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RATINGS OF ORGANIZATIONAL QUALITY AND PRODUCTIVITY IN THE NATIONAL AGRICULTURAL STATISTICS SERVICE

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Abstract

In mid-1989, 21 NASS supervisors and 20 non-supervisors (all except one from Headquarters) attended a series of management seminars and training sessions dealing with long range quality improvement. All attendees rated NASS' status on the ten-item Organizational Quality & Productivity Self-Audit; during the final seminar, 20 attendees completed the six-item Quality Management Maturity Grid. Both instruments' results indicated that NASS has some, but not all, of the key ingredients needed for "sustaining organizational quality and productivity improvement." There still is room for improvement in quality management. It was therefore recommended that NASS management consider these results and take suitable actions to instill organizational improvement. For example, administering customized organizational quality instruments to more personnel at regular intervals may help in validly detecting or diagnosing trends in perceived quality, and NASS' progress toward specific goals. NASS also is likely to obtain better results if it involves professionals well-versed in diagnosing and assessing organizational issues. Using objective, external measures of productivity and quality in NASS also would be helpful.

Keywords: Quality Management, Organizational Quality, Productivity.

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SUMMARY

During July to August 1989, 21 supervisors and 20 non-supervisors, all but one from NASS headquarters, attended a series of in-house management seminars dealing with the philosophy and techniques used in long range quality improvement. Virtually all Washington, D.C.-based branch chiefs and higher levels of NASS management attended the first three sessions, dealing with major issues in the field and the value of quality control. NASS headquarters statisticians directly involved in the June Agricultural Survey attended the next nine sessions, dealing with specific statistical and graphical quality control techniques.

The 41 attendees completed the ten-item Organizational Quality & Productivity Self-Audit (Maryland Center for Quality and Productivity, University of Maryland, 1986). Each item dealt with features, actions and management practices considered important for "sustaining organizational quality and productivity improvement." A 10-point rating scale was used to rate the extent to which each survey topic was present at NASS. During the final seminar 20 attendees completed the six-item Quality Management Maturity Grid (Crosby, 1980). Each respondent used a five-point rating scale to rate NASS' status on each topic. Survey data were analyzed to understand NASS personnel's current views toward quality control philosophy, and how these views varied by managerial status and amount of NASS experience.

Organizational Quality & Productivity Self-Audit results indicated that NASS has some, but not all, of the key ingredients needed for "sustaining organizational quality and productivity improvement." Overall, the 41 respondents perceived NASS as being about halfway between having none and having all of these ingredients in place. The highest overall scale mean was 8.2; 24 percent of respondents had overall scale means greater than 7.0. Of the remaining 76 percent, 29 percent had mean overall scores of 6.0 to 6.9, 35 percent scored between 5.0 and 5.9, while 12 percent had scores of less than 5.0. The median score was 6.0.

The topics Development of People and Awareness of the Challenge were considered **most** characteristic of NASS. Considered **least** characteristic of NASS were: Innovation is Encouraged, Broad Employee Involvement, and [Quality As] A Way of Life. Mean overall scores of respondents varied widely, from 4.1 to 8.2 points on the 10-point scale. The amount of variation present (also seen in fairly large item standard deviations for the 10-point rating scale used) suggests a low degree of consensus in how employees see NASS and its efforts to move toward higher quality.

NASS management may need to communicate better with its personnel, so that they gain a more unified and greater sense of "mission identification" and NASS' concern for quality.

Managers and non-managers had similar overall scores and scale item means. Mean survey item scores for managers were highest on the topic Development of People and lowest on Innovation is Encouraged. Mean item scores for non-managers were highest on Awareness of the Challenge and lowest on Broad Employee Involvement. Managers had higher mean scores than did non-managers on Broad Employee Involvement (6.0, compared with 4.5).

Quality Management Maturity Grid items with the highest means, Problem Handling, Summation of Company Quality Posture, and Management Understanding and Attitude, were about halfway between the management experience categories of "Stage II: Awakening" and "Stage III: Enlightenment". Respondents seldom used the highest levels of quality. Of the six items, between 53 percent and 89 percent of all respondents chose the two lowest categories---"Stage #I: Uncertainty" or "Stage II: Awakening". This was particularly true for Quality Improvement Actions, on which 89 percent (17 of the 19 respondents) selected the second lowest rating category, "Stage #II: Awakening". No overall group differences related to years at NASS were found.

Survey findings suggest that NASS has achieved some growth in quality management, although organizational improvement still is needed. NASS management needs to explore why these rating levels have occurred. An organizational quality measure more customized to NASS' mission and having better measurement properties also might be found or developed. If so, it should be periodically administered to (1) detect current levels and trends in perceived quality, and (2) monitor whether certain approaches actually improve Agency progress toward specific goals. To perform this work, NASS should involve professionals well-versed in diagnosing and assessing organizational issues.

INTRODUCTION

During mid-July through August 1989, 41 employees of the National Agricultural Statistics Service (21 supervisors and 20 staff members) participated in a series of in-house management seminars. These seminars dealt with the philosophy and techniques used in long range quality improvement. The seminars were conducted under contract by members of the Maryland Center for Quality and Productivity, College of Business and Management, University of Maryland.

As stated in the Administrator's July 3, 1989 memorandum distributed to NASS deputy administrators, division directors, branch chiefs, and staff directors, the purpose of these seminars was ". . . to familiarize ourselves with the current ideas of organizational quality so we may communicate ideas on quality among ourselves and with the survey quality team in a mutually understood language. The result should be a more unified strategy for implementing quality management in NASS."

These seminars might be considered a natural extension of other current efforts in the field to increase organizational quality. These efforts include the productivity improvement and quality enhancement (PIQE) program begun in 1982 by the National Aeronautics and Space Administration. This agency later developed evaluation criteria and guidelines for the NASA Excellence Award for Quality and Productivity, competitively awarded to its contractors and their suppliers (Jarrett, 1989). The award was patterned on the Deming Award used in Japan.

The Malcolm Baldridge National Quality Award first was issued in 1988 to represent a national quality award for the United States. NASA also has held two national conferences which focussed on organizational efforts to maintain and increase high levels of quality and productivity. (Gerard and Edwards, 1984, 1986) Several national associations now focus on quality control and employee involvement in participative quality processes (for example, The Association for Quality and Participation and The American Society for Quality Control). Numerous books also have been written on the topic by Deming, Crosby (1980), and others.

The federal government also has internally emphasized the productivity and quality improvement process. Its overall goal has been "to promote timely delivery of high quality cost effective products and services to the public." (Circular No. A-132. (Executive Office of the President, Office of Management and Budget, 1988).

Through Circular No. A-132 Executive Branch departments and federal agencies have received guidelines for developing, implementing and monitoring this process.

The seminar conducted by NASS consisted of 12 three-hour sessions. The first three sessions primarily were intended for branch chief and higher levels of NASS management based in Washington, D.C. Twenty-one of these personnel (including a State Statistician from a neighboring state) attended the three seminars. In addition to these managers, 20 other NASS headquarters-based staff members directly involved in the June Agricultural Survey participated.

