

Evaluation of Conducive Environment for Implementation of Quality Management System in an Organisation

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ABSTRACT

The ISO 9000 quality management system (QMS) is a philosophy. It is a consistent and logical approach, which if implemented and practiced in day-to-day activities, with total support from senior management, can lead to doing things right, first time—every time. Many organisations adopt ISO 9000 system as a milestone in their quest for quality management programme. Effectiveness of a system depends on the attitude of employees who are responsible for its implementation. Therefore, it is essential to know the prevailing environment in an organisation. To measure the attitude of employees, a survey through a well-designed questionnaire can be used as an effective tool. The items of questionnaire are framed on the basis of requirements of QMS. Attitude of employees is measured on a five-point scale, for each answer. Agreement or disagreement (positive or negative) directly measures the attitude of an employee on the said aspect. Data analysis is carried out for establishing the validity of individual score to the total score of items across, using product moment correlation formula. Based on analysis of data, a comprehensive programme can be worked out for correcting the deficiencies observed through the attitude survey. This can also be used as a base for measuring the improvement of QMS in an organisation.

Keywords: ISO 9000, quality management system, QMS, quality assurance

1. INTRODUCTION

The ISO 9000 quality management system (QMS) is a philosophy and an important tool in any organisation. Reputation of any organisation depends on the quality management system. This standard provides the guidelines for building the QMS in an organisation. It comprises all the activities, such as marketing, design, procurement, manufacturing, inspection and testing, servicing, measurement, data analysis and work towards continual improvement of QMS functions.

Monitoring mechanisms for the implementation of QMS are necessary. At each step, information

regarding progress of the programme is required to ensure success of the programme. An individual or a group of persons may be given the responsibility to monitor the progress. Special questionnaires can be designed to collect information from the employees, about the effectiveness of the system. Based on analysis of the data, corrective actions can be planned.

2. DIAGNOSTIC METHODS

Sehein (1988) observed that three different methods can be used to collect data: (i) direct observations, (ii) individual or group interviews, and (iii) questionnaires or some other survey instruments. Survey feedback method constitutes an important

stream for the measurement of organisational change movement. This method was developed by the Survey Research Centre at the University of Michigan. Three prominent scales have been used for the measurement of attitude, i.e., Thurstone, Guttman and Likert. Likert scale technique was developed by Rensis Likert for the measurement of attitudes forms the basis of the questionnaire used for survey feedback method.

3. METHODOLOGY

3.1 Designing of Questionnaire

A sample questionnaire has been designed based on the clauses of ISO 9001 in which the number of questions vary from 30 to 50. It is distributed initially to a few for evaluation and suggestions for its improvement. Then, the final questionnaire is designed based on this feedback and is introduced at an organisational level.

3.2 Selection of Respondents

Based on strength and structure of the organisation, the selection of employees can be made. Employees can be grouped into (i) top executives level, (ii) middle management level, (iii) lower management level, (iv) technical/scientific staff, and (v) supporting staff. Ten per cent of respondents at each level can be selected randomly from the groups for introducing the questionnaire. It can be distributed along with a note, mentioning the objective of survey, explanation for difficult questions and any other information which may deemed to be necessary for clarity.

3.3 Data Collection & Analysis

3.3.1 Data Collection

Agreement or disagreement of scientists/technical officers for the items of the questionnaire is measured on a five-point scale: Strongly agree (SA), agree (A), undecidedness (U), disagree (D), and strongly disagree (SD). The scale is chosen in such a way that the disagreement will come out prominently. The purpose of data collection is two-fold: (i) deciding direction, and (ii) measuring

magnitude. Total score is obtained by adding the response of all the respondents. Percentage for each category is calculated and is presented pictorially.

3.3.2 Data Analysis

For establishing validity, calculation of coefficient of correlation (r) with the individual item score to the total score of items across all the respondents data is carried out with the help of computer using product moment correlation formula*.

$$r = \frac{N \times \Sigma XY - \Sigma X \times \Sigma Y}{\sqrt{N \times \Sigma X^2 - (\Sigma X)^2} \times \sqrt{N \times \Sigma Y^2 - (\Sigma Y)^2}}$$

The items with poor correlations (< 0.26 at 5% confidence level) are eliminated and the remaining items are included for analysis of scores (*Appendix A*).

