

A Survey of TQM Practices in North Karnataka Manufacturing SMEs: an Empirical Evaluation

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Abstract: As the result of a perception that smaller firms do not have the resources necessary to implement TQM effectively, the focus of the literature has been on large organizations. For this study, a survey instrument was developed and a survey conducted to investigate the level of practice of TQM elements and to find the most critical factors perceived by the small and medium sized manufacturing enterprises (SMEs). Attempts at finding significant differences in quality practices were made and the result established the existence of significant differences between perceived and practice response on Total Quality Management implementation among small and medium manufacturing enterprise groups.

Index Terms— Total Quality Management, Business Excellence, Small and Medium Sized Enterprises, Perception, business excellence

I. INTRODUCTION

In view of the global level competition companies have emphasized that quality should be integrated into all aspects of products, processes, and services within their management system. Hence Total Quality Management (TQM) has become increasingly popular as one of the managerial tool in ensuring continuous improvement so as to improve customer satisfaction and retention, as well as, to ensure its product or service quality. A study has been undertaken to know the extent of the use of TQM practices of SMEs in north Karnataka.

II. LITERATURE REVIEW

TQM has the potential to not only increase competitiveness and organizational effectiveness but also improve product quality and organizational performance (Ahire, 1996). Powell (1995) suggests that there are significant relationships between TQM, competitive advantage and business excellence. A study by Simmons and White (1999) concluded that ISO 9000 registered companies are more competitive and profitable than non-ISO 9000 companies. The overall results point to the significant and positive impact of TQM on competitive advantage and customer satisfaction, which, in turn, significantly improves the performance of these companies. Hence, quality has been seen as a fundamental capability for enterprises to develop. Quality advocates have identified several critical principles for successful TQM practices like: top management role,

customer focus, supplier relationship, benchmarking, quality-oriented training, employee focus, zero-defects, process improvement and quality measurement (Saraph et al, 1989). Although, TQM is a well-established field of study for business excellence the success rate of TQM implementation is not very high. The major reason for TQM failure is owing to the tendency to look at TQM as tool and not as a system.

The critical factors of TQM are almost invariant across countries. The critical success factors of TQM identified for this study are Leadership & Top Management Commitment(LTMC), Vision and Plan Statement(VPS), Supplier Quality Management (SQM), System Process Quality Improvement (SPQI), Total employee involvement (TEI), Education and Training(ET), Performance Appraisal and Recognition (PAR), Customer Focus Satisfaction and(CFS), Evaluation(En), Work Environment and Culture (WEC), Continuous Improvement (CI), and Communication(Co), with a perspective on how to use critical factors as the foundation for driving transformational orientation in order to create a sustainable performance of business excellence

III. RESEARCH METHODOLOGY

The objective of this study is to investigate the level of implementation of TQM in north Karnataka SMEs. To that end, a survey questionnaire was developed. A total of twelve constructs were proposed. A 5-point Likert scale was employed with a score of 1= strongly disagree; 2=Disagree; 3= Neutral; 4= Agree; 5= strongly agree, for *practice* (level of perceived importance to the enterprise) and 1= Not important at all; 2=Not important; 3= Neutral important; 4=Important; 5= very important for *importance* (level of perceived importance to the enterprise). Having validated the questionnaire through expert validation and pilot testing, a sample of 950 companies of small and medium enterprises in north Karnataka region, were selected from the Directory of the north Karnataka small scale industries association (NKSSI) and the data base of the Karnataka Small and Medium Industry Development Corporation (KSMIDEC). The full survey, through mailed questionnaire and personal visits was carried out. Although the response rate was initially not encouraging, various techniques were used to improve the response rate including providing a stamped self-addressed envelope, and personalization (a hand-written note) on the covering letter in the follow-up stage. Out of 305 responses returned 10 responses were incomplete, resulting in only 295 (48 medium and 247 small) responses were considered for final study, i.e. 31.05% valid response rate which the authors felt to be reasonable for this kind of study. The responses were analyzed using the SPSS Version 11.5 statistical package.

