Research Problem Review 74-3

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OPERATING CHARACTERISTICS OF THE ORDER OF MERIT LISTS

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Research Problem Review 74-3

(6) OPERATING CHARACTERISTICS OF THE ORDER OF MERIT LISTS

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Research Problem Reviews are special reports to military management. They are usually prepared to meet requests for research results bearing on specific management problems. A limited distribution is made--primarily to the operating agencies directly involved.

FOREWORD

As part of its program on leadership development, the Army Research Institute for the Behavioral and Social Sciences provides an integrated research effort on the Officer Personnel Management System (OPMS) and Officer Evaluation System (OES) which includes identifying operationally feasible career progression choice points for evaluation of differential performance and potential of individual officers, combining these evaluation factors into "officer indices" to be used in assigning individuals to specific career development programs in OPMS, and using the officer indices to provide "Order of Merit" listings for assignment, military school selection, and promotion. The present publication is concerned with the evaluative components used in the Order of Merit List (OML).

This Research Problem Review analyzes the statistical properties and operational nature of the evaluative predictor variables used in the OML to determine its utility for personnel management decisions. It also suggests appropriate differential weights to be applied to these measures for specific career management purposes.

The entire task is responsive to the special requirements of the Deputy Chief of Staff for Personnel as well as the objectives of RDTE Project 2Q762717A722, "Indices for Officer Career Development," FY 1974.

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OPERATING CHARACTERISTICS OF THE ORDER OF MERIT LISTS

BRIEF

Requirement:

To determine the statistical adequacy and appropriate scoring weight of each of the evaluative factors used for the Order of Merit List (OML).

Procedure:

Individual records for 838 Infantry and Air Defense officers being considered for nomination to Command and General Staff College (C&GSC) and Senior Service College (SSC) were analyzed. The statistical aspects investigated were the weights used for scoring, the measurement characteristics, and the selection factor relationships.

Findings:

These findings should be considered tentative because of the comparatively small sample and inclusion of only two Army branches--both combat arms.

Scores should be standardized for all selection factors in order that weights used match the weights intended by management.

Military Education might be eliminated as part of the OML because most officers have equal education levels.

The present procedures for scoring the OER should be changed to eliminate an artificial and unreliable spread in scores that could lead to an erroneous interpretation.

Use of Branch Subjective scores should be reviewed; such scores seem to be too closely related to each other and to other similar scores.

Differences in distribution of evaluative variables between branches suggest that branch-specific OML scoring might be investigated. Differences found in the weights for C&GSC and SSC suggest that further changes in selection factors for the two programs should be investigated.

Utilization of Findings:

The results of the analysis suggest that the operational measures of performance and potential used in the OML can be improved. The research provides tentative estimates of the discriminatory value of the separate measures used for various decisions and suggests procedures for developing weights to apply to these measures when combined for specific career management purposes.

OPERATING CHARACTERISTICS OF THE ORDER OF MERIT LISTS

CONTENTS

OPERATING CHARACTERISTICS OF THE ORDER OF MERIT LISTS

BACKGROUND AND PURPOSE

Because the number of students must be limited, the selection of Army officers for attendance at Command and General Staff Colleges (C&GSC) and Senior Service Colleges (SSC) generates a need for an objective and quantifiable Army wide system to determine on the basis of merit those officers nominated for attendance, and rank ordering the eligible officers.

The Military Personnel Center (MILPERCEN), in response to this requirement, has developed a set of procedures--"Order of Merit Lists" (OML)--for establishing a numerical value for the quality of the record of each eligible officer, and then on the basis of the numerical values arraying the eligible officers on a rank order roster. While these OML procedures permit the quantifying of the records for a numerical comparison, they have not been subjected to a systematic investigation of the statistical adequacy of the record factors or the numerical weight to be applied to each factor.

This investigation was undertaken by the Army Research Institute for the Behavioral and Social Sciences to identify the nature and statistical properties of the common evaluative variables, as an initial background step in the development and application of "Indices for Officer Career Development" for a variety of career management needs.

The investigation focused on three basic questions:

1. Do the scores assigned to each evaluative factor by career management reflect the true mathematical weights forced by the statistical properties of the variable?