4. EVALUATION OF ATTITUDE OF DRDL SCIENTISTS/TECHNICAL OFFICERS

The technique was applied to assess the level of awareness of ISO 9001 QMS among the employees of DRDL. The study was restricted to officers, since the responsibility of implementation lies with them. Ten per cent of employees from each category were selected randomly. The following three groups were formed:

Level	No. of employees	No. of samples
Senior-level scientists (F & G)	78	8
Middle-level scientists (B to E)	300	30
Technical officers (A & B)	176	18

A total of 45 questions were framed based on the requirements of 20 clauses of ISO 9001 (*Appendix B*).

4.1 Analysis of Data

The questionnaire used in the study is based on attitude scale. Attitude are vector quantities having

* Earnest & McCormic, 1979, p. 591

magnitude and direction. Both these components have been separately calculated in terms of the percentage of strong agreement, agreement, undecidedness, disagreement and strong disagreement for each item separately. Score for the items is recorded in numbers and percentage on a format can be given as

Item No. : _____

Response	SA	A	U	D	SD
Frequency in numbers					
Frequency in percentage					

4.1.1 Dispersion of Responses

Coefficient of correlation for six items, i.e., item Nos. 1, 7, 8, 31, 33 and 40 are below the limit 0.26 at 5 per cent level of significance. Therefore, these items are deleted from the dispersion analysis. Dispersion analysis of remaining 39 items are also evaluated. Dispersion of responses for 45 and 39 items are given in Tables 1 and 2, respectively and are also shown in pie diagram in Figs 1 and 2, respectively.

Table 1. Dispersion of responses for 45 items

Category	Frequency	Magnitude of direction (%)
SA	287	11.4
A	1526	60.6
U	542	21.5
D	162	6.4
SD	3	0.1
	2520	100

Table 2. Dispersion of responses for 39 items

Category	Frequency	Magnitude of direction (%)
SA	247	11.3
A	1271	58.2
U	513	23.5
D	150	6.9
SD	3	0.1
	2184	100

The figures clearly indicate a total agreement with agreement statement, the next largest is undecidedness(U) and the next is strongly agree(SA). Agree(A) and strongly agree(SA) put together constitute 72 per cent in the case of 45 items and 69.5 per cent in the case of 39 items as shown in Tables 3 and 4, respectively. The data indicates that the requirements of ISO 9001 system are understood clearly.

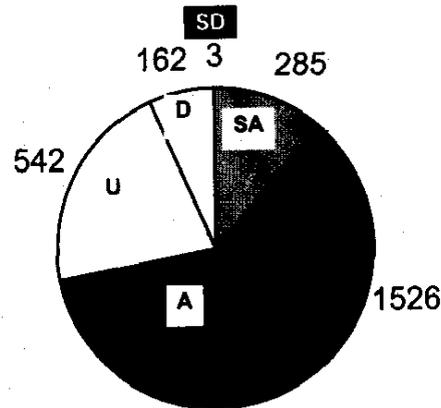


Figure 1. Direction of attitude of responses for 45 items

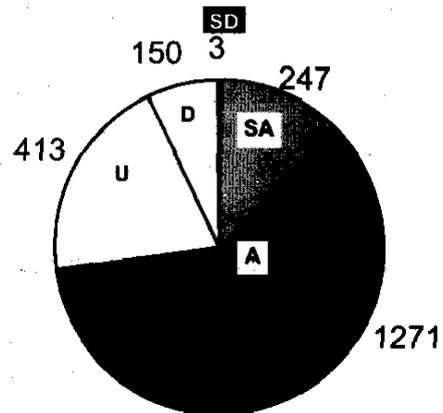


Figure 2. Direction of attitude of responses for 39 items

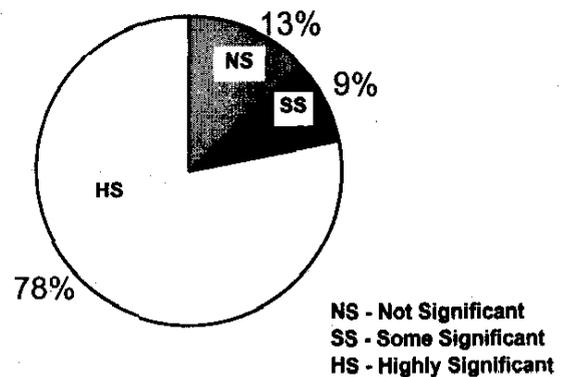


Figure 3. Coefficients of correlation

Table 3. Direction of attitude of responses for 45 items

Attitude	Scale	Frequency	Calculation	Percentage	Degree (Pie diagram)
SA	1	287	$287 \times 100/2520$	11.39	41.0
A	2	1526	$1526 \times 100/2520$	60.55	218.0
U	3	542	$542 \times 100/2520$	21.51	77.4
D	4	162	$162 \times 100/2520$	6.43	23.1
SD	5	3	$3 \times 100/2520$	0.12	0.5

