fourth order of similarity as those in the third order.

⁵ A Justice Needn't Have Been a Judge (in *The Washington Post and Times Herald*, Apr. 7, 1957, p. E-3).

⁶ The likelihood is that habit interference is (a) mainly a factor in low level functioning, (b) of greater importance in job situations involving things such as those involving data, and (c) not a factor in jobs whose functions are related to people.

⁷ Herbert A. Toops. Some Concepts of Job Families and Their Importance in Placement (in *Educational and Psychological Measurement*, Durham, N. C., 1945, vol. 5, No. 3, pp. 195-216).

Fifth Order Similarity. While transfer would still be feasible among jobs in T-1, D-1, and D-1a groups even though they were only of the fifth order of similarity, there is a question as to whether it would be practical. The low training time makes it likely that any qualified inexperienced person would adjust just as quickly as a person working in a job representing a transfer possibility. Although fifth order similarities on low training time levels might be used in selecting persons for transfer under certain labor market conditions, it would be necessary, particularly in jobs involving predominantly things, to avoid the possibility of negative transfer (habit interference) where it might occur. This is a vital consideration on all levels of similarity where transfer might be involved.⁶

Transfers between jobs of the fifth order of similarity in groups T-3 and D-3 would seem definitely unrealistic. It is of these types of transfer that Toops wrote:

There is some doubt whether the skills and traits of workers are in every instance transferable merely because they are in the same job family. A watchmaker and a cannon-barrel borer might come out in the same job family, yet the psychological characteristics, particularly as to precision, may be quite different so that actually there is little transferability of skills.⁷

TABLE 3.—Relative feasibility and practicality of transfer among occupations classified by order of similarity in elements of work performed,¹ by length of training time

Item	Order of similarity in elements of work performed ¹				
	First	Second	Third	Fourth	Fifth
Low training time jobs (groups T-1, D-1a, and D-1):					
Feasibility.....	✓	✓	✓	✓	✓
Practicality.....	✓	✓	✓	✓	?
Medium training time jobs (groups T-2, D-2, and P-2):					
Feasibility.....	✓	✓	✓	✓	?
Practicality.....	✓	✓	✓	?	?
High training time jobs (groups T-3, D-3, and P-3):					
Feasibility.....	✓	✓	✓	?	X
Practicality.....	✓	✓	?	X	X

¹ For definition, see table 2.

✓ Good.

? Questionable.

X No good.

Groups T-2 and D-2 job transfers within this order of similarity seem to offer some possibilities, but significant readjustment of a "career framework" nature would be necessary. It is in this area that most of the advantages of transfer can be realized if effective guidance is available and the changes are of a mandatory nature.

Applications to Manpower Problems

The foregoing outline of a systematic approach toward understanding transferability should facilitate research into the problem.⁸ Meanwhile, some preliminary inferences might be hazarded by applying it to the fundamental manpower problems recapitulated below from the first part of this article.

1. *Determining, in the case of unemployment insurance applicants, which jobs are "suitable" to skills they acquired on previous jobs.* Many considerations other than continuous use of developed skills are involved in determining "suitability"—a requirement for benefits eligibility under State unemployment compensation laws. However, insofar as transferability is a factor in assessing the suitability of various job openings, it should be determined by comparing first the training time levels and then the order of similarity. Once this is done, special job requirements of accuracy, temperament, or similar factors can be evaluated properly.

The two unemployment compensation cases described below suggest how the transferability element of suitability can be evaluated more objectively.

CASE A. Claimant had over 20 years' experience in selling ladies' better coats. Shortly after being hired as a replacement saleswoman, she was informed that the person to be replaced was not leaving and that the only opening was in the junior miss department as a salesperson of scarves, blouses, sweaters, sportswear, skirts, and coats. She had no experience in selling lower price merchandise and felt she could not earn sufficient commissions on the proposed job. She refused it and was terminated.

On the basis of our approach, the salesperson, ladies' better coats is a job requiring 6 months' training, while the salesperson, junior miss department needs about 3 months. The worker func-

tion pattern (handling, compiling, persuading) is about the same for both jobs, as is the technological objective (merchandising). The difference is in the product sold. These jobs, if correctly analyzed, are thus of the second order of similarity (or the third order depending on evaluation of the difference between the items sold). In either case, transfer is feasible and practical.

It happens that the ruling in this case supported the claimant for several reasons. One reason—"that claimant was not reasonably suited by training and experience as a salesperson in the junior miss department"—is questionable. There were status, salary, and contractual problems involved which probably were sufficient to support the final decision, but it seems demonstrable that transfer could reasonably have been tried with expected success.