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IV. SURVEY RESULTS

A. General profile of the company

1.1 Classification of Respondents by Type of Company

Table I below indicate classification of respondents by type of company. It is evident from finding that straightly higher percentage (83.7%) of small type of companies established with 16.3% groups of industries focused as compared to medium manufacturing enterprises. However the association between type of industries & study groups found to be non significant (NS).

Table I: Classification of Respondents by Type of Company

Type of Company	Respondents	
	Number	Percent
Small	247	83.7
Medium	48	16.3
Combined	295	100.0

B. Overall Degree of Agreement of Respondents on General TQM

2.1 Classification of Respondents on Agreement Level of Company on General TQM

The finding indicates that higher level of agreement (above 75% score, indicated 89.6% among medium manufacturing enterprises as compared to 75.3% observed for small manufacturing enterprises groups. It is also clear from the findings that 10.4% of medium manufacturing enterprises groups and 24.7% of small manufacturing enterprises groups had moderate agreement level (between 51-75% score).

2.2. The level of implementation for quality management practices.

The study of implementation of TQM practices involving twelve critical success factors, Fig.1 and Table II shows a summary of the mean score of each item of the survey questionnaire. The mean score ranges from 2.66 to 2.9498, which is very lower than the level of TQM practices in Singaporean SMEs, which gave a score of between 3.32 to 4.49 (Quazi & Padibjo, 1998) and between 3.067 and 3.654 in Malysian SMEs (Quek E. E. & Shari M. Y 2003). Although, the TQM practices highlighted by Quazi & Padibjo, 1998, were slightly different from those proposed, there were some similar ones, such as stressing the importance of leadership, customer satisfaction, human resource utilization and improvement tools and techniques.

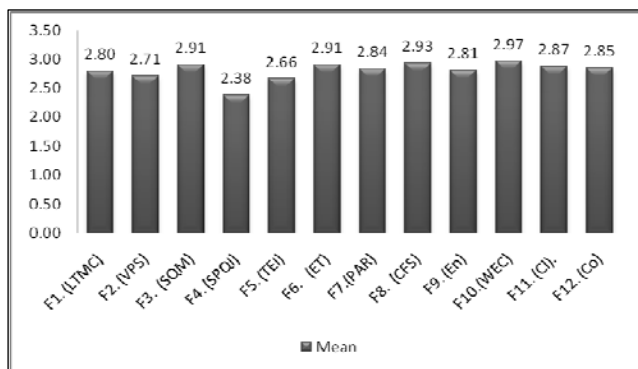


Fig.1. The mean of CSF for TQM implementation

Of these twelve critical factors in Table II, Work Environment and Culture gave the highest overall mean

rating of 2.9498, and Education and Training (2.6723) the lowest. One observation was that many of the respondents have rated 'the degree of practice' at the lower end of the scale, between 'moderate' to 'agree'. This could indicate that the companies could be still struggling to implement TQM successfully.

Table II: The mean of main factors for implementation

FACTOR	ITEM NO	MEAN	OVERALL MEAN
F1. Leadership & Top Management Commitment.(LTMC)	F11	2.3797	
	F12	2.6475	
	F13	2.7593	
	F14	3.0203	
	F15	2.9017	
	F16	2.8136	2.7981
F2. Vision and Plan Statement(VPS)	F21	2.3424	
	F21	2.5864	
	F23	2.5390	
	F24	2.8203	
	F25	2.9153	
	F26	2.8068	
F3. Supplier Quality Management (SQM)	F27	2.9729	2.7119
	F31	2.8305	
	F32	2.9085	
	F33	3.0271	
	F34	2.8271	
	F35	2.9932	
F4. System Process Quality Improvement (SPQI)	F36	2.8780	2.9107
	F41	2.8034	
	F42	2.8712	
	F43	2.8746	
	F44	2.9322	
	F45	2.8678	
F5. Total employee involvement.(TEI)	F46	2.7254	2.8458
	F51	2.6508	
	F52	2.6847	
	F53	2.6881	
	F54	2.8237	
	F55	2.6881	
F6. Education and Training (ET)	F56	2.4915	
	F57	2.6237	2.6644
	F61	2.9153	
	F62	2.8949	
	F63	2.7492	
	F64	2.8441	
F7. Performance appraisal, Recognition. (PAR)	F65	2.9898	
	F66	2.9153	
	F67	3.0305	2.9056
	F71	3.0136	
	F72	2.8339	
	F73	2.9864	
F8. Customer Focus and Satisfaction CFS	F74	2.7797	
	F75	2.6881	
	F76	2.7966	
	F77	2.7898	2.8412
	F81	3.0915	
	F82	2.7831	
	F83	2.9322	
	F84	2.9763	
	F85	2.8000	
	F86	3.0610	
	F87	2.8780	2.9317

