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INVESTIGATION STUDY ON THE FACTORS THAT INFLUENCE THE QUALITY MANAGEMENT AND CHALLENGES FOR ITS ADAPTATION: FROM MSME & INDIAN PERSPECTIVE

MR. K. RADHAKRISHNAN
PH.D. (PART-TIME) RESEARCH SCHOLAR DEPARTMENT OF MANAGEMENT STUDIES SREE SARASWATHI THYAGARAJA COLLEGE (AUTONOMOUS) (AFFILIATED TO BHARATHIAR UNIVERSITY) PALANI ROAD, POLLACHI. PIN CODE – 642 107
TAMIL NADU STATE.

DR. M. R. VANITHAMANI
PRINCIPAL / RESEARCH SUPERVISOR & GUIDE (DEPARTMENT OF MANAGEMENT STUDIES) SREE SARASWATHI THYAGARAJA COLLEGE (AUTONOMOUS) (AFFILIATED TO BHARATHIAR UNIVERSITY, COIMBATORE) PALANI ROAD, POLLACHI. PIN CODE – 642 107 TAMILNADU STATE.

ABSTRACT
The study intended to analyse the impression of quality challenges & QMS adaptation in Indian MSME to offer insights-out facts to the readers. Around 165 respondents were selected from special economic zones in various parts of India bases on convenience sampling technique. Further, the results have been represented in graphical form to visualize the facts in an appropriate form to provide more perceptions. Simple percentage analysis, regression Analysis of variance, correlation techniques used to interpret the results to provide more detailed views. From this standpoint, Quality plays a vital role in any industry, but it comes with a cost. The cost of quality mainly involves the expertise of the manufacturer, quality of raw materials, manufacturing productivity factors, equipment and tools used for production, and quality check & assurance compliance. These are the cost contributors that make sure that the product has supreme or excellent quality. Maintaining these QMS takes place a crucial role. This cost will be heavy for MSMEs, where they want to cut those costs to maximise their profit by reducing the cost of production. However, if the quality efforts are reduced and compromised, then it affects the goodwill of the company, which results in a reduction in sales and revenues. Therefore, placing the right quality plan makes the MSME survive for a longer period. Hence, this study marks evidence of the importance of quality in MSMEs for sustainable business.
Key Words: MSME, Quality, Management, Production, Cost & Defect Reduction

1. INTRODUCTION & BACKGROUND

An additional study aims to examine the reasons for and advantages of quality management system QMS / ISO adoption in Indian SMEs. Through statistical research, the connections between perceived and predicted benefits were examined. The results of the poll are highlighted in the following study, which found that internal factors, such as increasing productivity or processes or goods or services, were more important to QMS / ISO certified businesses than external factors, such as consumer pressure or rival imitation. Furthermore, the study noted that the process of implementing the QMS had produced more internal than external advantages. According to the research's findings, SMEs will continue to enhance their quality as a continuous process. In order to provide practical advice for practitioners, it also examines the reasons behind and advantages of implementing QMS / ISO (Bewoor, A. K., & Pawar, M. S., 2010).Total quality management, or TQM, is widely seen as a management revolution that has started to impact national corporate systems. Customer demands are regularly sought after and integrated into the organisation through TQM activities. Because of this, the vast bulk of research has been conducted in this area and continues to be conducted worldwide, particularly in developing nations that are falling behind in the use of TQM. Another paper's goal is to evaluate the TQM program's awareness in the Indian service sectors while taking the aforementioned factors into account. The principles and methods of TQM are more familiar to Indian provision managers, who also not only think, they implement that TQM is a means of ensuring high-quality goods and services. Consequently, service businesses ought to spend money on TQM as it can increase their ability to compete in the market. In order to make their organisation more capable of handling problems in the future, Indian facility executives and consultants should also be more focused on maintaining standards and adopt a more dynamic approach to TQM (Talib, F., et al 2011). In order to compete in the fiercely competitive global market, managerial models are intended to be integrated into the production of goods and services. Given that the production of sub-components is dispersed regionally, supply chain management (SCM) is essential in this situation. To attain high-quality goods and facilities in the supply chain, a small number of academics and practitioners have begun to gradually combine Six Sigma principles with supply chain

