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The Correlation of Global-Performance Rank Order Ratings with Factor Scores on a Graphic Rating Scale

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THE CORRELATION OF GLOBAL-PERFORMANCE RANK ORDER RATINGS WITH FACTOR SCORES ON A GRAPHIC RATING SCALE

BY

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THESIS

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INTRODUCTION

The ranking method of assessing employee performance is accomplished by arranging the individuals, being assessed, in order of merit where the rater simply picks out the employee he considers best, the one he regards as next best, and so on (Dunnette, 1966). Such a ranking process is a very natural type of evaluation, involving a kind of judgment which is frequently used in everyday living (Ghiselli, 1955).

The simplicity of rank ordering makes it a rather widely used method of making administrative decisions. In a recent survey (N=150) conducted by the Bureau of National Affairs (BNA) (Miner, 1975), 40% of the nonmanufacturing firms and 16% of the manufacturing firms surveyed, reported using a ranking or comparison rating system.

Other researchers indicate the use of ranking systems may even be more frequently used than the BNA survey found. Both Jurgensen (1950) and Ross (1966) report that overall ratings are frequently used for and agree with merit planning, promotions, discharges and other personnel actions which are supposedly based on merit. Lawler (1967) states that the supervisor's global rating of subordinates is still the most frequently used measure for criterion research and making personnel decisions. Campbell et al. (1970) report, however, that while many firms are starting to use more results-oriented appraisal methods, they still ask for global rankings at the same time.

In spite of its apparent wide usage, the rank-order rating technique has received relatively little attention in the literature of industrial psychology.

This is easily understood by contrasting the advantages and limitations of the ranking system. The advantages are as follows:

1. The procedure is fast, taking less of the rater's time than any other rating method.
2. The procedure is not subject to the common rating errors of leniency, central tendency and other rater response tendencies, because the rater is forced to rank the employees from highest to lowest (Cummings, 1973).
3. The procedure is reliable. Jurgensen (1950) reports on three case studies of rank ordering reliability that demonstrated reliabilities of consistently over 90%. Dunnette (1966) reports that different raters usually agree on the placement of employees in the ranking.

The system has many limitations, however, which makes it an unpopular and disinteresting subject for analysts. The major limitations are as follows:

1. Employees are generally ranked on only one dimension, usually some global-effectiveness measure (Cummings, 1973) such as "overall job success," "value to the company," "overall contribution," "performance on the job," etc. As Dunnette (1966) pointed out, treating job success as consisting of only one general characteristic is usually unrealistic.

2. In terms of rank, the differences in ability (or whatever) between any two successive persons is the same. The absolute individual differences are not taken into account so that individuals ranked in one group cannot be compared with those ranked in another group (Ghiselli, 1955). Ranking, therefore, provides virtually no data for the analysis of individual differences.
3. Different raters may not define the global-effectiveness measure in exactly the same way so that ratings may not be comparable between raters or groups (Ross, 1966).
4. The generality of the ranking criterion makes it very difficult to use for developmental and feedback purposes (Cummings, 1973).

The fourth limitation of the ranking system discussed above, that of not providing any development feedback for employees on specific behaviors or characteristics that make up their overall performance, and doubt about being able to rate performance on a global measure, has lead industry to use more qualitative assessment methods to help improve employee performance. The most popular and widely used method is the conventional graphic rating scale (GRS) (Cummings, 1973).

A GRS generally will have several statements about employee characteristics or behavior that attempt to dimensionalize job performance into a number of "a priori" factors such as quality and quantity of work and estimates of dependability, cooperativeness, etc.

A continuous or discrete scale is established for each item (Dunnette, 1966). Appendix A shows a GRS which is typical and will be used as part of this investigation.

The Bureau of National Affairs survey discussed earlier, also reported up to 51% of the companies surveyed used a GRS appraisal system. Campbell et al. (1970) reported on two studies of industry performance appraisals that indicated 68% to 74% of the industries studied used a GRS appraisal system of some kind.

The widespread use of GRS appraisal methods and their basic construction for qualitative measurement has resulted in extensive investigations into the errors, reliability and validity of the GRS. Investigators have consistently demonstrated that the GRS is subject to the errors of leniency, central tendency, "Halo" and many other possible error sources related to rater response tendencies (Dunnette, 1966).

Thorndike (1920) was the first investigator to report on the intercorrelations of the GRS items, and he coined the term "Halo" as descriptive of a constant error in GRS ratings where intercorrelations of the item ratings are much higher than would be expected. "Halo," as commonly applied to the industrial situation, means that if a supervisor regards an employee as very satisfactory on one item (such as personality), he is likely to rate the employee high also on other unrelated factors (like ingenuity or productivity) (McCormick, 1974). Jurgensen (1955) reported on his own and several other researcher's results that supported the apparent existence of

a constant error caused by highly intercorrelated GRS items or "Halo." Factor analytic studies (e.g., Grant, 1955; Ewart, Seashore, and Tiffin, 1941) indicate that a multi-trait GRS will typically reduce to as few as five factors or less. Grant (1955) concluded that the dominant factor (in his study of division managers) which contributed 31% of the variance, was a general factor resulting from "Halo," in that the loading of all the GRS traits on that factor were medium (.33 to .71). A second factor was well determined and was named "skill in dealing with others." Other factors had few "high" loadings and were not well defined.