The first three sessions dealt with the benefits of having increased organizational quality, major ideas advocated by authorities in the field, historical contexts for quality improvement directions, and similar topics. The next nine sessions in the series focussed on specific statistical and graphical techniques used in quality control procedures. These sessions were only attended by the 20 non-managerial personnel also attending the first three sessions.

The seminar attendance represented an opportunity to assess the current perception of quality control in NASS, although the findings cannot be directly generalized to all parts of the organization. The 21 branch level and above attendees attending the first three sessions represented virtually all of NASS' headquarters-based managerial personnel. This is a subset of NASS worth studying in its own right. However, since only one SSO manager was present, the findings can be only tentatively generalized to all SSO managers. These managerial personnel and the 20 non-managerial personnel have worked in SSO settings for the most part, although not at present. Results therefore may not reflect SSO experiences. Keeping these limitations in mind, survey information was gathered and analyzed, as presented in this report.

METHODOLOGY

During the first quality control seminar each of the 41 attendees completed a 10-question, self-administered questionnaire (titled, The Organizational Quality & Productivity Self-Audit). The questionnaire had been developed by the Maryland Center for Quality and Productivity at the University of Maryland (1986).

Survey topic content was based on a consensus of organizational themes, recommended actions and management practices discussed at the 1984 National Aeronautics and Space Administration (NASA) "Symposium on Productivity and Quality: Strategies for Improving Operations in Government and Industry." This symposium was attended by more than 650 top executives from over 110 corporations, 35 government agencies, and 20 universities (Gerard and Edwards, 1984).

Each item in the Self-Audit dealt with features considered important for "sustaining organizational quality and productivity improvement," as described in the questionnaire's instructions. Each item used a 10-point scale to rate how characteristic that particular feature was of NASS. (See Appendix Exhibit A-1, where the Self-Audit is reprinted with permission.)

Each rating scale contained three verbal anchors, or set of phrases expressed in behavioral terms. These phrases varied from scale to scale, based on the topic being rated. They were intended to guide respondents in understanding the range of response alternatives available, and in making low, middle or high ratings. Phrases therefore were placed at the first (low), tenth (high), and sixth (middle) scale points. After rating each of the 10 items respondents then totalled them. Total scores therefore could range from 10 to 100, or if a respondent completed all ten items, mean individual scores could range from 1.0 to 10.0.

The 20 persons attending the final nine quality control seminars varied in NASS experience. Six of them had less than five years, one between five and nine years, and 13 had 10 or more years. At the end of these seminars the 20 attendees completed another survey instrument, the Quality Management Maturity Grid. This was reproduced from Philip Crosby's book Quality Is Free (Crosby, 1980; see Appendix Exhibit A-2 where the Grid is reprinted with permission). This book had been distributed earlier throughout NASS headquarters.

Each person completed the Grid survey by writing-in his/her number of years worked at NASS, followed by rating at what stage NASS was believed to be on each of six topics. The five rating scale categories represented progressively more advanced stages of organizational or corporate maturity in using quality management procedures. The categories were the following:

Stage I: Uncertainty
Stage II: Awakening
Stage III: Enlightenment
Stage IV: Wisdom
Stage V: Certainty

These categories were used to rate the following six topics or "experience relations" (Crosby, 1980):

Management Understanding and Attitude
Quality Organization Status
Problem Handling
Cost of Quality As A Percent
Quality Improvement Actions, and
Summation of Company Quality Posture.

Each of these categories was represented by behavioral descriptions of organizational situations, so that by selecting a particular category it was possible to characterize how extensively quality management procedures were being used at the setting being rated. (See Appendix Exhibit A-2.) For example, for the topic Quality Improvement Actions, the Stage II: Awakening scale point was: "Trying obvious 'motivational' short-range efforts." Behaviorally anchored rating scales were used rather than the widely used Likert-type summated rating scales. (The latter format uses brief verbal phrases or response categories such as, "very much agree," "moderately agree," "slightly agree," and "not at all agree," Green, Chapter 9 in Volume I of Lindzey, 1954).

The value of using the Grid to detect organizational quality was described by Crosby (1980, page 25) as follows:

> "The need for long-range programs in quality can be deduced intellectually through the Grid. A manager of any operation can spend a few moments with the Grid, recognize familiar events, and pinpoint where the operation is at that moment. Then all that is necessary is to refer to the following stage of the Grid in order to know what actions need to be taken for improvement. And in the cases where an established program is now deteriorating, the Grid can be read backwards. You can see the last point at which you were successful and figure out how to get back there."

Analytic Goals

Data from these two surveys, the Organizational Quality & Productivity Self-Audit and the Quality Management Maturity Grid, were analyzed to: (1) understand current views held toward quality control philosophy and various aspects of that issue, and (2) determine whether or not differences in managerial status and the amount of NASS experience were related to these perceptions.

STUDY RESULTS BASED ON THE ORGANIZATIONAL QUALITY & PRODUCTIVITY SELF-AUDIT SURVEY

Overall Score Results

Frequency distributions, means, and standard deviations for mean overall scores appear in Table 1. Corresponding statistics for each of the 10 Organizational Quality & Productivity Self-Audit survey items appear in Table 2. All item distributions, means and standard deviations are based on 41 responses. None of the respondents omitted any item. The results in Table 1 reveal the following patterns. The overall scale score of 6.2 (each respondent's total scale score divided by 10, since respondents answered all 10 survey items) closely corresponds to the midpoint of the scale items. Most respondents treated this midpoint as being between "6" and "7." That is, overall the 41 NASS personnel perceived NASS as being about halfway between having none of the "key ingredients for sustaining organizational quality and productivity improvement" (to quote the survey's instructions section), and having all of these ingredients.

Although 24.4 percent of the respondents had overall scale scores of 7.2 or above, the remaining three-quarters of the personnel (75.6 percent) had mean scores of below "7". That is, almost one-third (29.3 percent) of all respondents had mean overall scores of 6.0 to 6.9, 34.1 percent had mean overall scores of between 5.0 and 5.9, while 12.2 percent had scores of less than 5.0. However, scores varied widely; overall scale scores ranged from 4.1 to 8.2, with a standard deviation of 1.1 rating scale points on the 10-point scale. This variation held for all 10 scale items. As shown in Table 2, the largest standard deviations were 2.1, for both Top Management Leadership and Broad Employee Involvement. The "smallest" standard deviation still exceeded one scale point, on the item Awareness of the Challenge.

The 41 respondents rated Development of People as being the **most** characteristic of NASS (mean= 7.5). This was followed closely by Awareness of the Challenge (mean= 7.4), then Appropriate Technology (mean= 6.5). Therefore, even the highest mean, 7.5, was only slightly more than 1 scale unit above the average of all 10 survey items, 6.2. The latter closely corresponds to the "true" rating scale midpoint of 5.5. (However, Appendix A-1 indicates that the middle rating scale statement seemed to be at 6.0 when used.) Three scale items had the lowest overall mean ratings and therefore were considered least characteristic of NASS. These were: Innovation is Encouraged (mean= 5.2), Broad Employee Involvement (mean= 5.3) and A Way of Life (mean= 5.6).

