Protocol for Matching O*NET™ Work Context Questionnaire Item Response Scale Values Between the Original "Analyst" Form and the Revised Incumbent Form

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This report provides the protocol for matching O*NET™ Work Context Questionnaire item response scale values between the original "analyst" form and the revised incumbent form.

Background

Currently, there are three principal versions of the O*NET Work Context Questionnaire. The first is the questionnaire for job incumbents produced for the prototype of the O*NET Content Model. It was administered to job incumbents from approximately 50 Occupational Units (OU's) in a field test of the original O*NET instruments. The second is a modified version of the prototype job incumbents questionnaire for use by job analysts. The O*NET 98 Database consists of analysts ratings using this second version to describe the Work Context of all 1,122 OU's. The third version is the RTI/HumRRO/O*NET Center modification of the first prototype job incumbent questionnaire. This is the version to be used in the survey of job incumbents from all O*NET occupations that is set to begin June, 2001.

One fact of life regarding these three versions is that the number of items is different for each of them and the response scales for virtually all items are not the same across any pair of the three. The analyst version could not be the same as the incumbent version because, for some of the items, the analysts would simply have no basis on which to answer. The revised incumbent version is different than the original because of the need to decrease the data collection time burden and make the instruments easier and clearer to use. Consequently, version three is shorter than version one. The analyst version (version two) is shorter still. In terms of changes in response scales (e.g., replacing a 7 point scale with a 5 point scale) the analyst questionnaire and the revised incumbent questionnaire are the most similar.

Objectives

The objective of the attached protocol is to present a conversion table that permits replacing the values for the response scale points on the analyst questionnaire with the equivalent scale point value from the revised incumbent questionnaire. If this can be done, then the mean ratings for a specific item computed from analyst data will be on the same metric as the mean rating on the same item computed from incumbent data in future surveys (e.g., an analyst mean of 2.8 and an incumbent mean of 3.1 would be based on comparable 5 point scales even though the original analyst questionnaire may have used a 7 point scale for that item). Obviously this cannot be done for items on the analyst questionnaire that do not appear on the incumbent questionnaire, or vice versa.

Common Items

The following categories of common, or not common, items exist.

1. There are items on the original analyst questionnaire that are not on the revised incumbent questionnaire. This occurred because the analyst questionnaire and the revised incumbent questionnaire are both revisions of the original incumbent questionnaire. The revision for the revised incumbent questionnaire eliminated some items that the revision for the analysts did not. These are as follows (using the analyst

questionnaire numbering system):

> #'s 1, 3a, 3b, 3c, 3d, 11b, 11c, 12b, 12c, 13b, 13c, 14b, 14c, 15b, 15c,
> 16b, 16c, 18a, 20, 23, and 24.

2. There are items on the revised incumbent questionnaire that are not on the original analyst questionnaire. This occurred because the analyst questionnaire and the revised incumbent questionnaire are both revisions of the original prototypic incumbent questionnaire. The revision for the analysts eliminated some items that the revision for the incumbents did not. They are as follows (using the numbering system of the revised incumbent questionnaire):

> #'s 1, 2, 3, 4, 5, 7, 16*, 18*, 19, 20, 21, 46, 47, 48, 52, 53, 54, 56, and 57.

3. There were 4 items on the original incumbent questionnaire that were collapsed into 2 items for the analyst questionnaire. However, they remained as 4 items on the revised incumbent questionnaire. On the revised incumbent questionnaire items 15 and 16 both ask how often you are required to work indoors, and they are distinguished by air conditioning vs. no air conditioning (e.g., warehouse). Items 17 and 18 both ask how often you are required to work outdoors, and they are distinguished by being totally exposed to the weather vs. being under a cover or roof. The analyst questionnaire just uses one item for each of these pairs by dropping the situation difference (i.e., the four items are reduced to two: How often do you work indoors? and How often do you work outdoors?). All four items on the incumbent questionnaire use the same scale so this anomaly is not relevant to the scale conversion issue. However, in terms of item content, none of the 4 items on the incumbent questionnaire is exactly the same as either of the 2 items on the analyst questionnaire. It's a matter of opinion, but perhaps items 15 and 17 on the revised incumbent scale reflect the "closest" match with the two items on the analyst questionnaire.

4. All the other items are on both questionnaires. The matching numbers and the scale point by scale point numerical conversions are shown on the attached protocol. The item numbers shown are from the original analyst questionnaire. Preceding that number is the same item's number in the revised incumbent questionnaire. The incumbent questionnaire item numbers are shown in parentheses (i.e., the Survey Booklet Location number). Obviously, the analyst questionnaire item numbers (which sometimes have letter subscripts) are not the same as the data columns in the date base. For each item the conversion for each scale point is shown.

Types of Scale Conversions

There are four kinds of scale point value conversions. They are listed below along with the items in the original analyst questionnaire that will use each type of conversion.