Ewart et al. (1941) reduced a 12-item GRS to three factors. Factor I, which contributed "most" of the variability of the ratings, was also a general factor but had sufficient high loadings on specific items to be defined as "ability to do the present job." This factor definition is similar to the global-performance criterion used in rank ordering as discussed earlier, e.g., "performance on the job," "overall job success," etc.

These studies of the rank ordering and GRS rating methods suggest the possibility that the dominant factors defined from factor analytic studies of the GRS may relate to the global-effectiveness criterion used by supervisors in rank ordering employees.

Whitlock's (1963) studies on the psychological basis of performance judgment linked rank order ratings to critical incident appraisal techniques. His data suggest that when people are asked to make global ratings, they act in a very predictable way, as

efficient processors of critical incident data from their observation of the individual's performance. His study related global rank ordering of employees to the number of ineffective and effective performance incidents observed for the employee. His data supported a relationship that a person's judged quality of performance grows as a power function of the ratio of observed effective to ineffective performance incidents. This suggests that global-performance ratings may yield a reasonable approximation of what would be obtained by a more extensive critical-incident or other type of checklist appraisal system (Lawler, 1967).

Whitlock's data also suggests the possibility that GRS ratings may also derive from observations of effective and ineffective performance incidents rather than from the rater's favorable biases toward certain employees because of specific traits or characteristics of the employee. This is also partially supported by Johnson (1963) who suggested that "Halo" of GRS ratings may be due to objective variation in the information available to the rater rather than the judgment process itself.

Cummings and Schwab (1973) speculate that halo error may provide the basis for an individual's global performance ranking but it may be impossible to identify since only one dimension is being ranked.

The purpose of this investigation will be to identify further the possible criterion or criteria used by supervisors in making rank order ratings by determining the relationship between the rank ordering of employees on a global performance criterion and factor

scores obtained from factor analytic studies of GRS ratings of the same employees.

METHOD

Subjects

The data for this research investigation were obtained from the Martin Marietta Corporation as part of the normal personnel administration and performance appraisal system. The groups of subjects were selected for analysis. Their characteristics are as follows:

Group 1 -- 36 Male Electronic Technicians (non-exempt salary) at the senior salary grade level, 10-15 years experience.

Group 2 -- 31 Male Mechanical Technicians (non-exempt salary) at the senior salary grade level, 10-15 years experience.

Each group of subjects had a different single supervisor who personally prepared and/or approved the appraisals for his group. The supervisors had been on the job for approximately ten years, know their men well, and maintain close supervision of their work.

Materials

The global rank order rating data were prepared by each supervisor as a normal process of preparing for the yearly merit budget planning of the company. The rating was not prepared to a specified format or procedure but was submitted as a ranked listing of the employees. The criterion for the ranking is the "overall performance" of the employee over a one-year period. The ranking is used for administrative purposes in determining pay increases and promotions,

and in the case of a business decline, lay-off priorities. The Graphic Rating Scale (GRS) appraisals were prepared by each supervisor as part of the yearly appraisal required for each employee and were conducted within a six-month period of the global rank ordering rating. The GRS is used to give performance feedback on eleven characteristics (see Appendix A).

The supervisors were not informed of any intent to use either appraisal data for research or comparison. As constructed, the GRS was not obviously scoreable and scores were not used as part of the normal appraisal system. The scoring system was established afterwards for the purpose of this research project by assigning values of one (low) through five (high) to the five discrete GRS evaluation steps. As far as the supervisors were concerned, there was no connection to be made between the rank order ratings and the GRS appraisal. Consequently, the situation under which the data was collected, maintained the integrity of the experiment and was not contaminated by the research process.

Statistical Procedure

The GRS data was evaluated through the use of several factor analytic methods including both orthogonal and oblique -- rotated versions of the Statistical Package for the Social Sciences (SPSS) (Nie et al., 1974) factor methods, PA 1, PA 2, ALPHA, and IMAGE. These factor methods are described in Appendix B. In addition, the Kaiser-Rice Measure of Sampling Adequacy was used to evaluate the quality of the data for factor analysis (Dziuban and Shirkey, 1974;

Shirkey and Dziuban, 1976). The results of these factor studies were used to determine the underlying factors in the GRS ratings. Factor scores for each factor were calculated for each subject and converted to rank orders. The correlation of the global rank order ratings and the GRS factor score rankings were calculated using Spearman's rank-correlation coefficient, rho (Guilford, 1965). The correlations were tested for significance using a procedure for Spearman's rho given in Glass and Stanley (1970).