TABLE 1: FREQUENCY DISTRIBUTIONS, MEANS AND STANDARD DEVIATIONS FOR ORGANIZATIONAL QUALITY AND PRODUCTIVITY SELF-AUDIT OVERALL SCALE SCORES

MEAN SCALE SCORE

Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
4.1	1	2.4	1	2.4
4.2	1	2.4	2	4.9
4.5	1	2.4	3	7.3
4.7	1	2.4	4	9.8
4.9	1	2.4	5	12.2
5.0	1	2.4	6	14.6
5.1	2	4.9	8	19.5
5.2	1	2.4	9	22.0
5.3	1	2.4	10	24.4
5.4	1	2.4	11	26.8
5.5	1	2.4	12	29.3
5.7	2	4.9	14	34.1
5.8	4	9.8	18	43.9
5.9	1	2.4	19	46.3
6.0	2	4.9	21	51.2
6.3	1	2.4	22	53.7
6.4	4	9.8	26	63.4
6.5	1	2.4	27	65.9
6.7	1	2.4	28	68.3
6.8	3	7.3	31	75.6
7.2	1	2.4	32	78.0
7.4	1	2.4	33	80.5
7.5	2	4.9	35	85.4
7.7	1	2.4	36	87.8
7.8	1	2.4	37	90.2
7.9	1	2.4	38	92.7
8.0	1	2.4	39	95.1
8.1	1	2.4	40	97.6
8.2	1	2.4	41	100.0

Mean = 6.2 Standard Deviation = 1.1

TABLE 2: FREQUENCY DISTRIBUTIONS, MEANS AND STANDARD DEVIATIONS FOR INDIVIDUAL ITEMS

1. AWARENESS OF THE CHALLENGE

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
5	5	12.2	5	12.2
6	5	12.2	10	24.4
7	8	19.5	18	43.9
8	13	31.7	31	75.6
9	10	24.4	41	100.0

Mean = 7.4 Standard Deviation = 1.3

2. VISION FOR THE FUTURE

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	5	12.2	5	12.2
4	6	14.6	11	26.8
5	5	12.2	16	39.0
6	7	17.1	23	56.1
7	13	31.7	36	87.8
8	3	7.3	39	95.1
9	2	4.9	41	100.0

Mean = 5.8 Standard Deviation = 1.7

3. TOP MANAGEMENT LEADERSHIP

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	2.4	1	2.4
3	5	12.2	6	14.6
4	6	14.6	12	29.3
5	3	7.3	15	36.6
6	5	12.2	20	48.8
7	8	19.5	28	68.3
8	7	17.1	35	85.4
9	5	12.2	40	97.6
10	1	2.4	41	100.0

Mean = 6.2 Standard Deviation = 2.1

4. INNOVATION IS ENCOURAGED

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	4.9	2	4.9
3	5	12.2	7	17.1
4	10	24.4	17	41.5
5	6	14.6	23	56.1
6	7	17.1	30	73.2
7	6	14.6	36	87.8
8	3	7.3	39	95.1
9	2	4.9	41	100.0

Mean = 5.2 Standard Deviation = 1.8

5. BROAD EMPLOYEE INVOLVEMENT

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	4.9	2	4.9
2	1	2.4	3	7.3
3	4	9.8	7	17.1
4	8	19.5	15	36.6
5	9	22.0	24	58.5
6	7	17.1	31	75.6
7	4	9.8	35	85.4
8	2	4.9	37	90.2
9	3	7.3	40	97.6
10	1	2.4	41	100.0

Mean = 5.3 Standard Deviation = 2.1

6. STRUCTURE FITS STRATEGY

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	2.4	1	2.4
3	3	7.3	4	9.8
4	4	9.8	8	19.5
5	4	9.8	12	29.3
6	7	17.1	19	46.3
7	13	31.7	32	78.0
8	7	17.1	39	95.1
9	2	4.9	41	100.0

Mean = 6.2 Standard Deviation = 1.7

7. APPROPRIATE TECHNOLOGY

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
4	8	19.5	8	19.5
5	5	12.2	13	31.7
6	8	19.5	21	51.2
7	4	9.8	25	61.0
8	12	29.3	37	90.2
9	4	9.8	41	100.0

Mean = 6.5 Standard Deviation = 1.7

8. DEVELOPMENT OF PEOPLE

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
4	1	2.4	1	2.4
5	2	4.9	3	7.3
6	6	14.6	9	22.0
7	12	29.3	21	51.2
8	10	24.4	31	75.6
9	6	14.6	37	90.2
10	4	9.8	41	100.0

Mean = 7.5 Standard Deviation = 1.4

9. FOCUS ON PERFORMANCE

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	2.4	1	2.4
3	2	4.9	3	7.3
4	2	4.9	5	12.2
5	6	14.6	11	26.8
6	8	19.5	19	46.3
7	13	31.7	32	78.0
8	8	19.5	40	97.6
9	1	2.4	41	100.0

Mean = 6.3 Standard Deviation = 1.6

10. A WAY OF LIFE

Item Score	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	2.4	1	2.4
2	2	4.9	3	7.3
3	2	4.9	5	12.2
4	6	14.6	11	26.8
5	11	26.8	22	53.7
6	2	4.9	24	58.5
7	10	24.4	34	82.9
8	6	14.6	40	97.6
9	1	2.4	41	100.0

Mean = 5.6 Standard Deviation = 1.9

Factor analysis techniques were used to determine if item ratings for certain items were similar enough to other ratings so that a meaningful pattern existed. If so, it would be easier to understand the obtained data. Three underlying dimensions or types of topics were found to be a useful and clear way of expressing the correlations among the ten survey items. (See Appendix A of Pawel, Fecso and Little, 1989 for a discussion of principal components factor analysis, the approach used here, and Appendix Table B-1, page 38 of this report for specific findings.)

The primary factor seemed to deal with future concerns or viewpoints toward quality control. Four survey item topics best described this dimension: Awareness of the Challenge, Appropriate Technology, Top Management Leadership, and Vision for the Future. A fifth item, Structure Fits Strategy, seemed more similar to these items than to any other, and therefore was considered part of this factor. The second factor, a relatively less important or less common set of ratings, might be characterized as a strategic- or philosophy-based dimension, which dealt with ways of using organizational approaches to quality control. This factor was best described by the following survey items: Broad Employee Involvement, Innovation is Encouraged, A Way of Life, and Focus on Performance.

The third factor was only slightly less important than was the second factor. It mainly was based on one item, Development of People, making the factor difficult to characterize. However, that item is a people-oriented topic. It therefore might be considered less of an organizational feature than would other survey topics.

Differences Between Managers and Non-Managers

The 21 managers and 20 non-managers had few differences in their item means. Table 3 contains the overall scale means, item means, differences between manager and non-manager item means, and item standard deviations. The rows of item means and standard deviations are arranged in descending order of factor loading size. This provides a clearer sense of how similar items differentiated manager and non-manager item scores.