2. What differential measurement characteristics of the evaluative factors are utilized?

3. What are the relationships between the various evaluative factors--e.g., independence of evaluations vs. duplication?

DESIGN OF THE RESEARCH

The research was exploratory in nature, and samples were used from only two Army branches (Infantry and Air Defense) of officers being considered for nomination to Command and General Staff College (C&GSC) and Senior Service College (SSC). The number and background of officers from each group was:

	INFANTRY	AIR DEFENSE
C&GCS--Primarily majors--beginning 1972	266	211
SSC--Primarily LTC--beginning 1972	188	173

The statistical aspects investigated were the weights for scoring, the measurement characteristics, and the selection factor relationships. Comparison of Weights--Individual records were scored in two ways: 1) The "real weights" used in the present procedures by MILPERCEN were based upon the total number of points assigned to a selection factor. 2) Weights for scoring were based upon first equalizing all the selection factors (standardizing) and then applying (multiplying) the "desired weights" to them. Measurement Characteristics--This included the compilation of the average and the distribution of scores. Selection Factor Relationships--For each of the four groups, the extent to which being high (or low) on one factor was related to being high (or low) on another factor was investigated.

RESEARCH FINDINGS

Tables 1 and 2 in the appendix summarize the weights applied to each factor of the OML by: 1) The present system "real weights" determined by the distribution of scores for a factor rather than by management intention, and 2) a standardized score system (desired weights) which reproduced the weights as intended by MILPERCEN.

The difference between "real" and "desired" weight for a given variable reflects the degree to which that variable is over- or under-represented in the composite score compared to its intended representation by career management.

Results for AD officers eligible for C&GSC (Table 1--Appendix) show that the OER 67-6 and "Performance in a difficult assignment" both receive a weight in the final OML greater than intended. Conversely, Military Education, OER 67-5, and "Manner of performance (MOP) in highest command" all showed a decrease in weight ("real") below the desired level. The results for AD officers--SSC (Table 1) indicated that OER 67-6, Command MOP, Branch Subjective, and Performance in a difficult assignment all have higher "real" weight than desired with decreases being found for Military Education, OER 67-5, and Staff MOP. Results for the IN branch (Table 2--Appendix) were similar to AD for both programs (IN branch did not include subjective evaluations in its OML procedures for either sample), with OER 67-6 and OER 67-5 being high and Military Education and Staff MOP being low. For IN officers (C&GSC) the Command MOP was also lower.

While large differences were found between the "real" and "desired" weights, it should be noted that the OML order produced by each weighting system was very similar (correlations between each list were in the .90's). But this is not an unusual finding for weighting problems, due to mathematical constraints.

Table 3 in the appendix lists the means and standard deviations for each OML factor. Scores on the OML reflect an arbitrary numeric value assigned to the various categories; i.e., for Civilian Education the score is the "number" assigned to the level of education and is not the number of years. All OML factors were assigned values (and ranges) as specified in the Operating Instruction, 614-100 (22), of the Officer Personnel Directorate, 26 May 1972. The means and standard deviations for Command MOP and civilian education are acceptable approximations of a normal curve. While the means and standard deviations for OER 67-6 and OER 67-5 were acceptable, this was achieved by a highly questionable procedure. The original OER scores were transformed by converting to a percentile distribution, where the highest score receives a percentile score of 100, the lowest score a zero, and the remainder spread evenly throughout the range. The percentile score is then transformed (by conversion table) back into an "OML OER" score, and a one point difference in the original increased to a three point difference in the OML score. Therefore, if two officers have a raw score difference of two, which is not reliable (i.e., not truly different), the OML score would reflect a 5 point difference. This five point difference would be viewed, by users, as a real difference when in fact nothing has changed. This increase in differences led to the large weights and standard deviations. The standard deviations for Combat Experience, Staff MOP, and Decorations were reasonable but the means tended to be extremely high or low thus producing a skewed distribution for these variables. For the remainder of the OML factors--Military Education, Branch Subjective, Educational Achievement, Special Advanced Degree, and MOP in a difficult assignment--the means were extremely low (or in the case of SSC Military Education, high) with very small standard deviations. Also, these same OML factors had very low real weights. The intercorrelations for AD are presented in Table 4 and for IN in Table 5 (Appendix). For both groups of AD, Military Education, Civilian Education, and Combat Experience do not have significant correlations with the Total (final) OML score. In addition, for the AD C&GSC group, the Decoration score is not related to Total OML score. A similar pattern emerged for both groups of IN; Combat Experience did not have a significant correlation with the Total OML score, Military Education for the SSC group was not related to Total OML score, and for the C&GSC group Civilian Education was not related to total OML score.