RESULTS

Group 1, Electronic Technicians

The GRS data were first evaluated using the Little Jiffy Mark IV, Kaiser (1970) to obtain the Measure of Sampling Adequacy (MSA) and Indices of Factorial Simplicity (IFS) as a measure of the adequacy of the data for further Factorial Analysis procedures. The Group 1 MSA and IFS were 0.81 and 0.77 respectively which are considered adequate.

The factor analysis of Group 1 produced three factors which are defined as follows:

Factor I: Job Performance

Factor II: Cooperation and Judgement

Factor III: Attendance and Housekeeping

Factor I Analysis

Factor loading of each GRS item on Factor I for each Factor Analysis procedure applied is shown in Table A of Appendix C. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates that Factor I is a general factor consisting of quality, quantity, initiative, dependability, job knowledge, judgement, adaptability/ versatility and communication. Table A also shows the amount of total variance accounted for by Factor I as ranging from 50.5 percent for orthogonal rotation solutions to 73.3 percent for oblique rotation solutions.

Factor I factor scores were calculated using SPSS procedures for each individual and converted to a rank order score. Ranks were based on comparisons to several decimal places where necessary to avoid tied rankings.

The correlation of the factor I rank scores and the global rank order ratings were calculated using the Spearman rank-correlation coefficient, rho (r_s) (Guildford, 1965). The results are shown in Table B of Appendix C for both orthogonal and oblique solutions.

These correlations were averaged using Fisher's Z transformation (Glass and Stanley, 1970) to obtain a correlation of 0.74 for orthogonal solutions and 0.79 for oblique solutions. Both of these correlations are significant at the 0.01 level (see Table H, Appendix C).

Factor II Analysis

Factor loadings of each GRS item on Factor II for each factor analysis procedure applied is shown in Table C, Appendix C. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates that Factor II consists of cooperation, judgment, and housekeeping. Table C, Appendix C, also shows the amount of total variance accounted for by Factor II as ranging from 13.3 percent for orthogonal solutions to 16.6 percent for oblique solutions.

The results of the calculations of the factor score correlations with the global rank order ratings, performed as discussed above for Factor I data, are shown in Table D of Appendix C.

The correlations were averaged using Fisher's Z transformation to obtain a correlation of 0.29 for orthogonal solutions and 0.27 for oblique solutions. These correlations are not significant at the 0.01 level (see Table H, Appendix C).

Factor III Analysis

Factor loadings of each GRS item on Factor III for each factor analysis procedure applied is shown in Table E, Appendix C. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates that Factor III consists of housekeeping and attendance. Table E, Appendix C, also shows the amount of total variance accounted for by Factor III as ranging from 8.5 percent for orthogonal solutions to 10.8 percent for oblique solutions.

The results of the calculations of the factor score correlations with the global rank order ratings, performed as discussed above for Factor I data, are shown in Table F, Appendix C.

The correlations were averaged using Fisher's Z transformation to obtain a correlation of 0.06 for orthogonal solutions and 0.11 for oblique solutions. These correlations are not significant at the 0.01 level (see Table H, Appendix C).

Intercorrelations of Group 1 Factors

The orthogonal factor solutions are uncorrelated. The intercorrelations of the oblique solutions are shown in Table G, Appendix C.

Group 1, Multiple Regression Analysis

An approximation of the amount of variance, R^2, in the GRS ratings accounted for by the GRS factors can be obtained by squaring and summing the average correlations of each orthogonal factor. For Group 1 R^2 is given by the following (see Table H, Appendix C):

R^2 (variance accounted for) = $(0.74)^2 + (0.29)^2 + (0.06)^2 = 0.64$.

Group 2, Mechanical Technicians

The GRS data were first evaluated using the Little Jiffy Mark IV (Kaiser, 1970) to obtain the Measure of Sampling Adequacy (MSA) and Indices of Factorial Simplicity (IFS) as a measure of adequacy of the data for further factorial analysis procedures. The Group 2 MSA and IFS were 0.65 and 0.82 respectively which are considered as being adequate.

The factor analysis of Group 2 produced four factors which are identified as follows:

Factor I: Job Performance

Factor II: Quality, Initiative and Versatility

Factor III: Attendance and Cooperation

Factor IV: Housekeeping

Factor I Analysis

Factor loadings of each GRS item on Factor I for each factor analysis procedure applied is shown in Table I, Appendix D. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates Factor I consists of quality, quantity, dependability, job knowledge,

judgment, and communication with adaptability/versatility marginally loaded. Table I, Appendix D, also shows the amount of total variance accounted for by Factor I ranges from 38.9 percent to 60.5 percent.

Factor I factor scores were calculated using SPSS procedures for each individual and converted to a rank order. Ranks were based on comparisons to several decimal places where necessary to avoid tied rankings.