CASE B. Claimant, age 70, had 49 years' experience as a garment worker on better suits and dresses and about 10 years' experience making dresses. For the past 15 years, he had made suits exclusively. The manufacture of suits and of tailored dresses requires the same skill in operators. Claimant refused employment as a sewing-machine operator at union piecework rates, making a higher price-line garment (\$59 and up), because of the type of work and his unwillingness to work at the piecework rates offered.

Both his last job and that offered are jobs involving middle-level skill but they are of second order similarity. Transfer is both feasible and practical. In this case, the claim was denied and the worker was required to take the job offered or forfeit unemployment compensation.

2. *Counseling workers who must change jobs because of handicap or age.* Here similarity is merely a starting point in the analysis. As already indicated, physical capacity requirements do not usually conform to worker function patterns. Hence, a careful search must be made among feasible and practical similarities, if transfer is to be adopted, for special physical and frequently, temperamental requirements that will suit the applicant. This may entail job re-engineering.

⁸ The proposed model seems to meet the perceptive suggestions made by Parnes in 1955. See Herbert S. Parnes, *Research on Labor Mobility, An Appraisal of Research Findings in the United States* (New York, Social Science Research Council, 1955), pp. 14-15.

Redirecting and retraining workers displaced because of technological changes. C. B. Gibbs⁹ seems to place in its proper setting the whole matter of the worker and his tools. He advances the key notion that the primary emphasis in the design of the job-worker situation should be on the nature of the worker, his capacities and his needs, not the nature of the machine and production situation. "The worker's machines and tools," Gibbs points out, "should be designed so that everyday skills and expectancies show high positive transfer to their use." Too often we take a static view of a job-worker situation as it evolves, regardless of how complex and perhaps unreasonably demanding of the worker, and then try to meet the demands by involved selection procedures. Perhaps, Gibbs suggests, the job should not have been so difficult in the first place. In other words, we often have to recommend transfer in terms of peculiar adaptation which should not be in the job-worker situation.¹⁰

4. *Making maximum use of military training and experience in civilian jobs and vice versa.* Because of the highly controlled nature of the military "labor" market this could be one of the most profitable (i. e., practical) areas for applying transferability. Under certain circumstances, every "feasible" transfer could be tried and it is likely that transfer between certain high-training-time categories, particularly in jobs involving predominantly people, would be not only feasible but practical. However, if we are to know whether transfer is actually taking place in the sense defined by this article, then background factors of individuals, such as special training, experience, and hobbies, unrelated to the job from which they are coming but related to the job to which they are going, would have to be known and controlled.

⁹ *The Worker and His Tools* (in *Occupational Psychology*, London, January 1957, p. 38).

¹⁰ The worker function analysis has suggested certain predictive possibilities with regard to automation. The jobs that are typically automated are jobs that have an overwhelming involvement with things or data (or even people) but on a very low functional level, associated with repetitiveness, short cycles, and strict limitation of range of functioning, which causes many workers to regard these jobs as drudgery. The solution to these problems may be and often is a machine, since the situation is really designed for a machine and not a person. However, as Walker and Guest have suggested, "job enlargement," providing for a more wholesome and dynamic relationship of worker to the range of human interest and function, may often be a good solution. Ultimately, such solutions will become more vital as we reach the point of readjusting some of our "efficiency" standards.

TABLE 4.—Job titles¹ of occupations representing both feasible and practical transfer possibilities for a pumpman (any industry), by order of similarity in elements of work performed²

Order of similarity in elements of work performed ²	Job titles ¹
First.....	None.
Second.....	Acid patrolman (rayon and allied products). Fire department pumpman (petroleum refining). Jack lineman (petroleum products). Dredge pumpman (construction).
Third.....	Kettleman (paints and varnishes). Mixer operator, III (explosives). Electric cell man (chemicals). Nitrator operator (explosives, plastics materials). Tallow refiner (slaughtering and meatpacking). Water filterer (waterworks). Jig runner (anthracite mining).
Fourth.....	Leakman, paraffin plant (petroleum refining). Sludge man (ore dressing, smelting, and refining). Furnaceman (furniture). Oven tender (any industry). Furnace operator (electrical equipment). Still operator (explosives). Evaporator (salt products). Coal washer (anthracite mining; bituminous coal mining). Deckerman (paper and pulp). Mud cleaning machine operator (petroleum products). Reelman (corn products). Amalgamator, I (ore dressing, smelting, and refining).
Fifth ³	

¹ For definitions, see *Dictionary of Occupational Titles*, vols. I and II, revised edition, 1949 (U. S. Department of Labor).

