

Influence of organization profile on the application of quality management tools and techniques

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ABSTRACT

Effective application of tools and techniques is critical for successful Total Quality Management (TQM) implementation. The influence of organization profile on the application of TQM tools and techniques and outcomes is investigated in Indian organizations. Correlation analysis and ANalysis Of VAriance (ANOVA) are utilized for the research. Tools and techniques are found having significant relation to the outcomes of implementation. Organization's age, size, and turnover significantly influenced the TQM results. Organization's size and turnover significantly influenced the application of tools and techniques. The study suggests taking the organization profile into consideration for effective implementation. Further research can be conducted in other countries.

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1. Introduction

Organizations face pressure in the acquisition of a quality certification or adopt a Quality Management System (QMS). Total Quality Management (TQM) is a QMS extensively adopted across the globe. According to Hellsten and Klefsjö (2000), a culture based on core values should be established. The choice of core values should be followed by a choice of techniques that support them. Finally, tools that suit the techniques must be chosen. Thus, implementation should aim for enhanced internal and external customer satisfaction with reduced resource requirements. Small organizations were seen as having problems with implementation (Hansson, 2001). Dubey and Kumar (2017) found reluctance among Indian SMEs to adopt a QMS. Successful implementation of TQM can help organizations stay competitive.

Management of quality requires in-depth knowledge of tools and techniques. Their appropriate application is critical for the success of any QMS (Singh et al. 2012). The seven basic quality control tools are: cause and effect diagram, pareto diagram, control chart, histogram, graphs, check sheet, and scatter diagram. The seven management tools are affinity diagram, arrow diagram, matrix data analysis method, relations diagram, matrix diagram, process decision program chart, and systematic diagram. Tools such as brainstorming, flow chart, questionnaire, force field analysis, control plan, and sampling find wide application. Benchmarking, fault tree analysis, failure mode and effects analysis, departmental purpose analysis, design of experiments, problem-solving methodology, quality costing, poka yoke, quality function deployment, quality improvement teams, and statistical process control are some widely used techniques. Fazel and Salegna (1996) grouped major tools and techniques into major categories based on the implementation strategy as customer-based; employee-based; management-

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based; supplier-based; product-based; process-based. Fifteen widely used TQM tools were classified into quantitative tools and qualitative tools by Scheuermann et al. (1997). Bunney and Dale (1997) presented an analysis of TQM tools and techniques based on function and application. The list of tools and techniques currently in practice is long. Sufficient training on the usage of tools and techniques should, therefore, be provided to employees. This will help them in effective understanding and application.

An investigation of the influence of tools and techniques on the organization has been done by studies. Application of tools and techniques was found to promote a team working culture (Ramesh and Ravi 2013). A planned approach is needed when making a choice. Appropriate utilization and the right timing are necessary for performance. Tools and techniques were found to have a positive correlation with business performance by Ahmad et al. (2013). They found statistical process control, total productive maintenance, and lean production to be the most important tools. Tari and Sabater (2004) showed a positive correlation between TQM results and the tools and techniques. Tari (2005) suggested improved application in ISO 9000 firms in Spain for quality enhancement. A moderate-to-low level relationship was found between TQM tools and organizational performance in SMEs (Ahmad et al. 2018). Chen (2013) studied a Taiwanese motor company and found the achievement of the highest level of satisfaction with the use of 'seven old QC tools'. An evaluation of the impact of SPC and 5-S practice was done by Suárez-Barraza and Ablanedo-Rosas (2014). They revealed that the application of 5-S practice can contribute significantly to continuous improvement in Mexican manufacturing and service organizations. The philosophical dimension of implementation is emphasized. The link between 5-S and some of the managerial dimensions was also provided. The study by Sharma and Suri (2017) has indicated the ability of QC tools for reduced product variability and increased production efficiency through scrap and rework reduction. They found the absence of their extensive use in Indian manufacturing industries despite the simplicity and ease seen in the application of these tools. Study of quality management in Indian organizations can be undertaken to throw light on the less researched aspects.

Researchers have studied the application of tools and techniques in different types of organizations. Equipment calibration testing, and material identification and control were the most frequently used, while Poka yoke and quality function deployment (QFD) were the least frequently used (Kannan et al. 1999). Effective application was seen as necessary in small and medium industries by Ahmed and Hassan (2003). The supply chain managers employed and stressed quality values and tools to a greater extent than operations managers (Foster and Ogden 2008). Benchmarking, complaint resolution, supplier development, design for the environment, supply chain management, ERP, and focus groups were emphasized by supply chain managers. ISO 9001:2000. Greek companies used tools that were easy to understand and implement (Fotopoulos and Psomas 2009). Ismyrlis and Moschidis (2015) have found low usage of standards and tools/techniques in ISO 9001:2008-certified Greek companies. Check sheets, and Flow charts have found wide application in Portuguese ISO 9001:2008 organizations (Fonseca et al. 2015). Bigger organizations use advanced tools more than smaller ones. Wind power sector supply chain organizations have implemented tools and techniques to a high degree (Castello et al. 2020). An improved understanding of the importance of tools and techniques in developing nations is seen as necessary.