The correlations between OER 67-6 and OER 67-5 were very low, and significant for IN (both groups) and AD SSC but not significant for AD C&GSC. These relationships indicate that the OER sums (67-6 and 5) were not very reliable indicators over time.

There was a tendency for Branch Subjective points (available for AD only) to be internally consistent (correlated) with other OML factors and somewhat consistent with each other. This tendency was most pronounced for the SSC group.

Finally, the two groups (SSC & C&GSC) had different patterns of correlation within a branch, and even larger differences in correlations were evident across branches and school groups. Recognition of these similarities and differences might be utilized to develop a more differentiated OML system.

CONCLUSIONS AND IMPLICATIONS

The findings and implications are summarized below. The data used were limited, and therefore the following conclusions are tentative:

1. Standard scores (same mean and standard deviation) for all selection factors should be used. Standardization would yield the weights desired by career managers for each factor, which current operational procedures do not provide.

2. Military education should be eliminated as a selection factor in OML's for school selection. In most cases officers all have the same educational level; therefore inclusion of a numeric value does not affect any officer's position on the OML.

3. The present procedures for scoring the OER should be changed. OER scoring includes the conversion to percentile scores which produces an artificial spread in scores that may well be unreliable. The increased spread in the OML score could lead to over-interpretation of score differences which are not real differences.

4. The use of Branch Subjective evaluations should be reviewed. Present procedures lead to Branch Subjective scores with reduced ranges, highly related to each other, and related to other similar OML scores.

5. The use of branch specific OML scoring should be investigated. Branch analysis indicated differences in the distribution of evaluative variables which might be used to produce more meaningful scores within branches.

6. Further changes in scoring for C&GSC and SSC should be investigated. While current procedures differ somewhat between programs (different weights assigned to selection factors), results of the analysis indicated that further changes in selection factors may be warranted.

SUMMARY

The results of this investigation have pointed to the need for changes in current OML procedures as outlined (conclusions 1-3) above. The limitations of sample sizes and of only two branch groups (both combat oriented) will make it necessary to confirm the indications and trends found between and within career branches (conclusions 4-6) on larger samples from all branches, to verify the conclusions of this preliminary analysis.

APPENDIX

Table 1

REAL VS. DESIRED OML WEIGHTS FOR AD OFFICERS

Selection Variable	Group					
	C&GSC			SSC		
	Real	Desired	Difference	Real	Desired	Difference
OER 67-6	434	240	+194	373	235	+138
Military Ed.	6	90	- 84	0	90	- 90
Civilian Ed.	53	50	+ 3	42	50	- 8
Combat Exp.	33	40	- 7	28	40	- 12
OER 67-5	140	180	- 40	102	185	- 83
Command MOP	115	165	- 50	208	165	+ 43
Staff MOP	75	85	- 10	43	85	- 42
Decorations	39	50	- 11	37	50	- 13
Branch Subjective	43	55	- 12	117	55	+ 62
Ed. Achiev.	7	10	- 3	3	10	- 7
Special Ad. Deg.	7	15	- 8	10	15	- 5
MOP Diffic. Assign.	48	20	+ 28	37	20	+ 17
OML - TOTAL	1000	1000		1000	1000	

Table 2

REAL VS. DESIRED OML WEIGHTS FOR IN OFFICERS

	Group					
	C&GSC			SSC		
Selection Variable	Real	Desired	Difference	Real	Desired	Difference
OER 67-6	328	267	+ 61	297	261	+ 36
Military Ed.	0	100	-100	34	100	- 66
Civilian Ed.	56	56	0	50	56	- 6
Combat Exp.	36	44	- 8	41	44	- 3
OER 67-5	349	200	+149	300	206	+ 94
Command MOP	134	183	- 49	185	183	+ 2
Staff MOP	44	94	- 50	42	94	- 52
Decorations	53	56	- 3	52	56	- 4
OML - TOTAL	1000	1000		1001	1000	

