JOB MATCHING SYSTEMS: ONE DIFFERENCE IS THE DATA

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Abstract

The use of computerized job matching systems carries with it the responsibility to fully understand the data being manipulated. Commercial computerized job matching systems use various occupational coding structures as a basis for job matching. Since each coding structure was developed for a different purpose, there is a very different perspective on how occupations are defined and grouped for the purpose of that code structure. This article examines the most commonly used coding structures, demonstrates the differences, and draws some important conclusions for vocational planning and expert testimony.

Computer technology enables vocational professionals to conduct a vocational analysis in minutes instead of hours. The use of a computer frees the professional from the mundane drudgery of manually comparing client characteristics (skills, interests, aptitudes, education, worker traits, limitations, and preferences) to the demands of occupations. But whether the resulting vocational analysis is complete and comprehensive is entirely dependent upon the defined purpose of the occupational coding structure used by the computer program.

The ease and speed with which vocational data can be sorted by the computer can be misleading (and consequently misinterpreted) without an understanding of the data being manipulated by the computer. This article examines the occupational coding structures most commonly used by commercial job matching systems.

Sources of Occupational Data.

There are a number of different sources of occupational data, each published by a different branch of the federal government. Each government agency had its own needs and perspective in mind when it classified occupations.

Dictionary of Occupational Titles (DOT).

The Department of Labor (DOL) has been charged with the development of methods for classifying information about occupations. Since 1939, the DOL has produced four versions of the DOT, the most recent of which includes the Fourth Edition and its Supplements (US DOL, 1977, 1982, 1986). In the early 1970's, the DOL published the *Handbook for Analyzing Jobs* (US DOL, 1972), a standardized method for collecting and reporting occupational data. The *Handbook for Analyzing Jobs* (HAJ) was an extension of earlier developmental work, but also established for widespread use important definitions of many coding structures and worker traits, including physical demands, environmental conditions, training time, aptitudes, temperaments, and interests.

The HAJ introduced two new coding structures to

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help describe the work performed in a job. These new coding structures are called WORK Fields and Materials, Products, Subject Matter, and Services (MPSMS). WORK fields codes characterize the machines, tools, equipment, and work aids used by the worker or describe the socio-economic purpose of the work. Methods verbs are also used to denote the specific methods for getting the work done. The MPSMS code structure indicates the materials processed or the products produced by the worker, the data or subject matter contemplated, and/or the services provided by the worker.

There are 103 three-digit codes assigned to describe the WORK fields; there are 580 three-digit codes to describe the MPSMS of the occupation. Each of these three-digit codes is a discrete category. The coding was carefully done so that at a two-digit code level, categories with the same first two digits are clustered together into logically related groups. The DOL encouraged the use of several WORK and MPSMS codes per occupation to adequately describe the work performed in an occupation.

The method of sentence analysis mandated in the HAJ caused the narrative job descriptions to be written in such a manner as to reflect these two important code structures (WORK and MPSMS codes). The importance of these codes to an accurate assessment of the transferability of the skills of the worker was emphasized by Botterbusch (1986). Most computerized job matching systems use the DOT as its source of occupational data. Only a few use WORK and MPSMS codes in its matching process. The transferability process using these codes was originally developed in 1981 (Watters, 1985).

Standard Occupational Classification (SOC).

The Department of Commerce did not need the elaborate DOT method of classifying occupations, since it was concerned with the nature of occupations in the US economy especially as compared to the labor force of other countries. Accordingly, the *Standard Occupational Code Manual* (US Department of Commerce, 1980) was developed using a four-digit code. Each additional digit in the SOC code adds finer detail to the occupational structure, which lends itself to statistical analysis and tabulation. There are only 649 SOC codes which cross reference to the DOT codes. Job matching systems based on SOC codes are usually those sponsored by the State Occupational Information Coordinating Committees (SOICC). SOC based systems work well for the non-disabled, general, and student populations, but have limited application to rehabilitation or special education populations since the Department of Commerce did not collect any worker trait data on SOC codes.

CENSUS Codes.

The Bureau of Census (1980) developed its own occupational classification structure, which is fairly consistent with SOC codes, but even more simple since it consists of only 473 three-digit codes. The comparatively small number of occupational codes works well for the Census Bureau, which uses semi-skilled interview workers to assign occupational codes to the information self-reported by the interviewees. Data cannot be aggregated or clustered using CENSUS codes since the numbering method is sequential rather than categorical. CENSUS codes are popular since they are used in County Business Patterns and some wage and employment statistics are available. However, like SOC codes, no worker trait information was gathered by the Census Bureau.

Guide for Occupational Exploration (GOE).

