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AUTHOR Woolsey, James W.; Bula, Ronald J.
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ABSTRACT

Twenty-eight industrial supervisors from nine different firms in the North Central VTAE District were selected by the management of their firm to take part in supervisor task analysis. The results of the analysis were to be incorporated into a supervisory training program. The survey instrument was divided into three sections: demographic data, direct task observations, and questionnaire answers. Presenting the data accumulated in a sample instrument identifying the frequency for each task, the frequency rank value assigned, and the mean significance of the task (reported by the supervisors), revealed that there was a significant difference between the actual tasks performed (as observed by researchers) and the tasks reported performed on the questionnaire. There was also a real difference between mean level of significance in the task analysis and questionnaire portions of the study, and there were no real correlations between frequency of tasks actually performed and the reported levels of significance for those tasks. With specific limitations understood, the data could be used to design a two-dimensional profile of the observed tasks and one for the "less than routine" tasks. (AG)

FINAL REPORT

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AN ANALYSIS OF INDUSTRIAL SUPERVISOR TASKS IN NORTH CENTRAL VTAE DISTRICT

Faculty Research and Curriculum Multi-Project Proposal

JUNE, 1973

NORTH CENTRAL TECHNICAL INSTITUTE
WAUSAU, WISCONSIN 54401

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James W. Woolsey, Research Investigator
Ronald J. Bula, Research Investigator

Russell Paulsen, Administrator, Research and Development

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North Central Technical Institute
Wausau, Wisconsin

Lawrence B. Hoyt, District Director

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PREFACE

The authors wish to acknowledge the assistance offered by the following people during the course of this study:

Mr. Russell Paulsen, Administrator, Research and Development at North Central Technical Institute, for arranging funding and providing advice and direction during the study.

Mr. Ronald Schubert, Trade and Industry Coordinator at North Central Technical Institute, for supplying liaison and leadership activities in assisting with this report.

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James W. Woolsey
Ronald J. Bula

An Analysis of Industrial Supervisor Tasks in North Central VTAE District

Background

Some indication of the need for a supervisory training program in North Central Vocational, Technical and Adult Education District was expressed early in 1973.[7,8] The authors of this report were contacted about the proposed program in May 1973, and it was suggested at that time that a task analysis be conducted of industrial supervisory jobs as they were being performed in the district. Contracts for carrying out the task analysis were awarded on June 5, 1973.

The Instrument

A measuring instrument for industrial supervisor task analysis was constructed in three phases. First, a survey of the literature cited in the bibliography and the personal experiences of one of the researchers as an industrial supervisor were used to construct a preliminary instrument. Both members of the research team discussed the preliminary instrument, point-by-point, with Ronald Schubert, Trade and Industry Coordinator for North Central VTAE District. The changes resulting from this discussion were incorporated in the second draft instrument.

One member of the team then presented the second instrument to two industrial management people in the district, Mr. Jack Sittler and Mr. George Glaser.[4,10] Their suggestions were incorporated in the construction of the final task analysis instrument.

The final instrument was arranged - and items were numbered - for direct entry on computer keypunch cards. Items numbered 1 through 15 were reserved for demographic data; items 16 through 59 were for direct task observations; items 60 through 71 were reserved for answers to a questionnaire.

During the construction of the instrument, several conferees suggested that some supervisory tasks would be significant but might not be done in the course of a particular work shift when an individual supervisor was being observed. These "less than routine" tasks were to be recorded in the questionnaire section of the instrument.

The direct task analysis portion of the instrument (44 items, numbered 16 through 59 on the instrument) was to be completed by a single member of the research team upon direct observation of the industrial supervisors being studied. The research was to record how often each task was accomplished (frequency) during several randomly selected time intervals during a supervisor's work shift. The researcher would also enter the significance of each task as that significance was reported by the supervisor under observation. Significance was rated on a scale of 1 through 5, 1 being least significant and 5 being most significant. A significance level of 3 was considered to be average.

It should be noted that entries for item 19, "OSHA problem solving," reflect only those overt actions beyond the minimum safety requirements for the individual industries.

Definitions

Each industrial supervisor observed during the study was identified as a "subject". Each cell in the task analysis matrix (44 items by "N" subject observation intervals) was defined as being a single "observation". Each observation would be awarded a value of 1 through 5 for "significance" and would receive a value of 1 on the frequency table. Each complete application of the 44-item task analysis instrument would be defined as an "instrument application". Each complete questionnaire would be considered to be a "questionnaire application", made up of 12 "task answers".