The objective of the empirical study is to find answers to the following research questions:

Does the application of TQM tools and techniques relate to TQM outcomes?

Does organization profile influence the application of TQM tools and techniques?

The hypotheses formulated for the purpose are as follows:

H₁: Application of TQM tools and techniques has significant relationship with TQM outcomes.

H₂: Age of the organization has significant influence on the application of TQM tools and techniques and TQM outcomes.

H₃: Size of the organization has significant influence on the application of TQM tools and techniques and TQM outcomes.

H₄: Turnover of the organization has significant influence on the application of TQM tools and techniques and TQM outcomes.

Although investigations on the impact of various factors on QMS implementation have been carried out, a focus on the organization's profile has not been attempted in the Indian context. This study intends to fill this gap by conducting an investigation of the manufacturing sector.

2. Empirical study

A structured questionnaire was the instrument given to 600 manufacturing organizations. 336 valid responses were obtained.

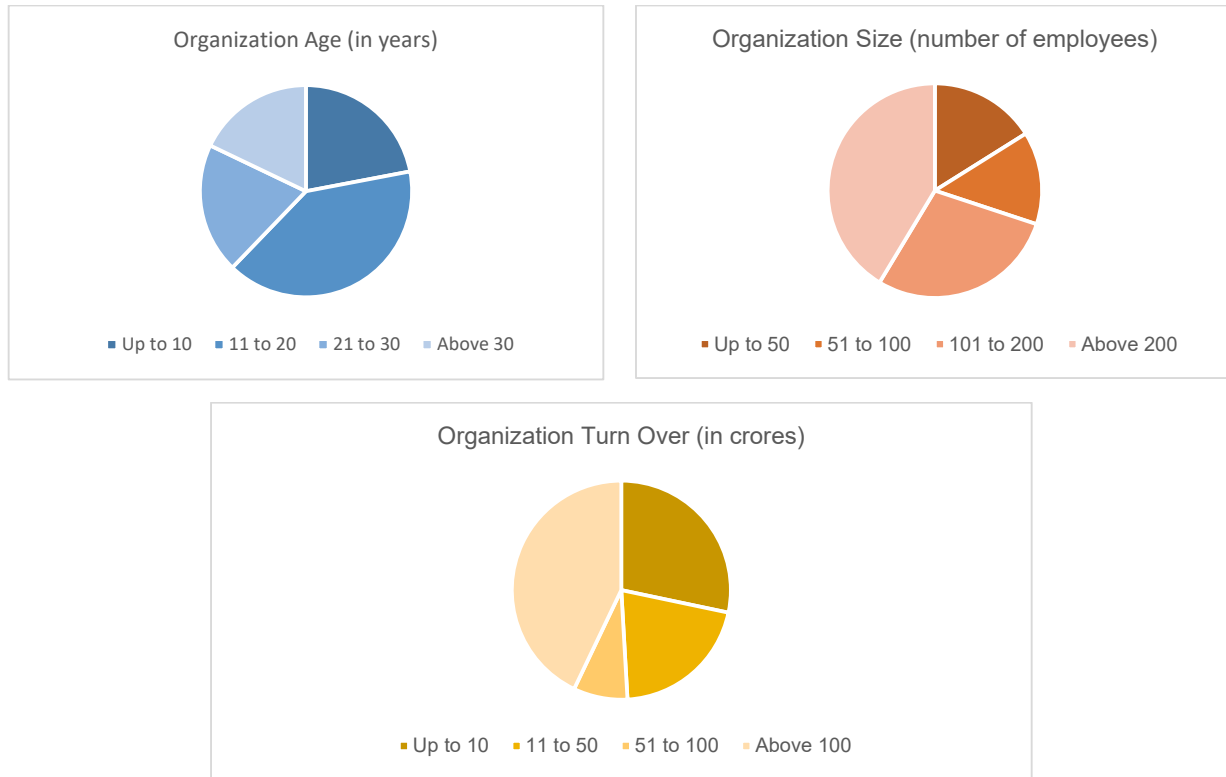


Fig. 1. Respondents profile

Fig. 1 shows the pie chart depicting the breakdown of respondents. The factors “TQM Tools and Techniques” and “TQM Outcomes” were measured on a five-point Likert scale where 1 denotes very low, 2 denotes low, 3 denotes moderate, 4 denotes high and 5 denotes very high.

3. Results and Discussion

The data was used for analysis and hypothesis testing. Correlation analysis was performed for testing H_1 . The correlation coefficient between TQM outcomes and tools and techniques was 0.776. The value was found significant at 1% level, showing a 77.6 % positive relationship and confirming H_1 . This finding is in agreement with earlier studies by Ahmad et al. (2013); Tarí and Sabater (2004); Tarí (2005); Ahmad et al. (2018); Suárez-Barraza and Ablanedo-Rosas (2014); Sharma and Suri (2017). TQM organizations should therefore work on the improvement of the application of tools and techniques, as this can increase organizational performance.