While not truly an occupational coding structure, the DOL (1979) introduced the GOE. Intended as a counseling tool for Employment Service counselors, the GOE structure groups DOT occupations by a six-digit interest code. The 350 GOE codes were used to group occupations based on "the broad interest requirements of occupations as well as the vocational interests of individuals". GOE codes are a popular way to conduct vocational exploration and career planning, but do not work well as an accurate mechanism for skills transfer. Having an interest in an activity cannot be construed as possessing a trained skill in performing a certain kind of work method, using certain tools and machines, etc.

Data Interrelationships

The only government coding system based on detailed, on-site job analyses by trained occupational analysts is the DOT. All other occupational code structures are a simple derivative of the DOT, with little else than a brief, general description of job duties and a cross-reference to the DOT codes which constitute that group. *The DOT is the only source for any kind of worker trait information.* These data relationships are best represented by Figure 1.

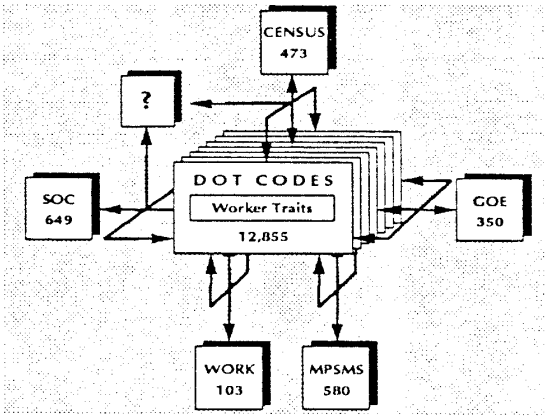

Figure 1. Relationships of the various occupational code structures.

The number associated with each data resource indicates the number of different codes used by that coding structure in relation to the DOT. For example, although the CENSUS code structure contains 503 occupational codes, only 473 have been cross referenced to the DOT. The same is true for SOC codes, where certain SOC codes have no corresponding DOT code(s).

Most important about Figure 1 is the directionality of the relationships. Every DOT code has one unique set of worker traits. Each DOT code has one corresponding SOC, CENSUS, and GOE code and it has one or more WORK field and MPSMS codes assigned. For the most part, there is a simple one-to-one relationship of the DOT to the other code structures. However, the inverse relationship is quite different; it is one code to many DOT codes. One GOE code (for example, 05.11.01 - Equipment operations, construction) refers to many DOT titles (there are 64 DOT occupations within this GOE subgroup). The same is true for nearly all other instances of the other code structures. This inverse one-to-many relationship is critical to the appropriate interpretation of vocational data, since important employment and wage information is predominantly collected using the abbreviated occupational coding structures, not the DOT code structure.

Data Differences

Each government agency collects occupational data using the coding format suitable for its intent. For example, the Bureau of Census uses their simple system to make it easy for semi-skilled interview workers to assign an occupational code. It is tempting to use CENSUS data to quote wage information, but it must be done with great caution since any one CENSUS code refers to many DOT codes. The wage data thus quoted might be accurate for the CENSUS group as a whole, but not likely in the context of one or two of the DOT titles which an individual might be able to perform in that CENSUS group following an injury. The same interpretation problems occur when quoting employment statistics or labor market projections based on CENSUS or other occupational code structures.

That each code system contributes a different perspective to an understanding of occupations is best understood through an example. Let us consider an apparently "pure" work activity such as stationary engineering. The three-digit WORK code for stationary engineering is 021, "producing and/or distributing heat, power, or conditioned air". A search through the DOT and its Supplements identifies 52 occupations which primarily involve this WORK code. These 52 occupations range from sedentary to medium strength and cover an SVP range of 2 to 8. Further examination of these 52 DOT occupations reveals 8 different six-digit GOE interest codes for the WORK of stationary engineering, 13 different CENSUS codes, and 16 different SOC codes (See Table 1).

The six-digit GOE interest code for stationary engineering is 05.06.02. A search of the DOT finds that only 22 DOT occupations fall into this GOE subgroup, which encompasses three different WORK codes (most of which are WORK = 021). The three-digit CENSUS code for stationary engineering is 696, which identifies only 12 DOT occupations (each of these 12 have a WORK code of 021) but these twelve DOT codes refer to 4 different GOE codes. The SOC code for stationary engineering is 6931, which identifies only 6 DOT titles, all of which are WORK code = 021, but which reveal 3 different GOE codes.