Procedure

The procedure for gathering the data for this report involved arranging for an initial meeting with members of management from each firm listed in the Preface. These individuals were given a copy of the task analysis instrument with an oral explanation of the purpose of the study. They were requested to select "good" supervisors for one of the researchers to observe. In most instances, a second meeting was scheduled to allow the selected supervisors to meet with the member of the research team to become acquainted with the individual and acquire an understanding of the purpose and method of the study.

The third phase of the procedure was the actual observation. The researcher reported to the firm at the start of the selected shift and began following the supervisor through his "usual" day. Instrument

applications were made at random intervals throughout the shift and observations were noted at each application period. In several instances, the supervisors offered oral explanations of the actions and activities so the researcher could better see the relationshi' of the total operation. For a more complete picture of the role of the supervisor, observations were made during different shifts.

It was not the intention of the researcher to disrupt the usual operations of the firm but rather to observe and record data about the actual tasks performed by the supervisors involved.

In some instances, an exit interview was held with the members of management responsible for the supervisor selections. During these interviews, the researcher received several items significant to a better understanding of the supervisors (i.e., job descriptions, sample forms used in daily production, samples of materials used in "in-house" training meetings). Since these materials do not relate directly to the purpose of this study, they will not be included but rather, they will be incorporated into future related projects.

The data obtained through the instrument applications was transcribed onto flow sheets which allowed for individual observation comparisons among the several firms. This transcription allowed for an easier identification of the significance of the specific task performed as well as the frequency of performance.

Results of the Study

Nine different industrial firms in the North Central VTAE District cooperated fully with the research team. The firms conducted orientation meetings for supervisors, provided safety equipment necessary and in general, acted as extremely congenial hosts to the researchers.

A total of 28 industrial supervisors from the firms were observed for their entire shifts. Gratitude must also be expressed to these people for their cooperation and many explanations they gave of a variety of products and processes being observed by the researcher. Several other supervisors were observed for portions of their respective shifts, but data from these "incomplete task analyses" are not included in this report.

A total of 237 instrument applications were completed, or an average of 8.5 per subject. With a total of 44 items per instrument application, a grand total of 10,428 single observations were obtained. In addition, the 12-item questionnaire was administered to the 28 subjects, resulting in 336 task answers. For purposes of this report, the "observations" and "task answers" will be treated separately.

A sample instrument is included here with each task item identified and four study findings recorded for each item. First, the frequency for each task in the entire study is noted. Second, a frequency rank value has been assigned to each task. That task being accomplished most

frequently is numbered 1, that being accomplished least frequently is numbered 28. Note that tied frequencies are all assigned the same number and are noted *.

The third column in the chart indicates the mean significance level reported by supervisors who did accomplish each task. Column four deals with the ranked significance, again that task with the highest level of significance being numbered one, the lowest level being numbered 31. As in the second column, ties are all awarded the same rank number and are identified with *. The questionnaire portion of the study is treated in the same way.

Rate the significance of each task during random intervals. Rate from 0 (not done) through 1 (least significant) to 5 (most significant). Include beginning and ending of each shift, and random intervals throughout the shift.

TIME SHIFT STARTED: _____ DATE: _____

		Frequency task was performed, N=237 instrument applications	Frequency rank 1 most frequent 28 least frequent	Mean reported significance of task	Significance rank. 1 most significant, 31 least significant
16	Completed time cards, personnel records	14	21	3.43	15
17	Assigned duties to subordinates	172	2	3.48	13
18	Inspected equip., selected tools	56	16	3.62	10
19	OSHA problem-solving (Health, Safety)	19	17	2.32	30
20	Actually engaged in work of dept.	64	14	2.38	29
21	Inspected work or product of dept.	193	1	3.24	21*
22	Recorded production, inspection data	59	15	3.37	18
23	Statistically treated data from 22	7	24	3.42	16
24	Made personnel decision based on 21-23	103	8	3.15	25