Table 4. Direction of attitude of responses for 39 items

Attitude	Scale	Frequency	Calculation	Percentage	Degree (Pie diagram)
SA	1	247	$247 \times 100/2184$	11.3	40.7
A	2	1271	$1271 \times 100/2184$	58.2	209.5
U	3	513	$513 \times 100/2184$	23.5	84.6
D	4	150	$150 \times 100/2184$	6.9	24.8
SD	5	3	$3 \times 100/2184$	0.1	0.4

4.2 Coefficients of Correlation Analysis

Coefficients of correlation analysis was carried out, using computer for each item. Seventy eight per cent of questions were highly significant. Details are given in Fig. 3 and *Appendix C*.

5. CONCLUSION

Survey feed mechanism for the evaluation of attitude of employees for a given system is an effective tool. The initial data provides the basic information and forms the base for planning the corrective action for improving the effectiveness of system. This technique can be used successfully for the evaluation of effectiveness of QMS on continual basis.

REFERENCES

- Jackson, Peter & Ashton, David. Implementing quality through BS 5750 (ISO 9000), Vinod Vasishtha, New Delhi, 1993.
- Stebbing, Lionel. Quality assurance—the root to efficiency and competitiveness. Ellis Harwood Ltd., England, 1986.
- Bajaria, Hans J. Quality assurance—methods, management and motivation. Society of Manufacturing Engineers, Michigan-48128, 1981.
- Anand, K.K. Quality management handbook. Vikas Publishing House, Pvt Ltd, New Delhi, 1993.
- Fox, Michael J. Quality assurance management. Chapman & Hall, London, 1993.
- Munro, Lesley, *et al.* Achieving quality standards, a step-by-step guide to BS 5750/ISO 9000. Pitman Publishing, London, 1994.
- Quality management and quality assurance standards—guidelines for selection and use. ISO 9000—1994.
- Quality systems—model for quality assurance in design/development, production, installation and servicing. ISO 9001—1994.
- Quality systems—Guidelines on elements of quality management system. ISO 9004—1994.

Significance of Coefficient of Correlation

This table shows the relationship between the size of sample and the value of coefficient of correlation (or rho) required for significance at the 5 per cent and 1 per cent levels. Use this table as follows: Find the number of cases in which r is based in the column labelled (N). Opposite this number will be two values, one for a 5 per cent level

of significance, and the other for a 1 per cent level of significance. If the coefficient lies above both of these values, it may be said to be highly significant; if it lies between these values, it is of some significance; if it falls below both values, it is not considered significant.

Sample size			Sample size			Sample size		
Coefficient of correlation (r) at level of significance (%)			Coefficient of correlation (r) at level of significance (%)			Coefficient of correlation (r) at level of significance (%)		
N	5	1	N	5	1	N	5	1
10	0.63	0.77	29	0.37	0.47	48	0.28	0.37
11	0.60	0.74	30	0.36	0.46	49	0.28	0.36
12	0.58	0.71	31	0.36	0.46	50	0.28	0.36
13	0.55	0.68	32	0.35	0.45	51	0.27	0.36
14	0.53	0.66	33	0.34	0.44	52	0.27	0.35
15	0.51	0.64	34	0.34	0.44	53	0.27	0.35
16	0.50	0.62	35	0.33	0.43	54	0.27	0.35
17	0.48	0.61	36	0.33	0.42	55	0.26	0.34
18	0.47	0.59	37	0.32	0.42	56	0.26	0.34
19	0.46	0.58	38	0.32	0.41	57	0.26	0.34
20	0.44	0.56	39	0.31	0.41	58	0.26	0.34
21	0.43	0.55	40	0.31	0.40	59	0.26	0.33
22	0.42	0.54	41	0.31	0.40	60	0.25	0.33
23	0.41	0.53	42	0.30	0.39	75	0.23	0.30
24	0.40	0.52	43	0.30	0.39	100	0.20	0.26
25	0.40	0.51	44	0.30	0.38	200	0.14	0.18
26	0.39	0.50	45	0.29	0.38	500	0.09	0.12
27	0.38	0.49	46	0.29	0.38	1000	0.06	0.08
28	0.37	0.48	47	0.29	0.37			

Source: Miles A Tinker and Wallace A Russel. Introduction to methods in experimental psychology.