FACTOR	ITEM NO	MEAN	OVERALL MEAN
F9. Evaluation. (En)	F91	2.6441	
	F92	2.5966	
	F93	2.6881	
	F94	2.8000	
	F95	2.9322	
	F96	2.8034	
	F97	2.8814	
	F98	2.9559	
	F99	3.0271	2.8143
F10. Work Environment and Culture. (WEC)	F101	3.2068	
	F102	3.0508	
	F103	2.8373	
	F104	2.9492	
	F105	2.9288	
	F106	3.0373	
	F107	2.8102	
	F108	2.8983	
	F109	3.0136	2.9702
F11. Continuous Improvement (CI).	F111	2.8881	
	F112	3.0475	
	F113	2.9153	
	F114	2.8814	
	F115	2.9119	
	F116	2.8847	
	F117	2.5864	2.8736
F12. Communication. (Co)	F121	2.7593	
	F122	2.7017	
	F123	3.2407	
	F124	2.7254	
	F125	2.8102	2.8475
OVERALL MEAN			2.844

C. Internal consistency analysis

Using the SPSS reliability analysis procedure, an internal consistency analysis was performed separately for the items of each critical factor. Cronbach's Alpha is commonly used for this purpose as shown in Table III.

Table III: Internal consistency analysis

Quality management practice	No. of items	Alpha value	Item for deletion	Alpha if item deleted
F1.LTMC	7	.8818	none	.8833
F2. VPS	7	.8511	none	.8532
F3. SQM	6	.9023	none	.9019
F4. SPQI	6	.9064	none	.9065
F5. TEI	7	.8506	none	.8546
F6. ET	7	.8653	none	.8606
F7. PAR	7	.8639	none	.8608
F8. CFS	7	.9188	none	.9193
F9. En	9	.9019	none	.9017
F10.WEC	9	.9270	none	.9262
F11.CI	7	.9090	none	.9089
F12. Co	5	.8421	none	.8437
Total	84	0.885	none	0.885

Values of alpha range between 0 and 1 with higher values indicating higher reliability. The value of each variable, as measured by each statement on the scale of 1 to 5, is computed using the reliability analysis procedure shown in Table 3. The alpha values range from 0.8259 to 0.9148, which indicates an internal consistency with the alpha value of more than 0.70, so no items were dropped from each variable. These results are therefore acceptable and are a reliable.

D. Test of significance on the difference of means

It was found that some statistical tests would be helpful to justify further the level of TQM implementation among the SMEs. Significance tests were carried out to investigate whether there are any significant differences between the small and medium sized companies on the extent of quality practices. In order to conduct the tests, the following hypotheses were set up.

H0: $\mu_1 - \mu_2 = 0$; i. e. there is no significant difference on TQM practice (on each of the TQM factors) between the small and medium size enterprises.

H1: $\mu_1 - \mu_2 \neq 0$; i. e. there is significant difference on TQM practice (on each of the TQM factors) between the small and medium size enterprises

4.1 Aspect wise Mean Response as Perceived on Total Quality Management Implementation: Small and Medium Company

The Table IV shows that the mean response on TQM implementation, as perceived by medium sized manufacturing enterprises is found slightly less at 87.4% as compared to small manufacturing enterprises at 88.0%. Further establishing the difference in the response as perceived on TQM implementation is found to be statically non significant ($t = 0.76$ NS) among 12 aspects of critical success factors indentified.