Table 3

MEANS AND STANDARD DEVIATIONS FOR OML VARIABLES
BY BRANCH AND SCHOOL

	AD				IN			
	C&GSC		SSC		C&GSC		SSC	
Selection Variable	$\bar{X}$	S.D.	$\bar{X}$	S.D	$\bar{X}$	S.D.	$\bar{X}$	S.D.
OER 67-6	112.3	66.3	126.9	52.9	137.5	47.1	141.6	44.9
Military Ed.	0.1	.7	50.0	0.0	0.0	0.0	49.5	5.1
Civilian Ed.	23.6	8.1	26.5	6.0	23.9	8.1	26.2	7.5
Combat Exp.	12.9	5.0	11.2	4.0	20.5	5.0	19.0	6.1
OER 67-5	129.9	21.2	146.1	14.4	73.1	50.2	111.6	45.3
Command MOP	89.4	17.5	105.4	29.4	94.5	19.3	116.4	28.0
Staff MOP	56.5	11.4	68.1	6.1	59.9	6.4	69.1	6.3
Decorations	14.7	5.9	16.4	5.2	20.8	7.7	21.8	7.9
Branch Subjective	2.0	6.6	8.2	16.6	--	--	--	--
Ed. Achiev.	0.1	1.0	0.1	.5	--	--	--	--
Special Ad. Deg.	0.2	1.1	0.4	1.4	--	--	--	--
MOP Diffic. Assign.	3.6	7.2	2.3	5.3	--	--	--	--
OML - TOTAL	446.1	91.7	559.2	95.0	429.8	87.9	554.4	89.1

Table 4

INTERCORRELATIONS OF OML ELEMENTS FOR THE AIR DEFENSE BRANCH[a]

OML ELEMENT	1	2	3	4	5	6	7	8	9	10	11	12	13
1. OER 67-6	----	.06	.08	.07	.12	.23*	.36*	.04	.34*	.21*	.23*	.59*	.92*
2. Military Ed.	.00	---	.02	-.10	.00	-.05	-.07	.16*	-.03	-.01	-.02	-.05	.05
3. Civilian Ed.	.07	.00	----	-.01	-.06	-.00	.03	-.08	.12	.21*	.31*	.19*	.16
4. Combat Exp.	-.13	.00	-.16*	----	-.16*	.16*	.19*	.03	.17*	.01	.00	.05	.02
5. OER 67-5	.19*	.00	.05	.01	----	.20*	-.16*	.11	.03	.01	.06	.16*	.33*
6. Command MOP	.32*	.00	.07	-.09	.35*	----	.13	.00	.28*	.09	.15*	.37*	.47*
7. Staff MOP	.49*	.00	.10	-.20*	.21*	.16*	----	-.13	.17*	.06	.12	.15*	.39*
8. Decorations	.20*	.00	-.07	.10	.20*	.27*	.18*	----	.02	.01	.01	.05	.12
9. Branch Subjective	.43*	.00	.04	-.05	.27*	.56*	.31*	.29*	----	.02	.09	.57*	.48*
10. Ed. Achiev.	.16*	.00	.06	.10	.09	.15*	.01	.07	.31*	----	.66*	.21*	.23*
11. Special Ad. Deg.	.25*	.00	.42*	-.03	.14	.23*	.15*	.12	.34*	.17*	----	.30*	.29*
12. MOP Diffic. Assign.	.44*	.00	.13	-.07	.25*	.44*	.28*	.28*	.74*	.36*	.44*	----	.70*
13. TOTAL OML POINTS[b]	.83*	.00	.14	-.10	.44*	.70*	.50*	.36*	.70*	.25*	.36*	.66*	----

[a] C&GCS Above the diagonal & SSC below the diagonal

* $p < .05$

[b] Part-whole correlations

Table 5

INTERCORRELATIONS OF OML ELEMENTS FOR THE INFANTRY BRANCH[a]

OML ELEMENT	1	2	3	4	5	6	7	8	9[b]
1. OER 67-6	----	.00	.13	-.11	.29*	.13*	.32*	.19*	.75*
2. Military Ed.	.04	----	.00	.00	.00	.00	.00	.00	.00
3. Civilian Ed.	.16*	.02	----	-.25*	.17*	-.06	-.03	.03	.22*
4. Combat Exp.	.01	-.02	-.08	----	-.08	.13*	.02	.02	.01
5. OER 67-5	.38*	.21*	.07	.18*	----	.01	-.07	.26*	.77*
6. Command MOP	.09	.07	-.15	.15	-.03	----	-.00	.07	.29*
7. Staff MOP	.63*	.09	.19*	-.02	.25*	.01	----	-.14*	.19*
8. Decorations	.13	.09	-.04	.13	.10	.29*	.17*	----	.35*
9. TOTAL OML POINTS[b]	.80*	.22*	.15	.03	.73*	.37*	.55*	.31*	----

[a] C&GSC Above the diagonal and SSC below the diagonal

* $p < .05$

[b] Part-whole correlations