**Questionnaire for Evaluating the Environment in DRDL
for Implementation of ISO 9001 Quality System**

Name :

Designation :

Department :

Item No.	SA	A	U	D	SD
1. DRDL quality policy is clear to me.					
2. Our tasks are well defined.					
3. ISO 9001 quality system as a long-term strategy is good for DRDL.					
4. ISO 9001 quality system carries big potential in bringing awareness in quality at all levels.					
5. Quality of the products is going to increase to a great extent by adoption of ISO 9001 quality system.					
6. ISO 9001 plan is a serious attempt of the management in the direction of improving the quality.					
7. Procedures involved in ISO 9001 are useful though they are somewhat time consuming.					
8. Increased paper work involved in ISO 9001 is a part of the system and inevitable.					
9. DRDL has conducive environment for ISO 9001.					
10. Introduction of ISO 9001 comes as an opportunity to us in evaluating weaknesses.					
11. Introduction of ISO 9001 is going to eliminate ambiguities in jobs.					
12. ISO 9001 is going to define employees job precisely.					
13. ISO 9001 system has improved the accountability.					
14. Information availability on job parameters has improved after introducing ISO 9001 system.					
15. ISO 9001 has given a boost in quality planning.					
16. ISO 9001 can make design infrastructure stronger.					
17. ISO 9001 has rendered great help for verification and validation of system.					
18. ISO 9001 can improve the process of review, recording and control of design changes in a better way.					
19. By the introduction of ISO 9001 quality system, documentation and data control has been improved.					

Item No.	SA	A	U	D	SD
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					
34.					
35.					
36.					
37.					
38.					
39.					
40.					
41.					
42.					
43.					
44.					
45.					

SIGNATURE

APPENDIX C

Analysis of Coefficient of Correlation Table

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14
Sum(X)	113	124	82	82	132	100	100	103	147	138	156	151	159	130
Sum(Y)	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662
Sum(X ²)	243	306	136	138	352	208	190	211	421	382	478	447	491	320
Sum(Y ²)	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186
Sum(XY)	11486	12738	8438	8426	13660	10381	10152	10486	15248	14291	16116	15576	16458	13315
R numerator	3410	11240	8244	7572	17576	15136	2312	4030	21574	18940	19224	17294	21390	9580
Denom1	28.97	41.95	29.87	31.69	47.83	40.60	25.30	34.74	44.35	48.46	49.32	47.23	47.06	31.94
Denom2	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69
Correlation coefficient r	0.1685	0.3835	0.3951	0.3420	0.5259	0.5336	0.1308	0.1660	0.6962	0.5594	0.5579	0.5240	0.6505	0.4293

Contd...

Item 15	Item 16	Item 17	Item 18	Item 19	Item 20	Item 21	Item 22	Item 23	Item 24	Item 25	Item 26	Item 27	Item 28	Item 29
120	109	116	96	115	121	146	118	115	117	134	152	148	157	111
5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662
278	241	260	188	253	281	408	268	245	255	348	440	410	455	233
581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186
12333	11190	11906	9942	11835	12465	15031	12155	11739	11929	13702	15620	15161	16071	11366
11208	9482	9944	13200	11630	12938	15084	12564	6254	5570	8604	14096	11040	11042	8014
34.18	40.19	33.23	36.22	30.71	33.09	39.14	32.92	22.25	24.31	39.14	39.19	32.50	28.83	26.96
698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69
0.4694	0.3377	0.4283	0.5216	0.5420	0.5596	0.5516	0.5462	0.4023	0.3279	0.3146	0.5148	0.4862	0.5482	0.4254

Contd...

Item 30	Item 31	Item 32	Item 33	Item 34	Item 35	Item 36	Item 37	Item 38	Item 39	Item 40	Item 41	Item 42	Item 43	Item 44	Item 45
108	119	119	137	127	168	134	134	113	110	110	162	160	135	142	92
5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662	5662
228	277	271	357	305	524	334	340	239	224	226	506	478	359	400	172
581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186	581186
11064	12097	12179	13955	13055	17182	13684	13791	11558	11194	11197	16666	16377	13899	14574	9498
8088	3654	8246	5786	12006	10976	7596	13588	7442	4044	4212	16052	11192	13974	12140	10984
33.23	36.76	31.86	34.97	30.84	33.47	27.35	32.92	24.80	21.07	23.58	45.74	34.18	43.35	47.29	34.18
698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69	698.69
0.3484	0.1423	0.3704	0.2368	0.5572	0.4694	0.3975	0.5907	0.4295	0.2747	0.2557	0.5023	0.4687	0.4614	0.3674	0.4600