Managers' mean survey item scores ranged from a high of 7.8 (when rounding Table 3 data to one decimal place) on the topic Development of People to a low of 5.5 for Innovation is Encouraged. This level suggests that even those responsible for introducing innovative approaches into NASS believe that NASS lacks such an atmosphere. Non-managers' mean item scores ranged from 7.4 on the topic Awareness of the Challenge to 4.5 on Broad Employee Involvement.

Although managers had a numerically greater overall scale score, it did not differ significantly from that for non-managers (6.4, compared to 6.0). It also may be of interest (and therefore suggest a pattern) that managers also had numerically higher mean scores than those of non-managers in how they perceived the:

* Development of people at NASS (item 8, see Exhibit A-1 for its text)
* Extent of top management support (item 3)
* Extent to which the NASS organizational structure supports and enhances its efforts to carry out a strategy (item 6)
* Presence of structured mechanisms for broad employee involvement (item 5)
* Way of life at NASS, or extent to which quality/productivity improvement is incorporated into management and human resource management systems (item 10), and the
* Extent to which NASS actively encourages innovation (item 4).

Managers had higher survey item means on six of the 10 individual items. However, the two sets of NASS personnel did not significantly differ across the vector of 10 survey item scores (Wilks' lambda=.713, F= 1.216, df= 10,30 and P=.321). However, there was some interest in understanding the nature of differences between the two sets of personnel on these dimensions. Additional, exploratory analyses therefore were conducted, despite the reduced statistical power.

As shown in Table 3, all differences in managers and non-managers' means were .57 of a unit or less, except for item 5, Broad Employee Involvement. This item was defined as: "The extent to which the organization provides structured mechanisms for employee involvement (e. g., quality circles, task teams, Scanlon committees, etc.) in decision making for all members of the organization." The mean rating of managers on this topic was 6.0 (or about average), while for non-managers it was 4.5. This difference of 1.5 points was about three-quarters of a standard deviation lower.

This item's scores significantly differentiated managers from non-managers when considering these personnel as two independent groups (univariate F= 5.875, p=.020). This type of result also occurred when hypothesizing managers' data on item 5 as a population parameter, the level at which non-managers might be if they were Washington, D. C. area managers. A one-sample t statistic was computed by comparing non-managers' item 5 ratings to managers' mean ratings on this item. The resulting t statistic was significant (t= 3.470, p=.003).

It is of interest that item 5, Broad Employee Involvement loaded on factor 2 (see Appendix Table B-1), as did two items with the next largest differences between sets of scores. These items were: Innovation is Encouraged, and A Way of Life, with differences of .57 and .56, respectively (see Table 3).

A multiple linear discriminant function analysis of survey item ratings was conducted to determine how similar were managers' data patterns to those of non-managers, and how well the data could categorize respondents. Overall, 76 percent of those in either group were accurately classified into their respective group, based on their survey item data patterns. For managers, data from 76 percent of the 21 respondents were classified into the managerial group. For non-managers, 75 percent of the 20 personnel were classified into the non-managerial group. Both of these classification rates were higher than each group's prior probability (about 50 percent) of being classified into the appropriate set of respondents.

TABLE 3: MEANS AND STANDARD DEVIATIONS OF OVERALL SCALE SCORES AND INDIVIDUAL ITEMS BY FACTOR AND MANAGERIAL STATUS

Factor Number	Scores	MEANS			STANDARD DEVIATIONS	
		Mgrs	Non-Mgrs	Difference	Mgrs	Non-Mgrs
	Overall Scale Score	6.37	6.02	.35	1.10	1.12
1	Awareness of the Challenge	7.43	7.45	- .02	1.33	1.36
1	Appropriate Technology	6.24	6.70	- .46	1.76	1.66
1	Top Management Leadership	6.43	5.90	.53	2.14	2.17
1	Vision for the Future	5.76	5.90	- .14	1.55	1.89
1	Structure Fits Strategy	6.33	6.05	.28	1.56	1.93
2	Broad Employee Involvement	6.00	4.50	1.50	2.02	1.93
2	Innovation is Encouraged	5.52	4.95	.57	1.99	1.67
2	A Way of Life	5.86	5.30	.56	1.74	2.08
2	Focus on Performance	6.29	6.30	- .01	1.59	1.59
3	Development of People	7.76	7.25	.51	1.34	1.52

Note: See Exhibit A-1 for description of survey items and rating scale categories.

STUDY RESULTS BASED ON THE QUALITY MANAGEMENT MATURITY GRID

As mentioned previously, the Quality Management Maturity Grid consisted of six self-administered survey items, completed by 20 NASS non-supervisory headquarters staff members directly involved in the June Agricultural Survey and State Statistical Offices' activities for that survey. A five-point scale was used to rate each item. Each scale ranged from Stage I: Uncertainty to Stage V: Certainty. Ratings were used to characterize employees' views of the quality management level present at NASS.

Overall Results

Table 4 contains means and standard deviations. The three survey items with the highest means were: Problem Handling (2.50) and Summation of Company Quality Posture (2.42), followed closely by Management Understanding and Attitude (2.40). Each of these survey item means therefore were about halfway between the categories of "Stage II: Awakening" and "Stage III: Enlightenment." (See Appendix Exhibit A-2 for the actual instrument and behavioral descriptions used to convey these two stages.)

The three items were not strongly related to each other, since their largest intercorrelation was .382 (between the first and third items). This correlation did not statistically differ from zero. (See Appendix Table B-2 presents the bivariate correlations between pairs of these six items, those correlations which statistically differed from zero, and the number of respondents who answered each pair.)

The item with the lowest overall mean was Quality Organization Status (2.11). The item Cost of Quality as a Percent had the most nonresponse (omitted by 5 of the 20 NASS personnel). This may have been because some respondents considered its question style and category formats unsuitable for the NASS setting and/or its being a government agency. Although respondents were asked to consider the item as a "percentage of operating costs," this did not fully help. Several respondents even highlighted their difficulties in handling the format by writing-in question marks alongside the item. The level of non-response suggests that certain topics which are effective for industrial settings are not always equally useful in other settings, and therefore need to be adapted and refined for NASS application.

Table 4 indicates that the six survey items had similar standard deviations; these ranged from .61 to .96 of a rating scale point.

However, Table 5 contains the distributions of scores for each of the six survey items. Fifteen or more of the 20 NASS personnel given the instrument completed each item. Nonetheless, not all respondents used all rating scale categories. In particular, the highest rated levels of quality were seldom used. Of the six items, between 53 percent and 89 percent of all personnel responding selected the two lowest categories--- "Stage #I: Uncertainty" or "Stage II: Awakening". This was particularly true on the item Quality Improvement Actions, on which 89 percent (17 of the 19 respondents) selected the second lowest category, "Stage #II: Awakening".

Only one person used the category representing the most quality, "Stage V: Certainty," and in doing so, for only one survey item, Quality Improvement Actions. Similarly, the next level of rated quality, "Stage IV: Wisdom," was used with all of the six survey items. However, only three of the 20 respondents rated NASS at this level (all with ten or more years of experience at NASS), and one of these three persons provided four of the six "Stage IV: Wisdom" responses. These responses may be due to order effects or global impressions of NASS rather than to the items' specific content, since three of the four "Stage IV: Wisdom" ratings were made to consecutive survey items.