Enter time of starting each observation interval here

25	Communicated decision 24	102	9*	3.13	26
26	Made equipment decision based on 21-24	76	10	3.26	20*
27	Communicated decision 26	74	11	3.27	19
28	Made materials decision based on 21-26	137	3*	3.16	24*
29	Communicated decision 28	137	3*	3.16	24*
30	Referred to specs, drawings or bill of material	122	6	3.24	21*
31	Communicated decision 30	110	7	3.26	20*
32	Conducted cost analysis	5	25*	3.40	17*
33	Communicated results of 32	5	25*	3.40	17*
34	Received cost analysis results	2	27*	4.00	2*
35	Made personnel decision on basis of 32 or 34	2	27*	4.50	1
36	Communicated decision 35	1	28*	4.00	2*
37	Made equipment decision based on cost analysis	2	27*	3.50	12*
38	Communicated decision 37	2	27*	3.50	12*
39	Made materials decision based on cost analysis	5	25*	3.60	11*
40	Communicated decision 39	5	25*	3.60	11*
		freq.	f/rank	$\bar{X}$ sig.	sig. rank

		freq.	f/rank	$\bar{X}$ sig.	Sig. rank
41	In conference, made a personnel decision	69	12*	3.68	7*
42	In conference, made a materials decision	102	9*	3.47	14
43	In conference, made an equipment decision	66	13	3.80	5
44	Communicated decisions 41, 42 or 43	126	4	3.63	9
45	Taught someone a new skill or process	10	23	3.90	3
46	Reviewed with someone a new skill or process	18	18	3.22	22
47	Learned a new skill or process from someone	1	28*	2.00	31*
48	Attended any meeting as a leader	2	27*	2.00	31*
49	Attended any meeting as audience (non-participant)	3	26	3.67	8
50	Attended any meeting as a participant	15	20	3.87	4
51	Engaged in oral technical reporting	2	27*	3.50	12*
52	Engaged in written technical reporting (beyond memos)	1	28*	2.00	31*

		freq.	f/rank	$\bar{X}$ sig.	sig. rank
53	Oriented or motivated new employees	16	19	3.06	27
54	Oriented or motivated old employees	124	5	3.18	23
55	Engaged in any product engineering activity	10	23	3.70	6
56	Engaged in any process engineering activity	12	22	3.50	12*
57	Completed standard forms to report items 55-56	1	28*	3.00	28*
58	Communicated items 55-56	16	19	3.50	12*
59	Engaged in writing specs	1	28*	3.00	28*

Mean significance levels were obtained by summing over all significance levels reported by subjects completing that task and dividing by number of subjects completing the task.

* denotes a tie in rank with one or more items in that column.

QUESTIONNAIRE

Record and rate the significance of each of the following tasks which you would perform at least once a month. Use 1 to indicate "least significant", 5 to indicate "most significance". If you never perform the task, record number 0.

		freq.	$\bar{X}$ sig.
60.	Conduct cost analysis.	24	1.68
61.	Plan to do a technical report.	22	1.04
62.	Write a technical report.	21	.78
63.	Engage in labor relations activities.	28	3.21
64.	Do quality control testing.	27	3.36
65.	Layout facilities.	24	2.46
66.	Order parts or tools.	28	2.82
67.	Engage in drawing, drafting or blue-printing.	24	1.32
68.	Write specifications.	18	.54
69.	Learn a new skill or process from someone.	28	2.50
70.	Do original problem-solving activities.	27	3.50
71.	Communicate results of item 70.	27	3.32

This portion of the study involved asking each subject to rate the significance only of each task he might perform in an average month. Total N=28. Significances reported here were means for those doing the tasks.

During the analysis of the data, it became obvious that the actual tasks performed (reported in items 16 through 59) differed significantly from the results of the questionnaire (items 60 through 71). For example, the most frequently observed task (rank 1, items 16 through 59) was performed in only 193 out of 237 instrument applications, or in only 81 percent of those applications. On the other hand, three items in the questionnaire portion of the study were reportedly performed by 100 percent of the subjects.

There was also a real difference between mean levels of significance in the task analysis and the questionnaire portions of the study. Supervisors reported a mean significance of 3.31 for tasks actually performed during the study and a mean significance of 2.21 for the items on the questionnaire. Application of the t test of significance showed these differences to be significant beyond the $p < .01$ level[5].

It was also determined that there were no real correlations between frequency of tasks actually performed and the reported levels of significance for those tasks. A product-moment correlation test applied to 44 items (frequency of each item paired with the reported significance of that item) resulted in $r = .16$[5]. An even lower value of r could be predicted for a similar test of items on the questionnaire portion of the study, though the actual correlation test was not conducted due to limited N in that portion of the study.