Table IV: Aspect wise Mean Response as Perceived on TQM Implementation: Small and medium sized Enterprises

No.	Aspects	Respondents Perceived (%)				't' Test
		Small (n=247)		Medium (n=48)		
		Mean	SD	Mean	SD	
I	F1.LTMC	87.9	4.4	87.4	4.7	0.68 NS
II	F2. VPS	86.6	4.8	85.5	6.7	1.08 NS
III	F3. SQM	88.7	6.5	87.0	6.5	1.66 NS
IV	F4. SPQI	88.2	6.7	89.0	6.9	0.74 NS
V	F5. TEI	86.5	6.2	85.7	6.6	0.78 NS
VI	F6. ET	88.6	6.3	87.3	6.3	1.31 NS
VII	F7. PAR	88.1	6.1	88.5	6.8	0.38 NS
VIII	F8. CFS	87.9	5.1	86.1	6.1	1.92 NS
IX	F9. En	88.4	5.7	88.0	6.1	0.42 NS
X	F10.WEC	88.4	6.9	88.9	7.8	0.41 NS
XI	F11.CI	87.5	6.7	87.5	6.2	0.00 NS
XII	F12. Co	89.1	7.2	87.3	6.1	1.81 NS
	Combined	88.0	4.7	87.4	5.1	0.76 NS

4.2 Aspect wise Mean Response as Practice on TQM Implementation: Small and Medium sized enterprises

The Table V shows the main practice on Total Quality Management Implementation in small manufacturing enterprises groups is found higher (57.0%) as compared to medium manufacturing enterprises groups (56.5%). There exist a significant difference in the performance of practice between small and medium manufacturing enterprises groups ($T = 0.22$ NS). It is interesting to record the statistical significant between all the practice aspect where the result exhibited non significant trend between small and medium manufacturing enterprises groups as shown in Fig.2.

Table V Aspect wise Mean Response as Practice on Total Quality Management Implementation: Small and Medium Company

No.	Practice Aspects	Respondents Practice (%)				't' Test
		Small (n=247)		Medium (n=48)		
		Mean	SD	Mean	SD	
I	F1.LTMC	56.0	15.5	56.0	14.9	0.00 NS
II	F2. VPS	54.2	13.0	54.5	13.0	0.15 NS
III	F3. SQM	58.3	16.3	57.7	15.3	0.25 NS
IV	F4. SPQI	56.9	17.2	57.1	18.4	0.07 NS
V	F5. TEI	53.3	13.5	53.4	14.4	0.04 NS
VI	F6. ET	58.1	13.4	58.0	15.1	0.04 NS
VII	F7. PAR	56.8	14.0	56.9	14.7	0.02 NS
VIII	F8. CFS	59.0	17.0	56.9	17.6	0.76 NS
IX	F9. En	56.3	14.7	56.4	16.2	0.04 NS
X	F10.WEC	59.3	17.2	59.9	17.0	0.22 NS
XI	F11.CI	57.9	18.0	55.1	16.9	1.04 NS
XII	F12. Co	57.3	14.9	55.3	15.3	0.83 NS
	Combined	57.0	14.1	56.5	14.6	0.22 NS

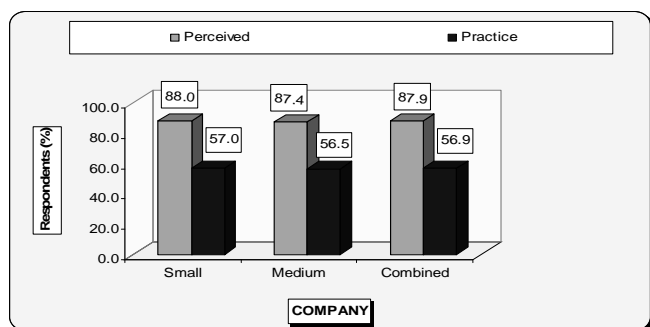


Fig. 2.: Overall Mean Response on Perceived and Practice scores on TQM Implementation