The correlation of the Factor I score ranks and the global rank order ratings were calculated using the Spearman rank-correlation coefficient, rho, r_s (Guilford, 1965). The results are shown in Table J, Appendix D, for both orthogonal and oblique solutions.

These correlations were averaged using Fisher's Z transformation (Glass and Stanley, 1970) to obtain a correlation of 0.85 for oblique solutions and 0.77 for orthogonal solutions. Both of these correlations are significant at the 0.01 level (see Table R, Appendix D).

Factor II Analysis

Factor loadings of each GRS item on Factor II for each factor analysis procedure applied is shown in Table K, Appendix D. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicate that Factor II consists of quality, initiative, adaptability/versatility, and judgment. Table K, Appendix D, also shows the amount of total variance accounted for by Factor II as ranging from 10.2 percent to 17.6 percent.

The results of the calculations of the factor score correlations with the global rank order ratings, performed as discussed above for Factor I data are shown in Table L, Appendix D.

The correlations were averaged using Fisher's Z transform to obtain a correlation of 0.12 for orthogonal solutions and 0.45 for oblique solutions. These correlations are not significant at the 0.01 level (see Table R, Appendix D).

Factor III Analysis

Factor loadings of each GRS item on Factor III for each factor analysis procedure applied is shown in Table M, Appendix D. Using a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates that Factor III consists of attendance and cooperation. Table M, Appendix D, also shows the amount of total variance accounted for by Factor III as ranging from 10.8 percent to 13.1 percent.

The results of the calculations of the factor score correlations with the global rank order ratings, performed as discussed above for Factor I data, are shown in Table N, Appendix D.

The correlations were averaged using Fisher's Z transformation to obtain a correlation of 0.21 for orthogonal solutions and 0.38 for oblique solutions. These correlations are not significant at the 0.01 level (see Table R, Appendix D).

Factor IV Analysis

Factor loadings of each GRS item on Factor IV for each factor analysis procedure applied is shown in Table O, Appendix D. Using

a factor loading of 0.3 as a criterion for selection of salient variables, inspection of the different factor solutions indicates that Factor IV consists of housekeeping. Table O, Appendix D, also shows the amount of total variance accounted for by Factor IV as ranging from 8.6 percent to 20.1 percent.

The results of the calculations of the factor score correlations with the global rank order ratings, performed as discussed above for Factor I data, are shown in Table P, Appendix D.

The correlations were averaged using Fisher's Z transformation to obtain a correlation of 0.04 for orthogonal solutions and -.03 for oblique solutions. These correlations are not significant at the 0.01 level (see Table R, Appendix D).

Intercorrelations of Group 2 Factors

The orthogonal factor solutions are uncorrelated. The intercorrelations of the oblique factor solutions are shown in Table Q, Appendix D.

Group 2 Multiple Regression Analysis

An approximation of the amount of variance, R^2, in the GRS ratings accounted for by the GRS factors can be obtained by squaring and summing the average correlations of each orthogonal factor. For Group 2, R^2 is given by the following (see Table R, Appendix D):

$$R^2 \text{ (variance accounted for)} = (0.77)^2 + (0.12)^2 + (0.21)^2 + (0.04)^2 = 0.65.$$

DISCUSSION

Group 1

The statistical analyses of Group 1 data has shown that of the three underlying factors identified, only Factor I is significantly correlated with the global rank order ratings.

Factor I would not be considered as "halo" according to the definitions applied by Grant (1955), Ewart et al. (1941), Thorndike (1920) and others in that not all of the GRS items were highly loaded on Factor I. The salient variables of Factor I comprise a set of dimensions that would be logically considered in defining job performance: quality, quantity, initiative, dependability, job knowledge, judgment, adaptability/versatility and communication.

Factors II and III on the other hand, which are not significantly correlated with the global rank order ratings, have salient variables of housekeeping, attendance and cooperation which would not be as job performance related, especially for the highly skilled technicians being evaluated. This would indicate the rater could discriminate between the GRS items in assessing employee performance.

Using the oblique Factor I solution as the one more empirically realistic and interpretable (Nie et al., 1975), the results have shown that Factor I is highly correlated (0.79) with the global-performance rank order ratings and accounts for 62.4 percent of the variance.

These results, therefore, indicate that job performance as defined by the salient GRS items of Factor I, is a significant contributor to the rater's criterion for making global-performance rank order ratings.

Group 2

The statistical analyses of Group 2 data has shown that of the four underlying factors identified, only Factor I is significantly correlated with the global rank order ratings.

Factor I would not be considered as "halo" for the same reasons as discussed above for Group 1 data. The salient variables of Factor I are quality, quantity, dependability, job knowledge, judgment, and communication with adaptability/versatility being marginally loaded. As with Group 1, Factor I can logically be defined as job performance.