management. The literature is examined in this manner to demonstrate the significance of integrating Six Sigma with SCM. Following the literature study, the research article contributes a managerial model called Six Sigma SCM along with a path for putting it into practice. To verify the effectiveness of the "Six Sigma SCM" management approach, a case study of a supply chain involving a small or medium-sized Indian business has been conducted. By using this "Six Sigma SCM" managerial style in the case study that was provided, the customer end rejections were improved from a sigma level of 3.75 to 5 (Senthilkumar, T., et al 2012). Micro, small and medium-sized businesses (MSMEs) in India are attempting to stay competitive by raising the calibre of their products in response to the global surge in quality awareness and expectations. It evaluates the development and quality preparedness of India's MSMEs. Finding out how prepared these MSMEs are for quality on the weighbridge of management, scheduling, set-up, people, capitals, and process management, as well as customer and employee satisfaction, is the main goal of the research. It also looks at the difficulties related to the quality of goods and services. Research is being done on Uttar Pradesh, India's export-focused leather, plastics, and chemical sectors. Additionally, it looks at potential links between MSMEs' quality preparedness and factors that facilitate quality deployment (Madan, P., & Ghoshal, M., 2013). In each nation's economy, SMEs are crucial, but this is especially true in emerging nations like India. They contribute to a nation's economic growth. It is often known that small and medium-sized businesses play a crucial part in the nation's social and economic advancement. In the Indian economy, it accounts for ended forty percent of the gross industrial worth extended. SMEs in the Indian economy and their role in the overall economic growth of the nation were the subject of another research. Another study aims to determine the critical elements and sub-elements necessary for Small and Medium Businesses (SMEs) in India to successfully adopt Total Quality Management TQM (Sharma, M., et al 2014).

2. LITERATURE REVIEW

Quality management techniques in India's micro, small, and medium-sized businesses (MSMEs) were the subject of an empiricalresearch. The study's primary goal was to determine Indian MSMEs' present level of quality preparedness and their level of preparation to face the challenges of the global market. The primary goal of the study, which focused on the leather, plastics, and chemical industries in and around Kanpur, India, was to gather primary data primarily from export-oriented MSME using the well-known quality management criteria derived from the European Federation for Quality Management and Malcolm Baldrige National Quality Award (Ghoshal, M., 2015).The manufacturing sectors may improve their organisational performance by using the idea of total quality management, or TQM. TQM implementation has emerged as a crucial component of corporate culture and a vital survival strategy for all manufacturing sectors. Although the majority of the major industrial sectors have embraced TQM, small and medium-sized businesses (SMEs) in India's manufacturing sector are hesitant to do so, despite the fact that SMEs represent the foundation of the country's economy. Therefore, it is therefore crucial to comprehend the issues and challenges faced by Indian manufacturing SMEs while implementing TQM. Following a thorough review of the literature and interviews with the management and quality teams of several Indian manufacturing SMEs, the authors determined the problems they faced when implementing TQM. They then ranked these challenges according to their significance and offered solutions, which will undoubtedly help industrial SMEs in Hindustan and other emerging nations successfully implement TQM to improve their organisational performance (Majumdar, J. P., 2016). Another research creates and suggests a structural framework that might aid in the effective use of QM techniques in micro, small, and medium-sized businesses. To achieve the study's goal, a comprehensive evaluation of the literature on quality management and performance in chronological sequence is conducted. A structural framework and a list of 20 key success factors (CSF) have been presented. Additionally, a number of assumptions have been developed and put to the test to support the framework. In order to conduct empirical studies, the survey questionnaire was created and responses from around ISO-certified businesses were employed (Kharub, M., & Sharma, R. K.,2016). India's manufacturing industry has expanded significantly since deregulation, but it still trails far behind its Asian rivals, particularly in terms of micro, small, and medium-sized businesses (MSMEs). The importance of MSMEs cannot be overstated, since India is the biggest marketplace in standings of both production and consumption. MSMEs provide a substantial contribution to employment, exports, and manufacturing. In order to strengthen the organization's financial, operational, and strategic position, quality management procedures are crucial. By implementing quality principles, several organisations achieved significant benefits and increased customer satisfaction. In today's competitive economy, when customers want improved goods and amenities at cheaper prices, quality is the only alternative accessible to companies. Given India's goal of becoming a global manufacturing powerhouse through the Make in India Plan, it is imperative to look at the aspects that contribute to TQM adoption success. To enhance the performance of Indian MSMEs, the study analyses and assesses TQM adoption variables. To determine which of these aspects are most crucial, a fuzzy DEMATEL-based technique has been used. Fuzziness in decision-making makes it easy to evaluate the decision-makers' impreciseness and vagueness (Gupta, H., et al 2017).In order to successfully apply quality management (QM) methods in micro, small, and medium-sized businesses, another study examines the link between latent variables, such as firm performance (FP), quality cost (QC), and human resource management (HRM) efficacy. When QM procedures are successfully implemented, the percent point score indicates that all organisational components have significantly improved. Only three areas - employee