It should be clear that the occupational groupings are very different depending upon the code structure used. With such startling differences in an occupational example as ostensibly "pure" as stationary engineering, the vocational professional is at a loss to explain where the 40 DOT occupations went which are known to involve the WORK of stationary engineering (WORK code = 021) if there is exclusive reliance on only one occupational code structure such as the CENSUS code for stationary engineering, which only identified 12 of the 52 occupations which involve the WORK of stationary engineering.

Table 1 presents a frequency count of different occupational codes as arranged by the primary WORK codes. These frequency counts clearly underscore the heterogeneity of the groups. On average, there are 24 different GOE codes per WORK field, 23 different CENSUS codes per WORK field, and nearly 28 different SOC codes per WORK code. (Similar frequency counts for GOE, CENSUS, and SOC codes are available through the author upon request.)

TABLE 1. FREQUENCY COUNTS OF CODES WITHIN EACH GROUP

WORK CODES	Total Titles	GOE Codes			CENSUS Codes			SOC Codes		
		Total	Min	Max	Total	Min	Max	Total	Min	Max
001	21	3	1	19	5	1	12	5	1	12
002	15	2	2	13	3	2	11	4	2	9
003	133	13	1	51	17	1	47	26	1	27
004	52	8	1	14	17	1	9	16	1	9
005	10	3	1	5	4	1	7	4	1	7
006	23	4	1	13	8	1	9	9	1	9
011	182	43	1	63	41	1	58	44	1	58
012	184	26	1	46	37	1	37	39	1	37
013	128	40	1	17	39	1	14	40	1	10
014	84	27	1	16	27	1	20	32	1	20
021	52	8	1	23	13	1	15	16	1	15
031	314	56	1	84	52	1	54	61	1	55
032	103	17	1	30	17	1	31	18	1	32
033	18	7	1	10	13	1	3	13	1	3
034	52	8	1	30	14	1	14	15	1	15
041	75	27	1	11	15	1	21	19	1	19
042	69	21	1	31	17	1	22	17	1	22
043	77	19	1	27	23	1	13	24	1	13
051	312	43	1	43	42	1	76	50	1	51
052	11	9	1	2	8	1	3	8	1	3
053	74	22	1	16	20	1	22	25	1	13
054	427	61	1	58	46	1	89	62	1	77
055	149	20	1	46	28	1	33	36	1	18
056	108	25	1	28	18	1	46	22	1	46
057	134	23	1	40	29	1	29	34	1	28
061	262	39	1	83	32	1	132	39	1	104
062	183	31	1	34	25	1	32	28	1	26
063	198	44	1	19	31	1	54	38	1	39
071	27	10	1	11	8	1	19	9	1	17
072	27	11	1	9	10	1	9	12	1	5
073	13	7	1	3	5	1	4	6	1	4
081	46	18	1	11	11	1	31	13	1	17
082	11	10	1	2	8	1	3	8	1	3
083	32	19	1	5	11	1	17	13	1	7
091	16	3	2	12	5	1	7	5	1	5
092	26	8	1	12	14	1	8	16	1	5
093	19	6	1	9	10	1	6	10	1	6
094	19	12	1	4	11	1	3	11	1	3
101	43	18	1	9	15	1	19	16	1	18

Note: Min is the minimum number of DOT occupations found in any cell
Max is the maximum number of DOT occupations found in any cell

TABLE 1. FREQUENCY COUNTS OF CODES WITHIN EACH GROUP (continued)

WORK CODES	Total Titles	GOE Codes			CENSUS Codes			SOC Codes		
		Total	Min	Max	Total	Min	Max	Total	Min	Max
102	823	80	1	98	104	1	157	129	1	149
111	293	36	1	83	46	1	46	56	1	46
112	63	20	1	10	18	1	16	23	1	12
121	472	49	1	111	62	1	59	73	1	59
122	33	16	1	7	22	1	4	24	1	4
131	78	22	1	17	20	1	17	24	1	17
132	188	45	1	24	28	1	33	36	1	32
133	66	24	1	12	15	1	20	18	1	17
134	247	47	1	51	40	1	25	58	1	22
135	123	34	1	27	24	1	27	36	1	22
136	93	33	1	12	27	1	14	31	1	13
141	186	33	1	22	24	1	57	27	1	55
142	142	35	1	31	21	1	74	22	1	76
143	219	37	1	49	22	1	145	28	1	145
144	38	14	1	7	9	1	22	11	1	19
145	219	41	1	52	21	1	125	25	1	92
146	285	21	1	103	37	1	58	41	1	51
147	397	44	1	58	32	1	101	41	1	94
151	91	26	1	24	18	1	23	22	1	23
152	151	28	1	57	22	1	59	26	1	59
153	151	33	1	45	29	1	37	33	1	37
154	23	10	1	8	9	1	13	11	1	9
161	52	14	1	18	9	1	30	11	1	28
162	41	16	1	13	11	1	17	13	1	15
163	141	28	1	28	21	1	39	26	1	38
164	68	18	1	15	18	1	18	23	1	14
165	35	14	1	5	13	1	10	16	1	7
170	10	5	1	4	4	1	6	4	1	6
171	227	24	1	102	26	1	125	29	1	125
181	11	7	1	3	7	1	4	7	1	4
182	19	10	1	6	12	1	4	11	1	4
183	35	11	1	16	14	1	9	15	1	9
191	173	37	1	27	28	1	52	39	1	37
192	53	25	1	5	20	1	12	23	1	12
201	49	11	1	21	12	1	13	16	1	11
202	30	7	1	19	6	1	16	10	1	14
211	714	87	1	261	93	1	276	103	1	275
212	80	19	1	45	15	1	23	14	1	23
221	208	42	1	45	45	1	28	48	1	28
231	274	51	1	53	73	1	23	80	1	23
232	262	39	1	48	49	1	39	55	1	39
233	8	8	1	1	6	1	2	6	1	2
241	70	23	1	14	24	1	11	26	1	11
242	55	5	1	50	12	1	37	13	1	37