4.3 Aspect wise Mean Response as Perceived and Practice on TQM Implementation: Small Enterprises

The overall response as perceived by small manufacturing enterprise is found to be 88.0% as compared to practice component of 57.0%. Further the respondent also established a range of 89.1% to 865%.in the perceived response as against range noticed between 59.3% to 53.3% with respect to practice. The result established the existence of statistical significant difference between perceived and practice response on total quality management implementation among small manufacturing enterprises groups is significant.

4.4 Aspect wise Mean Response as Perceived and Practice on TQM Implementation: Medium Enterprises.

The overall response as perceived by medium manufacturing enterprises groups found to be 87.4% as against practice 56.5%. The difference implied between perceived and practice with the application of test statistics (t= 14.49*). The mean response towards perceived aspect is between 89.0% to 85.5% as against practice response range 59.9% to 53.4%. Further the implication of statistical test resulting with significant between perceived and practice towards TQM implementation of medium manufacturing enterprises groups for all the aspect under study.

4.5 Average Preferential Ranking on Total Quality management practices – Instrument on their importance

The result shows that the lesser the ranking value, better is the preference factor Leadership Top management commitment (4.01) as the first preferential factor among small manufacturing enterprises groups followed by Total employee involvement (5.76), Supplier quality management (6.01), Education and Training (6.07), Vision and plan statements (6.25), System Process Quality Improvement (6.49), Performance appraisal, Recognition (6.68), Customer Focus & Satisfaction (7.04), Evaluation (7.22), Work Environment and culture (7.4), Continuous Improvement (7.46), Communication (7.62).

With respect to medium manufacturing enterprises groups the preferential ranking of factor on total quality management practice felt the importance of Leadership Top management commitment (4.12), Vision and plan statements (4.88), Supplier quality management (6.26), Total employee involvement (6.27), System Process Quality Improvement (6.29), Performance appraisal, Recognition (6.75), Work Environment and culture (7.79).

E. Perception on Barriers Total Quality management

5.1 Classification of Respondents on Perception level on Total Quality management

The data indicates that 43.32% of small groups noticed with moderate perception level as a barrier as compared to 54.66% found to be adequate percentage level shown if Table VI. It is interesting to note that among medium groups majority (64.59%) identified adequate percentage perception level on barriers to TQM as compared to 35.41% noticed with moderate perception level. The statistical test result also in conformity measuring the significant difference between ISO and non ISO of perception on barriers towards TQM ($\chi^2=2.27$ NS).

Table. VI. Classification of Respondents on Perception level on Total Quality management

Perception Level	Category	Classification of Company				χ^2 Value
		Small		Medium		
		No	%age	No	%age	
Inadequate	< 50 % Score	5	2.0	0	0.0	2.27 NS
Moderate	51-75 % Score	107	43.3	17	35.4	
Adequate	> 75 % Score	135	54.7	31	64.6	
Total		247	100.0	48	100.0	

NS: Non-significant

F. Response on Overall Business Performance

6.1 Overall mean Satisfaction of Employees on Overall Business Excellence

From Table VII the mean satisfaction of the employees of medium manufacturing groups is found to be comparatively higher at 43.5 % as against small manufacturing enterprises groups at 39.1%. Further, the overall mean satisfaction of the employees of combined groups found to be 39.8% with S D 20.3%. The result also substantiated significant in the mean satisfaction of employees between small and medium sized companies on overall business performance, (t=2.49*).