TABLE 4: ITEM MEANS AND STANDARD DEVIATIONS FOR THE QUALITY MANAGEMENT MATURITY GRID

	SURVEY ITEM	MEAN	S. D.
1.	Management Understanding & Attitude	2.40	0.68
2.	Quality Organization Status	2.11	0.68
3.	Problem Handling	2.50	0.61
4.	Cost of Quality As A Percent	2.27	0.96
5.	Quality Improvement Actions	2.26	0.81
6.	Summation of Company Quality Posture	2.42	0.77

TABLE 5: NUMBER OF RESPONDENTS SELECTING EACH RATING SCALE CATEGORY BY QUALITY MANAGEMENT MATURITY GRID ITEM

	RATING SCALE CATEGORIES					
	#I: Uncertainty	#II: Awakening	#III: Enlightenment	#IV: Wisdom	#V: Certainty	No. of Omissions
1. Management Understanding & Attitude	1	11	7	1	0	0
2. Quality Organization Status	2	13	2	1	0	2
3. Problem Handling	0	11	8	1	0	0
4. Cost of Quality As A Percent	4	4	6	1	0	5
5. Quality Improvement Actions	0	17	0	1	1	1
6. Summation of Company Quality Posture	2	8	8	1	0	1

Responses of those at NASS for 10 or more years (N=13) were compared with those at NASS for less than 10 years (N=7). Table 6 presents the group means, standard deviations, and number of respondents for the six survey items. The rows of data are arranged in descending order, based on the item means for personnel having 10 or more years at NASS.

For five of the six survey items, personnel at NASS for 10 or more years had higher means than those at NASS for less than 10 years. The exception to this was the topic Problem Handling, for which NASS personnel of less than 10 years had a higher mean (2.71, compared with 2.38). Five of seven respondents (or 71 percent) with less than 10 years experience had ratings at the "Stage III: Enlightenment" level. This category was defined as: "Corrective action communication established. Problems are faced openly and resolved in an orderly way." Due to their lesser experience, this group's results may be based on their dealing with smaller scope problems, which generally are easier to organize and resolve. In addition, six of the seven members of this group had a greater involvement in and awareness of quality philosophies, and therefore were more likely to use that approach. (As a footnote, four of these individuals are no longer with NASS.)

In contrast, nine of thirteen respondents (or 69 percent) with ten or more years experience had ratings at the less advanced "Stage II: Awakening" level. This category was defined as "Teams are set up to attack major problems. Long-range solutions are not solicited." If this is actually true (that senior NASS employees believe that long-range solutions for major problems are not being sufficiently addressed, notwithstanding the presence of teams), then this represents an area of some concern.

The more experienced group generally had higher item means than the other. However, the two groups did not significantly differ overall (multivariate F-ratio= 1.397; df= 6, 7; Wilks' lambda= 0.455, p= 0.334), nor on any of the six individual survey items.

TABLE 6: QUALITY MANAGEMENT MATURITY GRID ITEM MEANS AND STANDARD DEVIATIONS BY YEARS EMPLOYED AT NASS

Topic	10 OR MORE YEARS N	Mean	Std Dev	LESS THAN 10 YRS N	Mean	Std Dev
Summation of Company Quality Posture	12	2.58	0.90	7	2.14	0.38
Management Understanding & Attitude	13	2.46	0.78	7	2.29	0.49
Cost of Quality As A Percent	11	2.45	0.93	4	1.75	0.96
Quality Improvement Actions	12	2.42	1.00	7	2.00	0.00
Problem Handling	13	2.38	0.65	7	2.71	0.49
Quality Organization Status	11	2.27	0.79	7	1.86	0.38

DISCUSSION AND CONCLUSIONS

Organizational Quality & Productivity Self-Audit results indicate that NASS has some, but not all, of the key ingredients needed for "sustaining organizational quality and productivity improvement." About one quarter of the respondents had overall scale scores of between 7.2 and 8.2. None of the mean overall ratings were greater than 8.2, although a ten-point scale was available. Two topics, Development of People and Awareness of the Challenge, were considered most characteristic of NASS by both managers and non-managers. These topics had mean ratings of 7.5 and 7.4 on the ten-point scale. Managers generally have been at NASS longer than non-managers and therefore were possibly in a better position to rate its current status in dealing with quality control issues. As a result, managers considered Development of People as an quality management and organizational feature which was more characteristic of NASS than did non-managers (7.8 compared with 7.2).

On the other hand, findings also suggest that NASS may need organizational improvement.

A score of "9" or "10" (on the 10-point scale used here) should be considered a desirable score level. This indicates that a fairly high level of organizational quality management is present. However, three-quarters of the personnel (75.6 percent) had mean scores of below "7". This includes the over one-third (34.1 percent) of respondents having mean overall scores of between 5.0 and 5.9, while 12.2 percent had scores of less than 5.0. The median score was 6.0.

In addition, both managers and non-managers rated certain factors related to organizational quality and productivity improvement as only about average or even slightly below. This particularly applied to three survey topics with the lowest overall mean ratings: Innovation is Encouraged, Broad Employee Involvement, and A Way of Life. Directly related to these topics, Krajewski and Ritzman (1987) wrote in assessing the roles of quality management:

> "Quality must be the concern of all employees from the top manager to the hourly worker. The challenge of quality management is to instill an awareness of the importance of good quality in all employees and provide an environment in which employees are motivated to improve quality."

These views have been echoed at both National Aeronautics and Space Administration (NASA) national conferences on ways to maintain increase organizational quality and productivity (Gerard and Edwards, 1984, 1986). Deming's consistent belief that "quality is management's responsibility" also suggests that NASS management may wish to explore the reasons for these rating levels. If warranted, it should take suitable actions to bring about organizational improvement.

Because of the Self-Audit's survey format, even relatively high scores may actually indicate a lower perception of NASS. As Appendix Exhibit A-1 indicates, some of the verbal phrases used to anchor the mid-points of scales are more negative than neutral. For example, the topic Vision for the Future had the phrase "Some evidence of top management vision but little understanding or consensus throughout the organization," as a scale mid-point. As another example, Item 7, Appropriate Technology, included the following phrase in its scale mid-point: " . . . ideas for new technology rarely come from non-management employees." In general, with a more neutral or relatively more positive mid-point, ratings might have been higher. In addition, the wording used to describe rating scale mid-points overlapped the "6," "7, and "8" scale positions, also making it difficult to validly respond with a given category.

Thus, the position representing a scale's mid-point sometimes was unclear, probably varied with the respondent and topic being rated, and may not have uniformly conveyed each survey item's true mid-point. How closely attitude scale points match a person's beliefs on a topic, and how easily respondents can select a category is an important issue in validly assessing attitudes. Thus it would be useful in the future, if the scale is reused here or elsewhere, to thoroughly review its layout and concepts, reformat it as needed, and revise certain response category phases if they do not accurately represent that portion of the rating scale.