Factor II, with salient variables of adaptability/versatility, initiative, and quality was not significantly correlated with the global rank order ratings although these variables could logically also be relevant dimensions of job performance. This factor was not present in the Group 1 data and may indicate rater preference for certain job dimensions or may reflect true differences in job content compared to Group 1, however, sufficient data is not available to clarify this point.

Factors III and IV which are not significantly correlated with the global rank order ratings, have salient variables of housekeeping, attendance, and cooperation which are not highly relevant to job performance for the employees being evaluated.

Using the oblique Factor I solution as the one more empirically realistic and interpretable (Nie et al., 1975), the results have shown that Factor I is highly correlated (0.85) with the global performance rank order ratings and accounts for 72.3 percent of the variance.

These results, therefore, indicate that job performance as defined by the salient GRS items of Factor I, is a significant contributor to the rater's criterion for making global performance rank order ratings.

Summary and Conclusions

Both groups of data have shown that a job performance factor was defined from the GRS ratings and that the job performance factors are significantly correlated to the rater's global-performance rank order ratings.

The salient variables of the job performance factors of both groups differed mainly in the inclusion of "initiative" in Group 1 and not in Group 2, but it is not known if this reflects true job content differences.

Whitlock's (1963) studies showing a positive relationship between observed critical incidents and global rank order ratings and the results of this study showing a positive relationship between global rank order ratings and the GRS job performance factor, supports the notion that GRS ratings are not due entirely to rater error. Further research to evaluate the relationship between the GRS job performance factors and critical incidents may demonstrate

the GRS is more highly correlated to observed performance and, therefore, more valid than it is believed to be today.

Since approximately 35 percent of the variance in the GRS ratings is unaccounted for by the GRS orthogonal factors, additional studies would also be of interest to determine what other variables account for this remaining variance in the rank order ratings. Areas of possible investigation are employee seniority and personal-social relationships between supervisor and subordinate.

One possible benefit of this study would be that because of the strong relationship established between the GRS and the global rank order ratings, employers could use both approaches to advantage: the GRS for employee feedback without being obviously linked to administrative decisions, and the global ranking for personnel administrative purposes.

The supervisors used in this study had participated in the design of the GRS instrument and had been trained in its use which may account for their ability to discriminate among the GRS items, resulting in the absence of a general halo factor. This would suggest that employers that have management participate in the design of appraisal systems, could expect more valid appraisal results.

Appendix A: Graphic Rating Scale Instrument

QUALITY Freedom from errors and mistakes. Accuracy and quality of work in general.	Excessive errors and mistakes. Very poor quality. ☐	Acceptable by minimum standards. Improvement needed. ☐	No more mistakes than should be expected. Quality acceptable. ☐	Quality above average. Few errors and mistakes. ☐	Highest possible quality. Final job virtually perfect. ☐
Comments:			Employee's Comments:		
QUANTITY Actual work output relative to other employees.	Extremely low output. Definitely not acceptable. ☐	Acceptable but low output. Below average. ☐	Average output. Acceptable. ☐	Produces more than most. Above average. ☐	Definitely a top producer. ☐
Comments:			Employee's Comments:		
INITIATIVE AND CREATIVENESS Ability to plan work and to proceed with a job without being told every detail. Ability to make constructive suggestions.	Performs routine only, lacks initiative. ☐	Rarely shows initiative. Routine worker. ☐	Occasionally shows initiative. Sometimes makes suggestions. ☐	Is progressive; has some creativity. ☐	Initiative and creativeness result in consistent high productivity. ☐
Comments:			Employee's Comments:		
DEPENDABILITY Extent to which the employee can be depended upon to be available for work and to do it properly. Degree to which employee is reliable, trustworthy, and persistent.	Usually unreliable. Does not assume responsibility. Gives up easily. ☐	Sometimes unreliable. Avoids responsibility. Satisfied to "Get by." ☐	Trustworthy and reliable. Needs average direction. About average in persistence. ☐	More reliable than average. Usually persists in spite of difficulties. ☐	Completely reliable. Highly persistent. Finishes a job at any cost to himself. ☐
Comments:			Employee's Comments:		
COOPERATIVENESS Willingness to work harmoniously with others. Readiness to observe and conform to management policies.	Extremely negative and hard to get along with. ☐	Indifferent. Makes no effort to cooperate. ☐	Cooperative. Gets along well with others. Has an acceptable attitude. ☐	Goes out of his way to cooperate and get along. ☐	Extremely cooperative. Stimulates teamwork and good attitude with others. ☐
Comments:			Employee's Comments:		
JOB KNOWLEDGE Knowledge of the techniques, skills, processes, equipment, procedures and materials.	Lacks knowledge to perform work properly. ☐	Minimum knowledge for performing job. ☐	Satisfactory knowledge of job and sufficient knowledge of related jobs. ☐	Well informed about own job and related jobs. ☐	Authoritative knowledge of own work; superior knowledge of related jobs. ☐
Comments:			Employee's Comments:		