Note: Min is the minimum number of DOT occupations found in any cell
Max is the maximum number of DOT occupations found in any cell

TABLE 1. FREQUENCY COUNTS OF CODES WITHIN EACH GROUP (continued)

WORK CODES	Total Titles	GOE Codes Total	GOE Codes Min	GOE Codes Max	CENSUS Codes Total	CENSUS Codes Min	CENSUS Codes Max	SOC Codes Total	SOC Codes Min	SOC Codes Max
243	16	7	1	10	6	1	7	8	1	6
244	180	30	1	29	37	1	28	42	1	26
251	131	26	1	26	36	1	15	42	1	15
261	45	12	1	11	8	1	24	10	1	17
262	57	12	1	32	16	1	20	17	1	17
263	6	2	1	5	2	1	5	2	1	5
264	44	12	1	25	14	1	23	14	1	23
271	155	48	1	20	51	1	29	55	1	30
272	20	6	1	11	4	2	11	4	2	11
281	81	18	1	28	25	1	15	24	1	14
282	87	41	1	14	49	1	9	52	1	10
291	168	38	1	15	46	1	33	47	1	30
292	288	42	1	56	43	1	82	69	1	21
293	113	28	1	18	34	1	16	35	1	16
294	160	23	1	28	33	1	27	33	1	27
295	419	84	1	49	64	1	167	93	1	43
296	100	35	1	17	37	1	41	43	1	35
297	49	17	1	10	11	1	26	12	1	25
298	9	6	1	4	5	1	3	5	1	3
299	2	2	1	1	2	1	1	2	1	1
AVERAGE	125	24.2			23.7			27.7		

Note: Min is the minimum number of DOT occupations found in any cell
Max is the maximum number of DOT occupations found in any cell

Implications for Vocational Planning and Expert Testimony

This analysis clearly demonstrates that each occupational coding structure is very different from the others. Each structure contributes an additional perspective on the definition of occupations. Reliance on a singular coding structure to depict the world of work to a disabled or displaced worker may be overly restrictive of true occupational options and overlook some feasible opportunities.

Exclusive use of one approach in expert testimony can be easily refuted through review of Table 1 or any of the author's supplementary tables. Diminished access to the labor market may be substantially misrepresented and overstated. In the stationary engineering case, if a worker could only perform a maximum of light lifting, the WORK code identifies 30 sedentary and light occupations (57% of the 52 total in this WORK code) vs. the 4 light jobs of the 12 CENSUS code stationary engineers (33%). There is a huge difference in how this information impacts upon a settlement in a litigated case.

Valid vocational planning and expert testimony by the professional must recognize these enormous structural differences. Now that computer technology has removed the onus from the task of vocational analysis, we are free to reconsider the basics of what the data represents. We can study the HAJ to reconsider our methods of analysis and expand our repertoire of vocational tools. Recognize that the DOT is still at the center of all of the other code structures and that all worker trait information is associated with DOT codes only. Remember the issue of directionality when cross-referencing between coding structures. Exercise caution in interpretation of data based on cross-referenced codes.

When choosing a computerized job matching system or reviewing a report produced by one of them, look for flexibility and variety in the approaches to searching the data. Do not rely exclusively on one coding structure or job matching system unless it has the flexibility to search on a variety of occupational

codes. Your needs for vocational information and data analysis change with each new client and client situation. Any job matching software you use should enable you to respond accordingly.

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