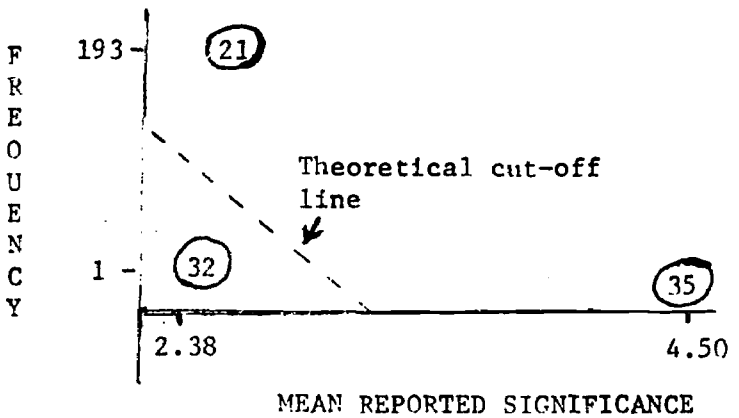
Conclusions and Recommendations

Several points should be considered in the application of the data obtained in this study to the design of an educational program for supervisory personnel. First, it must be noted that this study only involved tasks actually performed and reported as performed by 28 supervisors in nine industrial firms in Wisconsin's North Central VTAE District. Second, it should be noted there were significant differences in two properties (frequency and significance of task) and the two types of test (actual observation of tasks and tasks reported as performed). Finally, it should be pointed out that no attempt, beyond management's assignment of supervisors to be studied, was made to correlate tasks studied with tasks deemed essential by management for "good" supervisors. With these points in mind, the research team makes the following suggestions.

First, the data obtained in the task analysis, or instrument application, portion of the study could be used to design a two-dimensional profile of the observed tasks of industrial supervisors. The vertical axis of such a profile could be frequency of occurrence for each task and the horizontal axis could be the reported significance of each task. Each task could then be plotted on the graph, using the two coordinates for that task. Such a hypothetical profile is illustrated in figure 1, using only three tasks from the actual study as examples.

FIGURE 1

Profile of routine supervisory tasks, instrument items 16 through 59



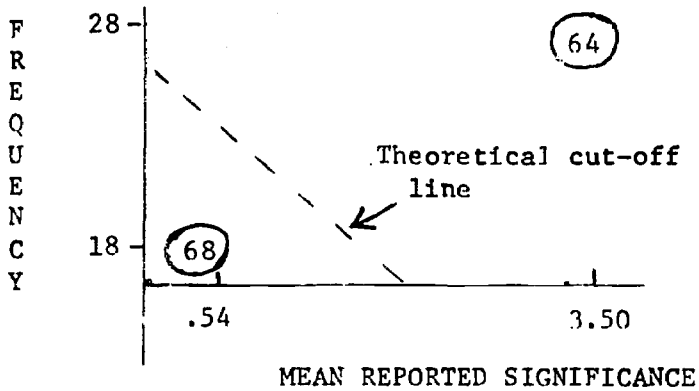
Circled numbers are numbered items from the instrument, plotted on two dimensions

A separate two-dimensional profile could be generated for those "less than routine tasks" studied in the questionnaire portion of the study. Such a hypothetical graph has been reproduced in figure 2, using only two tasks from the actual study to illustrate the type of profile suggested. Since the means of actual tasks and reported tasks do differ, no attempt should be made to combine routine task profiles with less than routine task profiles.

Finally, advisory committees, involving top management personnel from the industries studied and coordinators and instructors from the various educational disciplines reflected in the study should be established to determine just where actual cut-off lines on the two profiles should be placed. Any task falling to the right and above the

FIGURE 2

Profile of less than routine supervisory tasks, instrument items 60 through 71



Circled numbers are numbered items from the instrument, plotted on two dimensions.

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cut-off lines could be the core for a complete course in the proposed program. Any task falling below and left of the cut-off lines could be incorporated in general courses or ignored in the educational program. It should be pointed out that the theoretical cut-off lines on the example profiles in figures 1 and 2 are illustrative of the procedure proposed and are in no way suggestive of any actual cut-off lines which could be generated by persons presently working in industrial management positions.

Future Study

It is suggested that additional studies of the comparison of task analysis and questionnaire techniques be conducted. The research team is designing such a study, based on the items and data from this particular study.

Since the principle investigators are communications instructors, they have a great deal of interest in the type of communications used and the direction in which that communication flowed. This information was recorded for each communications task in the instrument, and will be reported in the near future. It is hoped that any communications units considered for any proposed courses in Industrial Supervisory Development will be based in part on that report.

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