1) A 7 point scale was converted to a 5 point scale as shown below. The verbal anchors for the highest value, lowest value, and midpoint are the same on the two questionnaires. For the 7 point scale, the values of 2, 3, 5, 6 have no verbal anchors. Consequently, the extrapolation assumed equal intervals. There are no appropriate data that could be used to develop any other alternative. (This conversion was used for #'s 2, 19, and 21.)

Original		Replaced by
7	→	5.00
6	→	4.33
5	→	3.67
4	→	3.00
3	→	2.33
2	→	1.67
1	→	1.33

2) An 8 point scale (with values 0-7) was converted to a 5 point scale (values 1-5). Again, the verbal anchors for the highest and lowest scale points were the same. However, for these two items the 5 point scale midpoint (i.e., "3") had the same verbal anchor as the value of 4 on the 8 point scale. Consequently, 4 is converted to 3. The conversion values for 1, 2, 3 represent equal intervals between 0 and 4, and the conversion values for 5 and 6 represent equal intervals between 4 and 7. (This conversion was used for #'s 4 and 5.)

Original		Replaced by
7	→	5.00
6	→	4.33
5	→	3.67
4	→	3.00
3	→	2.50
2	→	2.00
1	→	1.50
0	→	1.00

3)   Some items on the analyst questionnaire used a 6 point scale with the values 0-5. However, for all these items, the value 0 used the anchor "Does Not Apply," which simply means the occupation does not possess this characteristic at all. The verbal anchor for a value of 1 is "Minimally Important." The verbal anchor for the lowest value (i.e.,1) on the 5 point scale used for the revised incumbent questionnaire is "Not Important At All" and the anchor for the next lowest (i.e., 2) is "Fairly Important". Consequently, the conversion is one for one except that for ratings of either 0 or 1 on the original analyst questionnaire, the replacement value is 1. Essentially, this means that no ratings are changed except that all zeros become ones. (This conversion was used for #'s 3e, 3f, 22, 25, and 26.)

Original		Replaced by
5	→	5*
4	→	4*
3	→	3*
2	→	2*
1	→	1.50
0	→	1.00

* stays the same

4)   The largest category of items is comprised of those with 5 point scales on both questionnaires except that for the analyst questionnaire, the values are 0-4, and for the revised incumbent questionnaire, the values are 1-5. There is a certain amount of variation in the verbal anchors, both within questionnaires and across questionnaires. In terms of the nature of the verbal scale anchors, the analyst questionnaire departed more from the original incumbent questionnaire usage than did the revised incumbent questionnaire. However, for each of the item matches the verbal anchors for the lowest value, highest value, and midpoint have the same meaning. Although it is sometimes less obvious that the verbal anchors have much the same meaning for the points between the midpoint and the two ends (i.e., values 2 and 4 on a 5 point scale), the one for one conversion is made for these two values as well. Doing anything else (e.g., using IRT or some other "test equating" procedure) requires data that are not available. (This conversion was used for #'s 6, 7, 8, 9a, 9b, 10a, 10b, 10c, 10d, 10e, 10f, 11a, 12a, 13a, 14a, 15a, 16a, 17a, 17b, 17c, 17d, 17e, 17f, 17g, 17h, 17i, 18b, and 18c.)

Original		Replaced by*
4	→	5
3	→	4
2	→	3
1	→	2
0	→	1

*Simply add 1 to every original value. This means that the existing mean analyst rating can be converted to the new metric simply by adding 1.00 to the existing item mean for each occupation.

Examples of Verbal Anchor Differences

The two major types of scale anchor differences are illustrated by the following comparisons across the analyst and revised incumbent questionnaires. Again, the revised incumbent questionnaire is more faithful to the original because the anchors are quantified to some degree.

For Ratings of Frequency of Physical Requirements*
(e.g., Walking, Running)

Analyst Questionnaire			Incumbent Questionnaire (revised)	
Always	4	→	5	Continuously or almost continuously
Often	3	→	4	More than half the time
Sometimes	2	→	3	About half the time
Almost never	1	→	2	Less than half the time
Never	0	→	1	Never

*The original incumbent questionnaire used a 6 point scale with the anchors: Never, Under 10% of the time, 10-33%, 53-67%, Over 67%, Almost continually.

For Ratings of Frequency of Exposure to Hazards (e.g., radiation)**

Analyst Questionnaire			Incumbent Questionnaire (revised)	
Always	4	→	5	Every day
Often	3	→	4	Once a week or more but not every day
Sometimes	2	→	3	Once a month or more but not every week
Almost never	1	→	2	Once a year or more but not every month
Never	0	→	1	Never

** The original incumbent questionnaire used an 8 point scale with the anchors: Never;

Once per year or less; More than once per year, but less than monthly; More than once per month, but less than weekly; More than once per week, but less than daily; Several times per day; Hourly or more often.