CARE OF EQUIPMENT – HOUSEKEEPING Keeping work area and equipment in clean and orderly condition.	Generally, work area or equipment is in dirty and disorderly condition. Misuses equipment. ☐	Often, work area or equipment is in dirty or disorderly condition. Sometimes misuses equipment. ☐	Usually, work area and equipment are in clean and orderly condition. Sometimes under rush, equipment is not given care. ☐	Nearly always, work area and equipment are in clean and orderly condition. Careful use of equipment. ☐	Work area and equipment are in clean and orderly condition even in rush. Very careful use of equipment. ☐
Comments:			Employee's Comments:		
ATTENDANCE Faithfulness in coming to work daily and conforming to work hours.	Often absent without good excuse. Frequently reports for work late. ☐	Lax in attendance and/or reporting for work on time. ☐	Usually present and on time. ☐	Prompt, regular in attendance. ☐	Always regular and prompt. ☐
Comments:			Employee's Comments:		
JUDGMENT Extent to which employee makes sound decisions. Free from impulsive and immature thinking. Ability to base actions on fact rather than emotion.	Frequently makes unsound judgments. Immature in thinking and judgment. ☐	Sometimes fails to consider facts and makes errors in judgment the average person would avoid. ☐	Generally thinks rationally. Not immature or illogical. Has healthy respect for facts. ☐	Better than average judgment. Very mature and sound in thinking. ☐	Unusual rational powers. Superior in analyzing facts and solving problems. No impulsive decisions. ☐
Comments:			Employee's Comments:		
ADAPTABILITY/VERSATILITY Ability to learn new tasks and handle various assignments and changing conditions.	Unable to learn new tasks. Cannot adjust from one job to another. Resists change. ☐	Learns new tasks slowly. Has difficulty in understanding and going from one assignment to another. ☐	Neither slow or fast. Able to perform several related tasks. Handles new assignments with some difficulty. ☐	Catches on fast. Learns new tasks easily. Handles new assignments with minimum difficulty. ☐	Very adaptable and flexible. Masters new tasks easily. Handles various assignments without difficulty. ☐
Comments:			Employee's Comments:		
WRITTEN AND ORAL COMMUNICATION Ability to transmit ideas, facts, and data to others either orally, in writing, or through the use of graphic arts.	Inept in expression. ☐	Occasional lack of clarity and conciseness. ☐	Acceptable communications skills. ☐	Well organized, clear messages with very little excessive verbiage. ☐	Outstanding communicating skills, well organized, clear and complete. ☐
Comments:			Employee's Comments:		

Appendix B: Description of the Factor Analytic Methods Employed

Four factor analytic methods were employed using SPSS procedures to investigate the underlying factor structure of the graphic rating scale (GRS) data. The four methods are briefly described as follows:

PA 1: Principal factoring without iteration - the PA 1 factoring method extracts principal components as factors which are defined as extract mathematical transformations of original variables. The importance of a factor is evaluated by examining the proportion of the total variance accounted for by the factor. Both orthogonal and oblique rotations were employed with this factor method.

PA 2: Principal factoring with iteration - the PA 2 factoring method is a modification of PA 1 and employs an iteration procedure for improving the estimates of commonality so that the importance of a given factor can be expressed more accurately in terms of the variance accounted for by the factor. Both orthogonal and oblique rotations were employed with this factor method.

ALPHA: Alpha factoring - the ALPHA factoring method employes more complex iteration processes than PA 2 to obtain commonalities and seeks to define factors that have maximum generalizability as measured by the Kuder-

Richardson (Glass and Stanley, 1970) reliability coefficient. Both orthogonal and oblique rotations were employed with this factor method.

IMAGE: Image factoring - the IMAGE factoring model is based on methodology developed by Guttman (Nie et al., 1975). If basic assumptions made on the composition of variables is correct, this method can provide the most valid factor analytic inferences about the data. Only the orthogonal solutions were employed for this factor method.

Appendix C: Group 1, Statistical Tables

Table A

Group 1, Factor I Loadings of GRS Items

		Factor I Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA R/O	ALPHA	PA 2	PA 2 R/O	IMAGE
Quality	Q1	85	88	84	81	82	85	78
Quantity	Q2	74	76	68	67	66	67	67
Initiative	Q3	76	77	73	72	72	72	70
Dependability	Q4	73	74	71	69	70	73	69
Cooperation	Q5	05	-00	02	08	07	04	09
Job Knowledge	Q6	75	74	71	72	72	70	67
Housekeeping	Q7	07	-03	-04	09	05	-09	08
Attendance	Q8	23	15	10	21	25	14	24
Judgment	Q9	58	56	55	58	56	55	54
Adapt/Versa	Q10	92	95	1.00	94	93	1.00	86
Communication	Q11	58	62	53	50	48	51	46
% of Variance		50.5	50.5	73.3	50.5	73.8	50.5	64.6