Table VII. Overall mean Satisfaction level of Employees on Overall Business performance

Company	Sample (n)	Max. Score	Satisfaction Scores			't' Test
			Mean	Mean (%)	SD (%)	
Small	247	10	3.88	38.8	19.9	2.49*
Medium	48	10	4.52	45.2	15.5	
Combined	295	10	3.98	39.8	20.3	

* Significant at 5% level, $t(0.05, 293df) = 1.96$

6.2 Overall Mean Perception Scores on Quality of Product

The overall mean perception scores of combined sample found is to be 68.6% with S D 8.0%. Further the mean perception score is found to be slightly higher among medium manufacturing enterprises groups (70.5%) compared to small manufacturing enterprises groups (68.2%), shown in Table VIII.

Table VIII. Over all Mean Perception Scores on Quality of Product

Company	Sample (n)	Max. Score	Satisfaction Scores			't' Test
			Mean	Mean (%)	SD (%)	
Small	247	35	23.87	68.2	7.7	1.61 NS
Medium	48	35	24.67	70.5	9.3	
Combined	295	35	24.00	68.6	8.0	

NS: Non-significant

Data subjected for statistical test established non significant difference between small and medium manufacturing enterprises groups on perception score towards quality product. ($T=1.61$ NS).

6.3 Classification on Satisfaction of Customer on Overall Business performance

The result indicates that 50.2% and 42.1% of respondents among small manufacturing enterprises groups is found to be moderate and adequate level of customer satisfaction on overall business performance. With regard to accuracy, 56.3% & 33.3 % among medium manufacturing enterprises groups is found to be moderate with adequate satisfaction level of customer on level of customer performance.

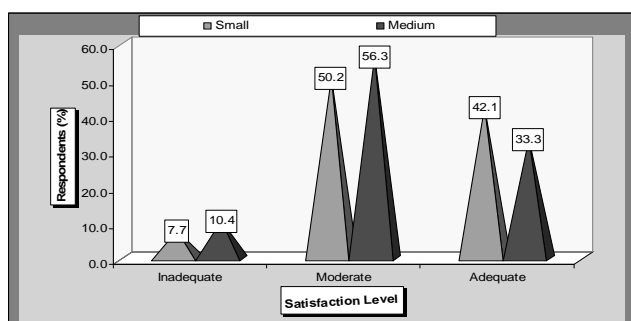


Fig.3: Classification on Satisfaction level of Customers on Overall Business Performance

Further statistical chi –square test reveals the existence of significant in the level of satisfaction on Overall Business performance. Found to be significant ($\chi^2=1.41$ NS), as shown in Fig..3.

6.4 Overall Mean Satisfaction Scores of Customer on Overall Business performance

The Table IX indicates that the overall Mean Satisfaction of Customer on Overall Business performance is found to be 73.4% and S D 13.4%. It is interesting to note that the overall Mean Satisfaction of Customer among small sized companies groups found to be 74.2% as compared medium sized companies 69.3%, which is slightly less in the response.

Table IX. Overall Mean Satisfaction Scores of Customer on Overall Business performance

Company	Sample (n)	Max. Score	Satisfaction Scores			't' Test
			Mean	Mean (%)	SD (%)	
Small	247	10	7.42	74.2	13.6	2.45*
Medium	48	10	6.93	69.3	12.5	
Combined	295	10	7.34	73.4	13.4	

* Significant at 5% level, $t(0.05, 293df) = 1.96$

The data subjected for statistical test reveals the existence of non-significant difference in the Mean Satisfaction response of Customer on Overall Business performance between small & medium sized companies ($t=2.45^*$). It is evident from the findings that the satisfaction of small and medium sized company on business performance is found to be more similar response.

6.6 Classification on Respondents on Strategic Business performance

Table X and Fig.4 shows that 66.4% & 54.2% of small and medium sized companies measured the performance level as moderate compared to remaining 33.6% and 45.8% of the respective groups noticed with adequate performance level. The chi square test indicates the association between performance level among the small and medium study groups found to be non-insignificant ($\chi^2=2.62$ NS).