The differences in verbal scale anchors play no role so long as the O*NET database for Work Context is populated either by the original analyst data or by the new incumbent data for all occupations. If at some point in the future the Work Context for some occupations is described by the original analyst ratings and for some occupations by new job incumbent ratings, then anchor differences could be an issue. However, anchor differences would be confounded with rater differences (old analysts vs. new incumbents) as well, and one might expect the rater effect to be larger than the anchor effect. Previous analyses by Carter, Johnson, and Dorsey (2000) have shown significant differences between analyst and incumbent ratings on Skill and General Work Activity (GWA) requirements. Also possible are item x anchor interactions (e.g., the "true" latent variable rating differences for "Often" vs. "More than half the time" may not be the same across items). There may also be rater type x anchor type interactions. It is even possible that there could be a three way interaction (rater x anchor x item). Accounting for the systematic variance produced by these various sources would be expensive.

Ideally, such a study would require a representative sample of occupations, a "large" sample of incumbent raters from each occupation, and a large sample of analysts. For each occupation the sample of analysts and the sample of incumbents would be randomly divided into two half samples. One of the half samples would use the original analyst questionnaire anchors for the items and the other would use the new incumbent questionnaire anchors for the items. This is a completely crossed design and with large enough samples it could estimate all the relevant effect sizes. However, such a design would be very resource intensive. Also, given that the strongest effect would probably be the analyst rater vs. incumbent rater differences, the problem then is what do with such differences, if the database must use analyst ratings for some occupations and incumbent ratings for other occupations. "Adjusting" one or the other set of ratings would be difficult.

To estimate just the anchor effect some additional tasks could be imposed on the "new" analysts who will be used to rate Ability and Skill requirements in this year's data collection. Two randomly drawn subsamples could be asked to also use the Work Context questionnaire for a representative sample of occupations. One sample would use the original analyst questionnaire anchors and one would use the new incumbent questionnaire anchors.

In sum, there are a number of issues that could be important if the O*NET database for Work Context descriptions will confound occupation and rater differences. If rater differences are not an issue, then mean analyst scores based on the old metric and the mean analyst scores based on the new metric should correlate .99.

Work Context Questionnaire
Item by Item Data Conversion Protocol

The item numbers and the original scale point values are from the original analyst questionnaire which yielded the data in O*NET 98 for Work Context. The number in parenthesis is the number for the same item in the revised incumbent Work Context questionnaire (i.e., the Survey Booklet Location number).

Revised Incumbent Questionnaire Item #	Original Analyst Questionnaire Item #	Analyst Questionnaire Scale pts.	Replaced by
(WC06)	2.	7	→ 5.00
		6	→ 4.33
		5	→ 3.67
		4	→ 3.00
		3	→ 2.33
		2	→ 1.67
		1	→ 1.33
(WC08)	3e.	5	→ 5.00
		4	→ 4.00
		3	→ 3.00
		2	→ 2.00
		1	→ 1.50
		0	→ 1.00
(WC09)	3f.	5	→ 5.00
		4	→ 4.00
		3	→ 3.00
		2	→ 2.00
		1	→ 1.50
		0	→ 1.00
(WC10)	4.	7	→ 5.00
		6	→ 4.33
		5	→ 3.67
		4	→ 3.00
		3	→ 2.50
		2	→ 2.00
		1	→ 1.50

		0	→	1.00
(WC11)	5.	7	→	5.00
		6	→	4.33
		5	→	3.67
		4	→	3.00
		3	→	2.50
		2	→	2.00
		1	→	1.50
		0	→	1.00
(WC12)	6.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1
(WC13)	7.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1
(WC14)	8.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1
(WC15)	9a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1
(WC17)	9b.	4	→	5
		3	→	4

		2	→	3
		1	→	2
		0	→	1

(WC22)	10a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC23)	10b.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC24)	10c.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC25)	10d.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC26)	10e.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC27)	10f.	4	→	5
		3	→	4
		2	→	3

		1	→	2
		0	→	1

(WC28)	11a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC29)	12a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC30)	13a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC31)	14a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC32)	15a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC33)	16a.	4	→	5
		3	→	4
		2	→	3

		1	→	2
		0	→	1

(WC34)	17a.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC35)	17b.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC36)	17c.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC37)	17d.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC38)	17e.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC39)	17f.	4	→	5
		3	→	4
		2	→	3
		1	→	2

| | | 0 | → | 1 |

(WC40)	17g.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC41)	17h.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC42)	17i.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC43)	18b.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC44)	18c.	4	→	5
		3	→	4
		2	→	3
		1	→	2
		0	→	1

(WC45)	19.	7	→	5.00
		6	→	4.33
		5	→	3.67
		4	→	3.00
		3	→	2.33

| | | 2 | → | 1.67 |
| | | 1 | → | 1.33 |

(WC49)	21.	7	→	5.00
		6	→	4.33
		5	→	3.67
		4	→	3.00
		3	→	2.33
		2	→	1.67
		1	→	1.33

(WC50)	22.	5	→	5.00
		4	→	4.00
		3	→	3.00
		2	→	2.00
		1	→	1.50
		0	→	1.00

(WC51)	25.	5	→	5.00
		4	→	4.00
		3	→	3.00
		2	→	2.00
		1	→	1.50
		0	→	1.00

(WC55)	26.	5	→	5.00
		4	→	4.00
		3	→	3.00
		2	→	2.00
		1	→	1.50
		0	→	1.00