Table B

Correlations of Global Rank Order Ratings with

Group 1, Factor I Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.76	0.79
PA 2	0.71	0.79
ALPHA	0.73	0.80
IMAGE	0.77	--

Table C

Group 1, Factor II Loadings of GRS Items

		Factor II Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA R/O	ALPHA	PA 2	PA 2 R/O	IMAGE
Quality	Q1	-06	-37	-23	-04	-04	-24	02
Quantity	Q2	-07	-29	-15	01	-00	-16	01
Initiative	Q3	25	-10	09	25	24	06	24
Dependability	Q4	44	-03	27	42	45	30	43
Cooperation	Q5	90	65	73	74	74	71	63
Job Knowledge	Q6	18	-07	02	19	17	-02	19
Housekeeping	Q7	51	69	40	48	42	31	39
Attendance	Q8	-00	34	-08	05	04	-09	09
Judgement	Q9	67	29	58	70	68	54	59
Adapt/Versa	Q10	18	-33	-02	17	22	03	23
Communication	Q11	33	-15	13	23	25	15	25
% of Variance		13.5	13.5	16.0	16.0	16.6	16.6	13.3

Table D

Correlations of Global Rank Order Ratings with

Group 1, Factor II Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.26	0.25
PA 2	0.26	0.27
ALPHA	0.24	0.27
IMAGE	0.40	--

Table E

Group 1, Factor III Loadings of GRS Items

		Factor III Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA R/O	ALPHA	PA 2	PA 2 R/O	IMAGE
Quality	Q1	04	18	09	22	21	08	21
Quantity	Q2	10	22	13	23	23	13	22
Initiative	Q3	01	00	10	23	26	13	25
Dependability	Q4	-13	-23	-04	09	09	-06	11
Cooperation	Q5	-09	-47	06	11	16	12	18
Job Knowledge	Q6	13	15	23	35	37	26	36
Housekeeping	Q7	46	26	64	64	77	80	59
Attendance	Q8	64	69	75	74	63	62	54
Judgement	Q9	-01	-23	11	22	27	16	30
Adapt/Versa	Q10	-15	-18	-16	01	-01	-18	07
Communication	Q11	-26	-34	-10	-00	03	-07	06
% of Variance		10.1	10.1	10.8	10.8	9.6	9.6	8.5

Table F

Correlations of Global Rank Order Ratings with

Group 1, Factor III Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.05	0.07
PA 2	0.05	0.08
ALPHA	0.03	0.19
IMAGE	0.10	--

Table G

Intercorrelations of Oblique Factor Solutions for Group 1

Factor Method	Factor	Factor I	Factor II	Factor III
PA 1	I	1.0		
	II	0.23	1.0	
	III	0.37	0.20	1.0
PA 2	I	1.0		
	II	0.24	1.0	
	III	0.24	0.10	1.0
ALPHA	I	1.0		
	II	0.27	1.0	
	III	0.34	0.20	1.0

Table H

Results of Significance Tests for Group 1 Factor Score Correlations with Global Rank Order Ratings

Factor	Solution Type	Correlation r_s	$\underline{t}$
I	Orthogonal	0.74	6.43*
	Oblique	0.79	7.52*
II	Orthogonal	0.29	1.67
	Oblique	0.27	1.64
III	Orthogonal	0.06	0.35
	Oblique	0.11	0.64

Note. $\underline{t}$ is calculated from $\underline{t} = r_s [(1 r_s^2)/(n - 2)]^{-1/2}$ where r_s is the Spearman rank-correlation coefficient and n is the sample size

* $p < .01$

Appendix D: Group 2, Statistical Tables

Table I

Group 2, Factor I Loading of GRS Items

		Factor I Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA	ALPHA R/O	PA 2	PA 2 R/O	IMAGE
Quality	Q1	70	68	61	58	59	55	50
Quantity	Q2	58	47	59	46	59	46	52
Initiative	Q3	06	-14	10	-13	10	-11	11
Dependability	Q4	80	84	72	75	70	73	60
Cooperation	Q5	17	04	23	12	21	10	18
Job Knowledge	Q6	74	74	77	79	75	76	70
Housekeeping	Q7	16	20	05	10	03	09	-01
Attendance	Q8	09	02	12	-05	09	-06	11
Judgement	Q9	82	83	74	75	76	79	68
Adapt/Versa	Q10	31	16	28	11	28	10	29
Communication	Q11	32	21	37	29	37	27	35
% of Variance		38.9	38.9	60.5	60.5	56.0	56.0	47.2

Table J

Correlations of Global Rank Order Ratings

with Group 2, Factor I Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.73	0.82
PA 2	0.79	0.87
ALPHA	0.78	0.86
IMAGE	0.78	--