Table X. shows the classification on Respondents on Strategic Business performance

Performance Level	Category	Classification of Company				χ^2 Value
		Small		Medium		
		No	Percent	No	Percent	
Inadequate	< 50 % Score	0	0.0	0	0.0	2.62 NS
Moderate	51-75 % Score	164	66.4	26	54.2	
Adequate	> 75 % Score	83	33.6	22	45.8	
Total		247	100.0	48	100.0	

NS: Non-significant

$\chi^2(0.05, 2df) = 5.991$

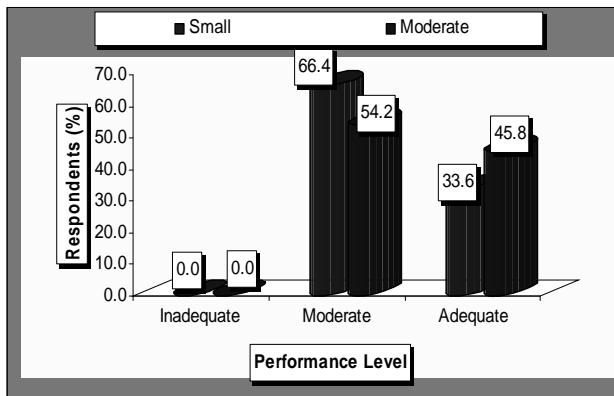


Fig.. 4: Classification of Respondents on Strategic Business Performance level

V. DISCUSSIONS

Having described the survey results, this section attempts to present a broad evaluation of the current status of TQM amongst the north Karnataka SMEs. The findings are emphasized on which of the twelve constructs have the highest degree of practice and importance to achieve business excellence.

It is very evident from the overall result that the perceived response to be 88.0% as compared to practice component of 57.0%. ($t=15.07^*$, $P<0.05$), TQM Implementation among small size companies. Further the respondent also established a range of 86.5% to 89.1% in the mean perceived response as against range noticed between 53.3% to 59.0% with respect to practice aspect.

The overall mean response as perceived by medium sized companies found to be 87.4% as against practice 56.5%. Further, the difference implied between perceived and practice with the application of test statistics ($t= 14.49^*$). The mean response towards perceived aspect found between 85.5 to 89.0 as against practice response range between 53.4% to 59.9%.

Results reveals that, there exists non significant difference of response as perceived on TQM Implementation between small and medium size companies with respect to 12 aspects elicited non-significant findings in using t-test statistic.

It is also interesting to record the statistical significant between all the practice aspect where the result exhibited non-significant trend between small and medium manufacturing enterprises groups. The result finally establishes that the practice on TQM between small and medium companies found more or less similar in response.

The result indicates that the overall Mean Satisfaction of Customer on Overall Business performance found to be 73.4% & S D 13.4%. It is interesting to note that the overall Mean Satisfaction of Customer among small manufacturing enterprise groups found to be 73.6% as compared medium manufacturing enterprises groups 72.1% which is slightly less. The data analysis shows overall Mean Response of Respondents on Strategic Business performance found to be 71.10% % S D 8.6. The response of medium manufacturing enterprise groups explicit more (73.3%) as compared to small manufacturing enterprise groups (70.7%) on the component Strategic Business performance.

Many research results have revealed that top management commitment and leadership, education and training are the most important elements in a successful implementation of TQM (Zhang et al., 2000). However, as

direct comparisons cannot be made with other countries from these findings, it can be said that north Karnataka SMEs are behind in this initiative based on a mean practice of 2.844. Finally, there is enough evidence that there should raise some concerns on system process quality improvement. In case of this work, system process quality improvement gave the lowest practice (2.38) from the twelve constructs.

VI. CONCLUSIONS

This paper has presented the results of a survey conducted on north Karnataka SMEs, with the prime purpose of investigating the status and level of quality management practices in these companies. From the results presented and discussed, the level of TQM implementation among these north Karnataka SMEs has been far below South Asian countries. Although some of these results may not be directly comparable, they have undoubtedly provided some indications on the extent of achievements for north Karnataka SMEs in their journey towards business excellence. The paper has also indicated and identified crucial issues for organizations to consider, especially in areas found to be lacking in implementation like LTMC, SPQI, TEI, and WEC.

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