² For definitions, see table 2.

³ Additional occupations of this order of similarity are too numerous to list.

5. *Determining how and where "surplus" skills (e. g., weaving, mining) in certain labor market areas can best be absorbed by other industries or other areas, perhaps experiencing "shortages" of similar skills.* In this instance, we can demonstrate the processing of such a situation involving a mine shutdown. Among the mining skills that are surplus in this particular area is that of pumpman, a job which requires a relatively low level of training. The work-performed analysis of this job is: Worker functions—Operating-controlling (7), comparing (2), and taking instructions through speaking-signaling (1); work field—pumping; and materials, products, etc.—miscellaneous materials.

The list of work fields shows several different but related groups: Loading-moving, hoisting-conveying, transporting, cooling, and processing-compounding. Similarly, the list of materials, etc., shows that the different but related categories include: Petroleum, natural gas, coal, and products; utilities, power, and sanitation; water transportation services; pipeline transportation

services; chemicals, inorganic and organic; and chemical preparations. Finally, since the pumpman would probably meet the requirements of jobs in the training time range from 4-3 through 4-5 (that is, the fourth level of general educational development and the third through fifth levels of specific vocational preparation), jobs within this range might represent possibilities.

With these criteria in mind, the 4,000 jobs for which the functional analysis is available are sorted appropriately. Table 4 shows the resulting job titles in each order of similarity. Since the pumpman, and indeed all of the miners affected are unemployed, then even fifth order similarities may prove to be practical, if only from a selection standpoint.

6. *Preparing for civilian defense, which would involve emergency needs for very large numbers of workers with special skills such as clearing debris, nursing, etc.* Since it is virtually impossible to predict what "skills" will be available for transfer to which jobs at a given place and time, it would seem wise not to depend on transferability in a civilian defense emergency. Transferability by its very nature requires orderly analysis and a relatively stable situation. However, transferability could be used as a selection method designed to maintain continuous use of the worker's functional potential as represented by his functional attainments. This approach might be used to train individuals in advance in certain anticipated defense skills. In short, if nurses, for example, will be needed in large numbers, it is better to train individuals with this potential to assume those responsibilities now rather than to hope to meet requirements later by transfer from other work. This latter alternative probably would work only in low-training-time jobs.

7. *Planning vocational training programs of the widest practical application in industry.* Some of the brightest possibilities for transferability appear to lie in the planning of vocational training programs. Bartlett suggested, as indicated in the first part of this article, that we "set the learner from a very early stage on the way to realize that the number of ways of doing things is very far short of the number of things that have to be done, and that the methods, procedures, and plans of attack remain much the same in circumstances and for problems which at first sight appear very different from one another."¹¹ This appears to

dovetail with Gibbs' point of view to the effect that much might be gained by building transferability into vocational training.¹² For example, a curriculum might be organized around machine operating including the adaptation of machine to material (sawing wood, metal, plastics, etc.); the setup of machines; the relation of tolerance to material to setup; the use of jigs and fixtures, their relation to tending and feeding, and their role in simplification. Similarly, a course could be organized around handtools, say those in various structural activities. Holding, cutting, hammering, twisting, screwing, bolting, riveting, and similar operations could be compared and understood in relation to material and structure. Selection and relating of tool to activity, i. e., purpose and function, could be demonstrated and practiced. The range of relationship, in operations from handling to precision work, might be demonstrated by selected problems.

The benefits of this type of training would be, as suggested, to build transferability into the functioning of the worker. But it may well do much more. Such training would by its nature achieve a balance between the job functions associated with things, data, and people because the worker could see his specific job-worker situation from a much broader point of view. The job-worker situation would be a challenge; where there is a challenge, there are problems and where there are problems, there is opportunity for interpersonal relations with a foreman and fellow workers that are problem oriented. This type of work situation provides for growth and self-development.

* * * * *

As a final note, it needs to be stressed that, in effect, the transferability model presented here based on USES work in functional occupational classification has provided a framework for research. Little is definitely known; much needs to be learned. Especially important is the need to determine, for many groups of jobs, the relative importance of the specific knowledges and abilities on the basis of which transferability predictions are made, versus the general qualities of the individuals which have little to do with the specifics on which we focus.

¹¹ Sir Frederic Bartlett, *The Transfer of Training* (in *Cambridge Institute of Education Bulletin*, Cambridge, England, June 1954).

¹² Gibbs, *The Worker and His Tools*, op. cit.