Table K

Group 2, Factor II Loadings of GRS Items

		Factor II Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA	ALPHA R/O	PA 2	PA 2 R/O	IMAGE
Quality	Q1	33	21	35	21	36	23	34
Quantity	Q2	52	46	52	44	50	43	46
Initiative	Q3	88	91	78	83	75	79	70
Dependability	Q4	-04	-21	05	-14	04	-15	07
Cooperation	Q5	35	30	32	27	31	26	28
Job Knowledge	Q6	11	02	11	-00	11	-01	15
Housekeeping	Q7	17	09	16	06	18	07	18
Attendance	Q8	-05	-12	02	-06	01	-06	03
Judgement	Q9	27	14	28	13	27	11	27
Adapt/Versa	Q10	86	87	81	84	86	88	73
Communication	Q11	15	11	16	10	14	08	16
% of Variance		14.7	9.8	17.6	10.2	13.1	10.8	16.6

Table L

Correlation of Global Rank Order Ratings

with Group 2, Factor II Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.09	0.34
PA 2	0.12	0.49
ALPHA	0.15	0.50
IMAGE	0.11	--

Table M

Group 2, Factor III Loadings of GRS Items

		Factor III Loadings						
		Factor Types						
GRS Item	Var	PA 1	PA 1 R/O	ALPHA	ALPHA R/O	PA 2	PA 2 R/O	IMAGE
Quality	Q1	20	09	16	06	20	09	24
Quantity	Q2	23	12	21	11	24	13	27
Initiative	Q3	18	12	15	09	15	09	14
Dependability	Q4	34	25	28	20	33	23	34
Cooperation	Q5	62	59	33	30	38	35	34
Job Knowledge	Q6	-01	-12	-00	-11	05	-07	11
Housekeeping	Q7	07	05	-00	-02	01	-00	00
Attendance	Q8	89	92	97	1.00	85	88	50
Judgement	Q9	01	-12	02	-09	02	-12	11
Adapt/Versa	Q10	-05	-14	-08	-17	-04	-15	01
Communication	Q11	44	40	28	23	34	29	33
% of Variance		11.0	11.0	11.8	11.8	10.8	13.1	11.5

Table N

Correlation of Global Rank Order Ratings

with Group 2, Factor III Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	0.17	0.13
PA 2	0.19	0.45
ALPHA	0.02	0.38
IMAGE	0.43	--

Table 0

Group 2, Factor IV Loadings of GRS Items

GRS Item	Var	Factor IV Loadings						
		Factor Types						
		PA 1	PA 1 R/O	ALPHA	ALPHA R/O	PA 2	PA 2 R/O	IMAGE
Quality	Q1	20	22	24	22	21	20	23
Quantity	Q2	-27	-26	-12	-16	-18	-21	-14
Initiative	Q3	06	03	07	02	09	04	13
Dependability	Q4	08	12	14	15	15	16	16
Cooperation	Q5	16	15	14	12	12	09	12
Job Knowledge	Q6	-49	-47	-37	-37	-31	-31	-24
Housekeeping	Q7	90	90	90	90	98	98	69
Attendance	Q8	-08	-06	-03	-04	-01	-02	-00
Judgement	Q9	05	07	13	12	14	13	15
Adapt/Versa	Q10	06	03	09	03	08	03	13
Communication	Q11	-49	-48	23	-24	-21	-22	-17
% of Variance		9.8	14.7	10.2	17.6	20.1	20.1	8.6

Table P

Correlation of Global Rank Order Ratings

with Group 2, Factor IV Score Rankings

	Correlation r_s	
Factor Method	Orthogonal Rotation	Oblique Rotation
PA 1	-.04	-.13
PA 2	.06	-.05
ALPHA	.08	.09
IMAGE	.06	--

Table Q

Intercorrelations of Oblique Factor Solutions for Group 2

Factor Method	Factor	Factor			
		I	II	III	IV
PA 1	I	1.00			
	II	0.37	1.00		
	III	0.28	0.20	1.00	
	IV	0.09	0.06	0.03	1.00
PA 2	I	1.00			
	II	0.44	1.00		
	III	0.35	0.23	1.00	
	IV	0.05	0.14	0.00	1.00
ALPHA	I	1.00			
	II	0.45	1.00		
	III	0.32	0.21	1.00	
	IV	0.04	0.15	0.00	1.00

Table R

Results of Significance Tests for Group 2 Factor Score Correlations with Global Rank Order Ratings

Factor	Solution Type	Correlation r_s	$\underline{t}$
I	Orthogonal	0.77	6.52*
	Oblique	0.85	8.77*
II	Orthogonal	0.12	0.65
	Oblique	0.45	2.71
III	Orthogonal	0.21	1.15
	Oblique	0.38	2.20
IV	Orthogonal	0.04	0.21
	Oblique	-0.03	0.16

Note. $\underline{t}$ is calculated from $\underline{t} = r_s [(1 - r_s^2)/(n - 2)]^{-1/2}$ where r_s is the Spearman rank-correlation coefficient and n is the sample size

* $p < .01$

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