Rating patterns also reflect other signs of a possible need for organizational improvement at NASS. Mean overall ratings of what quality control features are now present at NASS sizably varied (by a range of 4.1 scale points). This variation might be due to one or more of the following reasons:

(a) personnel actually do differ in how they perceive these factors and their visibility at NASS; ratings particularly varied on the topics Broad Employee Involvement, Innovation is Encouraged, Top Management Leadership, and A Way of Life,

(b) particular topics were hard to rate because of their very nature and how they occur at NASS; not all personnel are involved in, sufficiently know about NASS activities and policies, or recall enough instances so that they can reliably rate those topics, and

(c) the possibly multidimensional survey, its layout, type of question wording, and behaviorally expressed rating scale format which at times was unrepresentative of NASS activities reduced the validity of the findings.

If the topics had been measured more sensitively and precisely, it is possible that less variation in ratings might have resulted. However, a sizable amount of variation was present on all topics and on both measurement instruments. This suggests that employees do not sufficiently agree (for the sake of organizational effectiveness) on how they see NASS and its efforts to move toward higher quality. Perhaps there is a need to communicate better with NASS personnel at all levels. In this way personnel might gain a unified, higher sense of "mission identification" and more fully understand NASS' goals, concern for quality, and activities to reach those goals.

There were no statistically significant overall differences between managers and non-managers. Perhaps the overall sample size of 41 respondents was too low or the item standard deviations (ranging from 1.3-2.1 units) were too large. Nonetheless, on the topic Broad Employee Involvement managers' and non-managers' mean ratings differed by 1.5 points. This topic dealt with ". . . the extent to which the organization provides structured mechanisms for employee involvement . . . in decision making for all members of the organization." The sizable disparity in these two sets of ratings suggests that this topic may be one of concern.

Study results also showed that three factors or response dimensions were most associated with rating scale scores. These response dimensions should be emphasized when considering possible changes in NASS policies and procedures. As mentioned earlier, these factors were the following:

(1) A primary factor, characterized as dealing with future concerns or viewpoints toward quality control (defined by the survey item topics Awareness of the Challenge, Appropriate Technology, Top Management Leadership, and Vision for the Future),

(2) A second factor, characterized as a strategic- or philosophy-based dimension; this dealt with ways of using organizational approaches to quality control (defined by the survey item topics Broad Employee Involvement, Innovation is Encouraged, A Way of Life, and Focus on Performance), and

(3) A third factor, defined by a people-oriented topic, one survey item, Development of People.

The first factor appears to reflect a concern for whether or not NASS can advance its quality control levels, on what job elements or aspects NASS needs to do so, and whether all personnel (managers or non-managers) agree on the mission of NASS. The second factor may deal with ways of promoting the need for quality control, instituting procedures for measuring greater productivity and increased quality, and generally increasing internal communication on quality control issues.

The third factor reflects a topic which did not strongly correlate with other topics. However, it seems quite important and appropriate: how personnel grow within an organization and contribute to it. Respondents rated this item as being the most characteristic of NASS. However, it may be less regarded since it was the third factor extracted from analyses. Such an issue also could be related to job satisfaction, and in turn to employee turnover and the relative attractiveness of other work settings (a relationship found in a number of organizational research studies).

At present, NASS lacks a valid measure of organizational quality which would be useful to have. There may already exist relevant instruments which (1) more closely mirror the working conditions of NASS staff and which (2) have reasonable validity and reliability levels. If so, a literature search should be conducted to find these measures, compare their relative merits, and make a presentation to NASS on a suggested adoption decision. Some of the instruments already in the field may fit NASS' purposes, since they may generically deal with relevant topics (such as organizational goals). Or, it may be valuable to redesign The Organizational Quality & Productivity Self-Audit for future and periodic use (assuming the authors who hold its copyright grant permission to do so). As part of that redesign, there needs to be agreement on how to meaningfully and clearly define and measure organizational quality in a governmental, official Statistical Agency context, or as NASS sees its mission. Any related issues, such as how innovation operates in such contexts, also would have to be defined (see Wilk, 1989). As Hansen said in the discussion following Wilk's paper,

> "Innovation can be successful and effective in the balanced approach. . . described. It includes a willingness to ask why we are doing the things as we are and the way we are, to constantly re-examine goals and how to achieve them, and to consider and evaluate alternatives--- to plan, but to re-examine and to keep plans flexible."

The redesigned instrument needs to be sufficiently valid and reliable to make results credible and a basis for planning. For example, data used in this study came from seminar participants. Expectations of attending such sessions may have shifted the initially completed Self-Audit scores; actually participating in such sessions may have affected the later-completed Grid scores. (Of course, if scores were somehow increased by respondents being part of these seminars, this is an area of concern, since the scores indicate a need for improvement which therefore is even greater.) NASS personnel not part of such training, such as those in SSO's, may have different scores or perceptions of NASS organizational quality.

In addition, these data represent attitudinal measurements rather than (1) more objective or independent, proven measures of productivity and quality, or perhaps (2) management audit teams' interviews with NASS personnel over several months. (At least this is a longer period of measurement or sample of NASS experiences than data gathered on one occasion.) If attitudinal views of NASS' status agreed with such measures of "reality," it would strengthen these perceptions' concurrent validity, consistency and utility.

It may be that personnel (managerial or non-managerial, Headquarters or SSO) have a better or worse view of NASS' organizational quality and productivity than actually is the case. It would be useful to know this by regularly using objective measures within NASS and analyzing their levels.

In general, having a clear-cut picture of what needs to be measured will help make quality control survey results as useful as possible. A more focussed and streamlined survey could become a starting point for calibrating "initial" (as of a particular date) levels of perceived quality control in NASS. The same survey could be periodically readministered to detect trends in perceived quality. In particular, it could help determine whether desired levels of effectiveness had been reached after undertaking certain programs designed to improve the Agency. If survey results indicated that these levels were not reached, then other quality improvement approaches could be used. The survey then could be re-administered to measure improvement within NASS (after allowing for the intended program effects to occur). This technique is called "discrepancy evaluation," and is used to regularly check for improvement and progress toward desired quality control goals or levels.

The survey could become a better diagnostic tool for detecting employee perceptions by redesigning and basing it on the three factors or underlying dimensions found in survey data patterns. Other topics related to quality control also could be added to survey content. The survey also could be supplemented with other types of measures, such as open-ended survey items or focus discussion groups. These could provide an even clearer-cut picture of quality control levels, and the features considered most needed for NASS' progress toward higher quality.

Quality Management Maturity Grid findings were similar to Organizational Quality & Productivity Self-Audit results. Each of the three Grid survey items with the highest means, Problem Handling, Summation of Company Quality Posture, and Management Understanding and Attitude was about halfway between the measurement categories of "Stage II: Awakening" and "Stage III: Enlightenment" on the five-point rating scale. Like the Self-Audit data, Grid data reflect room for improvement at NASS, fulfilling the diagnostic purpose Crosby (1980) intended for it. For example, only one person on one survey item used the highest level of "Quality Management Maturity, "Stage V: Certainty." Similarly, only three of the 20 persons used the next highest category "Stage IV: Wisdom." This rating scale category was used on each of the six survey items, although one respondent provided four of these six responses.