ANalysis Of VAriance (ANOVA) was performed for testing H_2 , H_3 , and H_4 .

Table 1

Influence of Organization Age

		Organization Age (in years)				F - value	P - value
		Up to 10	11 to 20	21 to 30	Above 30		
TQM	Mean	27.99	28.62	29.55	29.45	1.212	0.305
TT	S.D.	6.07	5.67	4.95	5.84		
TQM Outcomes	Mean	24.34 ^a	25.41 ^{ab}	26.21 ^b	26.47 ^b	2.976	0.032
	S.D.	5.47	4.95	3.55	3.67		

Table 1 gives the ANOVA results for the influence of age. With P-value seen as less than 0.05, manufacturing organizations are found to be significantly different based on their age with regard to TQM outcomes at 5% level. The Duncan Multiple Range Test (DMRT) results show the existence of significant difference between manufacturing organizations aged below 10 years and those aged above 21 years with regard to TQM outcomes, but with no difference seen between organizations aged

between 21 and 30 years and those aged above 30 years. Since P value is greater than 0.05, the manufacturing organizations do not differ significantly based on their age with regard to tools and techniques. This confirms H₂ with regard to TQM outcomes.

Table 2
Influence of Organization Size

		Organization Size (number of employees)				F - value	P - value
		Up to 50	51 to 100	101 to 200	Above 200		
TQM TT	Mean	26.76 ^a	28.34 ^{ab}	29.50 ^b	29.30 ^b	3.362	0.019
	S.D.	6.56	5.82	4.86	5.61		
TQM Outcomes	Mean	23.00 ^a	24.89 ^b	25.95 ^b	26.42 ^b	8.040	<0.001
	S.D.	5.94	4.91	4.21	3.92		

Table 2 gives the ANOVA results for the influence of size. With P value less than 0.01, manufacturing organizations are found to be significantly different based on their size with regard to TQM outcomes at 1% level. DMRT results show organizations that employ up to 50 as significantly different with regard to TQM Outcomes from those employing above 51, but those employing 51 to 100, 101 to 200 and above 200 do not exhibit differences amongst themselves. With P value less than 0.05, the manufacturing organizations are significantly different based on their size with regard to tools and techniques at 5% level. DMRT results show that, manufacturing organizations employing up to 50 significantly differ from those employing over 101 with regard to tools and techniques. This confirms H₃ with regard to TQM tools and techniques and TQM outcomes.

Table 3
Influence of Organization Turn Over

		Organization Turn Over (in crores)				F - value	P - value
		Up to 10	11 to 50	51 to 100	Above 100		
TQM TT	Mean	27.83 ^a	27.96 ^a	29.93 ^b	29.67 ^b	2.992	0.031
	S.D.	5.97	6.21	4.33	5.26		
TQM Outcomes	Mean	24.11 ^a	25.06 ^{ab}	26.33 ^b	26.53 ^b	5.952	<0.001
	S.D.	5.39	5.44	2.80	3.67		

Table 3 gives the ANOVA results for the influence of turnover. With P value less than 0.01, manufacturing organizations are found to be significantly different based on their annual turnover (in crores) with regard to TQM outcomes at 1% level. DMRT results show organizations with an annual turnover of 10 and below as significantly different from organizations with an annual turnover above 51 with regard to the results of TQM implementation. With P value less than 0.05, manufacturing organizations are found to be significantly different based on their annual turnover (in crores) with regard to tools and techniques at 5% level. DMRT results show manufacturing organizations with a turnover of less than 50 exhibiting significant differences from ones with a turnover of over 51 with regard to tools and techniques. This confirms H₄ with regard to TQM tools and techniques and TQM outcomes. ANOVA results have clearly shown the influence of organization age, size, and turnover on TQM implementation. It is found that the profile of the organization impacts the results achieved due to QMS implementation. A customized plan is therefore required for successful implementation. Additionally, the results have indicated the favorable effect application of tools and techniques can have on the results of quality management. Efforts taken for improved utilization can positively impact organizational performance.

4. Conclusion

Organizations should assess their performance on a regular basis and take steps for enhancement. Improved implementation of tools and techniques is imperative for effective quality management. The research investigated TQM tools and techniques, and TQM outcomes. Correlation analysis and ANOVA were employed for Hypotheses testing. The study has found the influence of organization profile on the application of tools and techniques in the manufacturing sector of the Indian subcontinent. Deployment facilitators should, therefore, take this into consideration and adapt their strategy accordingly. The empirical investigation has shown age, size, turnover, etc., with the requirement of consideration during the study as they can influence the results. The survey was confined to the manufacturing sector. Further investigation can be taken up on the influence of other features in different parts of the world.

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