As with Self-Audit items, fairly large standard deviations for the five-point rating scale were present (ranging from three-fifths to almost one scale point). This variation suggests a lack of agreement among managers and non-managers on these issues as they exist at NASS.

Those at NASS for 10 or more years had higher item means on five of the six Quality Management Maturity Grid items than did those at NASS for less than 10 years. Both groups of personnel apparently share the same viewpoints toward quality management issues, since multivariate tests did not reveal any statistically significant differences. However, data also indicate two areas of concern. On the topic Problem Handling, NASS personnel of less than 10 years had a higher mean than those at NASS for 10 years or more (2.71, compared with 2.38). Almost seven out of ten of this more senior group of NASS personnel believed that teams exist for meeting major problems, but that long-range solutions are not asked for. This important focus for planning was perceived as relatively less present than it probably should be. In addition, the topic Quality Organization Status had the lowest overall mean. This topic's implications probably should be considered to determine if action is needed.

In summary, each of the two sets of survey findings suggest that NASS has achieved some growth in quality management. However, there still is room for improvement, for the betterment of the organization and its employees. Periodically using a more suitable or improved, redesigned survey to detect shifts in perceived quality control and related organizational issues may be one way of effectively monitoring these shifts.

REFERENCES

Crosby, P.B. Quality Is Free. New York, New York: NAL PENGUIN, 1980.

Executive Office of the President, Office of Management and Budget. Circular No. A-132. Washington, D. C. April 22, 1988.

Gerard, M. and Edwards, P. W. (Eds.) Strategies for Revitalizing Organizations. Proceedings of the Second NASA Symposium on Quality and Productivity, Washington, D. C., December 2-3, 1986. Sponsored by National Aeronautics and Space Administration, in cooperation with American Institute of Aeronautics and Astronautics, 1986.

Gerard, M. and Edwards, P. W. (Eds.) White-Collar Productivity and Quality Issues. Proceedings of the NASA Symposium on Productivity and Quality: Strategies for Improving Operations in Government and Industry, Washington, D. C., September 25-26, 1984. Sponsored by National Aeronautics and Space Administration, operated by American Institute of Aeronautics and Astronautics, 1984.

Green, B. F. Attitude Measurement. Chapter 9 in Lindzey, G. (ed.) Handbook of Social Psychology. Volume I: Theory and Method. Reading, MA: Addison-Wesley Publishing Company, 1954.

Jarrett, J. Ensuring World Leadership: NASA's Excellence Award for Quality and Productivity. Journal for Quality and Participation, 12, #1, 100-102, 1989.

Krajewski, L. and Ritzman, L. Operations Management. Reading, MA: Addison-Wesley, 1987.

Maryland Center for Quality and Productivity, College of Business and Management, the University of Maryland. The Organizational Quality & Productivity Self-Audit. College Park, Maryland: Author, 1986.

Pawel, D., Fecso, R. and Little, J. An Examination of Correlations in Board Reported Yields for Several Commodities (SRB Staff Report Number SRB-89-02). Washington, D.C.: National Agricultural Statistics Service, United States Department of Agriculture, March 1989.

Wilk, M. B. Management's Contributions to Innovation in Statistics Canada. In: Proceedings of the Fifth Annual Census Bureau Research Conference. Washington, D.C.: Bureau of the Census, U.S. Department of Commerce, 1989.

APPENDIX A: DATA COLLECTION INSTRUMENTS

EXHIBIT A-1: THE ORGANIZATIONAL QUALITY & PRODUCTIVITY SELF-AUDIT *

Instructions

Listed below are characteristics which the Maryland Center's research suggests are key ingredients for sustaining organizational quality and productivity improvement. Please rate your organization on each item by circling the appropriate number on the 10-point scale. When you have completed the ratings, use the score sheet to calculate your total score.

1. **Awareness of the Challenge** - The extent to which members of the organization are aware of present and future challenges due to competitive and changing economic or budgetary conditions.

1	2	3	4	5	6	7	8	9	10
Little evidence that members of the organization are aware of the challenges.					Top management is aware but few others are.				People at all levels are aware of the challenges.

2. **Vision for the Future** - The organization has a clear understanding of a strategy which allows it to meet the competitive challenge and be the type of organization (values, philosophy, etc.) required to implement that strategy.

1	2	3	4	5	6	7	8	9	10
Little evidence that the organization has a vision for the future.					Some evidence of top management vision but little understanding or consensus throughout the organization.				Broad understanding and consensus throughout the organization regarding the future vision.

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3. **Top Management Leadership** - The extent to which top management support for quality/productivity improvement is consistently and visibly demonstrated and the extent to which that support flows through to all management levels.

1	2	3	4	5	6	7	8	9	10
Little visible evidence of top management support for quality/ productivity improvement.					Evidence of senior management support but that support does not flow through to lower management levels.				Consistent, visible top management support that does flow through all management levels.

4. **Innovation is Encouraged** - The extent to which the organization actively encourages innovation through creating a climate that encourages and supports risk-taking and creative solutions rather than "playing it safe."

1	2	3	4	5	6	7	8	9	10
It's clear that way to be successful in this organization is to avoid mistakes and play it safe.					Risk taking is tolerated but not promoted. If you ever fail there are negative con- sequences to be feared.				Risk taking is the rewarded and there is tolerance for failure. The organization actively nurtures innovation.

5. **Broad Employee Involvement** - The extent to which the organization provides structured mechanisms for employee involvement (e.g., quality circles, task teams, Scanlon committees, etc.) in decision making for all members of the organization.

1	2	3	4	5	6	7	8	9	10
There are no structured mechanisms for employee invol- vement in deci- sion making except for an ineffective suggestion system.					There are effect- ive structured mechanisms for employee involve- ment but less than 50% of the employees actually participate.				There are effective structured mechan- isms for employee involvement which reach over 50% of the employees.

6. Structure Fits Strategy - The extent to which the organization structure supports and enhances the organization's efforts to carry out its strategy and build the type of organization that can effectively react to a rapidly changing environment.

1 2 3 4 5 6 7 8 9 10

The organization is out of "sync" with the strategy rigid and inflexible.

Some structural changes have been made to support the effort but more are needed.

The organization structure clearly supports the and is strategy. It allows for flexibility and adaptability to respond to environmental demands.

7. Appropriate Technology - The extent to which the organization gives priority in technology investment decisions to new equipment or technology that will promote its strategic goals, and the extent to which the organization has mechanisms in place to identify such technology.

1 2 3 4 5 6 7 8 9 10

Investment in production/ office technology is evaluated on the basis of short-term cost rather than contribution to strategic position. Most ideas for new technology come from engineering or outside experts.

Strategic considerations sometimes outweigh short term costs in technology decisions. Ideas for new technology rarely come from non-management employees.

Strategic considerations routinely outweigh short term cost in technology decisions. Ideas for new technology often originate with non-management employees.

8. **Development of People** - The extent to which the competitive position of the organization is viewed as dependent on the continuing growth of people and the existence of organization mechanisms (e.g., management accountability, developmental assignments, training, etc.) to support that growth.

1	2	3	4	5	6	7	8	9	10
There is little explicit commitment to employee development and few mechanisms support it.					Employee development is encouraged but the responsibility rests solely with the individual employee.				Managers are held accountable for the development of their people, and employee development is widely viewed as a principal contributor to the competitive position.

9. **Focus on Performance** - The extent to which the organization's strategy is translated into specific performance expectations at all levels and performance measures exist to provide feedback to performers at all levels regarding how well they are performing.

1	2	3	4	5	6	7	8	9	10
Performance expectations are unclear and there is little apparent relationship between the strategy and performance measures which are used.					Performance expectations are reasonably clear but measurement and feedback systems focus on cost/budgets rather than physical performance.				Performance expectations are clear and measurement systems permit employees to assess how well they are doing on dimensions that are linked to the organization's strategy.

10. A Way of Life - The extent to which quality/productivity improvement is incorporated into management and human resources management systems leading employees to view continuous quality/productivity improvement as a way of life and the way to be successful in this organization.

1	2	3	4	5	6	7	8	9	10

Most employees in this organization see little personal benefit to them from improved quality/ productivity.

There have been some attempts to link quality/productivity improvement to pay and promotion decisions, but this is very inconsistent. Quality and/or productivity are seen as programs that will pass.

Continued quality/ productivity improvement is viewed as a way of life in this organization and as a win/win situation for both the organization and the employees.

Record Your Responses Below

Item #	Rating
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
TOTAL =	_____

EXHIBIT A-2: THE QUALITY MANAGEMENT MATURITY GRID *

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APPENDIX B: SELECTED TABLES

APPENDIX TABLE B-1: FACTOR LOADINGS OF ORGANIZATIONAL QUALITY AND PRODUCTIVITY SELF-AUDIT ITEMS

Method: A principal components factor analysis of data from 41 respondents was used with an orthogonal varimax rotation. Factor loadings of .600 or greater were used as criteria for determining on which factors particular survey items loaded. This analysis approach resulted in a very interpretable three-factor structure. All items were reasonably assigned to a single factor or underlying dimension. This structure was more easily interpretable than when using four or five factors, other analyses which were tried. The three-factor approach had eigenvalues greater than 1.0 and explained 67 percent of the total variance.

Eigenvalues of the Correlation Matrix: Total Variance

	FACTOR 1	FACTOR 2	FACTOR 3
Eigenvalues of Matrix	4.201	1.381	1.154
Difference in Eigenvalues		2.820	.227
Proportion of Total Variance	.420	.138	.115
Cumulative Variance	.420	.558	.674

Final Rotated Factor Pattern (Most Interpretable Structure)

SURVEY ITEM	FACTOR 1	FACTOR 2	FACTOR 3
Awareness of the Challenge	<u>.844</u>	.162	.221
Vision for the Future	<u>.773</u>	.265	-.128
Top Management Leadership	<u>.781</u>	.440	-.201
Innovation Is Encouraged	.171	<u>.710</u>	.300
Broad Employee Involvement	-.071	<u>.788</u>	-.055
Structure Fits Strategy	<u>.502</u>	.493	-.360
Appropriate Technology	<u>.807</u>	-.041	.268
Development of People	.087	.188	<u>.872</u>
Focus on Performance	.261	<u>.592</u>	.087
A Way of Life	.357	<u>.671</u>	.091

Note: Underlined factor loadings represent the factor assigned to each item. See page 13 for a description of these factors.

APPENDIX TABLE B-2: BIVARIATE INTERCORRELATIONS BETWEEN QUALITY MANAGEMENT MATURITY GRID ITEMS

	ITEM NUMBERS					
	1.	2.	3.	4.	5.	6.
1. MANAGEMENT UNDERSTANDING & ATTITUDE	1.000 0.0 20	.277 .266 18	.382 .096 20	**.545** .036 15	.288 .231 19	.275 .255 19
2. QUALITY ORGANIZATIONAL STATUS		1.000 0.0 18	.267 .284 18	**.604** .022 14	**.678** .002 18	.456 .057 18
3. PROBLEM HANDLING			1.000 0.0 20	.449 .093 15	**.605** .006 19	.330 .168 19
4. COST OF QUALITY AS A PERCENT				1.000 0.0 15	.504 .066 14	**.760** .002 14
5. QUALITY IMPROVEMENT ACTIONS					1.000 0.0 19	.439 .060 19
6. SUMMATION OF COMPANY QUALITY POSTURE						1.000 0.0 19

Note: The likelihood of correlations being significantly greater than zero appears below each correlation coefficient; probabilities less than an alpha level of .05 are underlined. The number of persons answering both survey items appears below each significance level.

QUALITY MANAGEMENT MATURITY GRID

Rater _____ Unit _____

Measurement Categories	*Stage I: Uncertainty*	*Stage II: Awakening*	*Stage III: Enlightenment*	*Stage IV: Wisdom*	*Stage V: Certainty*
Management understanding and attitude	No comprehension of quality as a management tool. Tend to blame quality department for "quality problems."	Recognizing that quality management may be of value but not willing to provide money or time to make it all happen.	While going through quality improvement program learn more about quality management; becoming supportive and helpful.	Participating. Understand absolutes of quality management. Recognize their personal role in continuing emphasis.	Consider quality management an essential part of company system.
Quality organization status	Quality is hidden in manufacturing or engineering departments. Inspection probably not part of organization. Emphasis on appraisal and sorting.	A stronger quality leader is appointed but main emphasis is still on appraisal and moving the product. Still part of manufacturing or other.	Quality department reports to top management, all appraisal is incorporated and manager has role in management of company.	Quality manager is an officer of company; effective status reporting and preventive action. Involved with consumer affairs and special assignments.	Quality manager on board of directors. Prevention is main concern. Quality is a thought leader.
Problem handling	Problems are fought as they occur; no resolution; inadequate definition; lots of yelling and accusations.	Teams are set up to attack major problems. Long-range solutions are not solicited.	Corrective action communication established. Problems are faced openly and resolved in an orderly way.	Problems are identified early in their development. All functions are open to suggestion and improvement.	Except in the most unusual cases, problems are prevented.
Cost of quality as % of sales	Reported: unknown Actual: 20%	Reported: 3% Actual: 18%	Reported. 8% Actual: 12%	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%
Quality improvement actions	No organized activities. No understanding of such activities.	Trying obvious "motivational" short-range efforts.	Implementation of the 14-step program with thorough understanding and establishment of each step.	Continuing the 14-step program and starting Make Certain.	Quality improvement is a normal and continued activity.
Summation of company quality posture	"We don't know why we have problems with quality."	"Is it absolutely necessary to always have problems with quality?"	"Through management commitment and quality improvement we are identifying and resolving our problems."	"Defect prevention is a routine part of our operation."	"We know why we do not have problems with quality."