involvement, hiring and retention, and supplier relationships - showed a significant variance in connection to business size, according to the $\chi 2$-test. According to the SEM results, FP and HRM efficacy are directly and favourably correlated, but FP and QC are negatively correlated. (In some cases, they are positive correlated also) Managers will be aware of the factors they need to take into account as a sign of QM practices in their organisation or organisations. The first of the three latent components that have been found will aid in the development of effective human capital, while the second will assist in resolving additional costs brought on by subpar quality. Lastly, the third latent mutable will help assess the success of the company and demonstrate how effective these two are (Kharub, M., et al 2018). In order to attain company competitiveness, TQM is a useful concept for enhancing organisational performance and cost effectiveness in all manufacturing sectors, regardless of size. In the current competitive business climate, TQM adoption is a crucial survival strategy and culture for manufacturing SMEs. Even though the majority of Indian manufacturing SMEs are certified to ISO 9001, only a small percentage have embraced TQM. However, the foundation of India is made up of SMEs. The exploratory research study analyses data gathered from many Indian manufacturing SMEs using a comprehensive interview-based survey in an attempt to pinpoint the reasons of the averseness of Hindustan industrial SMEs in executing TQM (Majumdar, J. P., et al 2019). Using a two-stage methodology, another study recorded the current state of QM practice implementation and created a framework for suggestive ranking by using fuzzy TOPSIS and fuzzy AHP to rank QM practices according to their relevance to IT-enabled businesses in the context of Indian service SMEs. In order to survive in a complicated, unpredictable world, suggestive ranking places a strong emphasis on techniques including strategic concerns, organisation attention, client emphasis, staff management, and process management. In order to pinpoint areas of concern and execute corrective and preventative actions for quality improvement, the study's findings should provide useful guidance for developing implementation strategies (Basu, R., et al 2020). The obstacles to implementing QMS in MSME organisations in India are demonstrated by further exploratory research investigations. The workforce, customers, QMS and BE practitioners, and leadership have been highlighted as the main stakeholders for MSMEs. Customers and MSMEs prefer industry-specific ISO certificates, according to the survey. QMS is seen as crucial for process definition, a methodical work style, and organisational performance. Organisational performance and results, growth, and sustainability are made possible by QMS. It also improves customer focus, helps leadership make the right decisions, ropes worker commitment, concert, and development, increases quality and reliability, aids in process maintenance and improvement, and makes an organisation more effective and efficient. Effective QMS implementation also supports technology, innovation, and organisational knowledge, transparency, and risk management. The following are the limitations: inadequate commitment from top management; QMS awareness, focus, and execution; workforce reluctance; lack of skills and expertise; government assistance; customer purchasing habits; costly technological tools; and a absence of novelty and new-fangled goods (Rao, R. K., et al 2021). Analysing whether supplier relationships may enhance or diminish the impact of raw material and manufacturing process quality on the final product's quality is the subject of more study. Production quality process, the quality of the raw materials, and supplier relationships are all crucial factors in their realisation. The study concluded that the impact of raw material and manufacturing process quality on making eminence in SMEs is not mitigated by supplier partnerships (Supriadi, A., 2022). MSMEs can serve both domestic and foreign markets, but they face challenges because of the increased competition in the global market and their reliance on outdated technology. Since Punjab, in particular, and India as a whole are dealing with a high unemployment rate, particularly for the "Educated" unemployed, MSMEs could help create more jobs for the technically trained workforce. The sector faces a number of challenges, such as intense international competition, pressure to use raw materials, energy, and water more efficiently, and the implementation of further ecologically maintainable making progressions. By streamlining and embracing green and inclusive innovations, India's MSME sector can create new economic opportunities and boost its long-term competitiveness. There is a strong correlation amid the oldness of the businesses and the advancements they make to their manufacturing and product processes. Additionally, the average yearly turnover of the businesses is significantly correlated with their level of initiative and commitment to marketing research, innovation, and QMS (Mahajan, D., 2023). The use of IoT in MSME making to improve quality and process control is investigated in another study. The emphasis is on resolving issues including data security, expensive expenses, and a lack of technical knowhows and penetrating to the technical knowledge, whichever applicable. Highlighting the advantages of IoT, assessing implementation difficulties, and offering tactical advice are the objectives in order to help MSMEs prosper in the digital age. Understanding how IoT is being used to enhance excellence and progression mechanism in MSMEs is the aim. In line with the goals established, the study approach offers comprehensive insights into the occurrences that have been observed. Due to limitations including lack of perceived advantages, prices, data security, and technological knowledge, MSMEs have low levels of IoT awareness and implementation. High expenses, a lack of technological expertise, and worries about data security are obstacles (Mardiani, E., et al 2024).Another research uses the Technology-Organization-Environment (T-O-E) paradigm in conjunction with performance indicators to examine how IT and digitalisation might increase the growth and competitiveness of Indian MSMEs. It also points out obstacles to a successful digital transition, providing important information for the sector's development. According to the study's stage model, MSMEs have not yet completely comprised digital development, and their revolution is still in its early phases because of a number of significant obstacles, such as a lack of qualified personnel and technology understanding as well as inadequate internet infrastructure. The report emphasises that organisational and contextual variables, in addition

to technological ones, have an impact on MSMEs' use of digital technology. These elements have a big influence on digital adoption, which helps Indian MSMEs achieve notable gains in fiscal and non-fiscal recital indicators (Mittal, R., et al 2025).

3. RESEARCH OBJECTIVES & METHODOLOGY

The study intended to analyse the impression of quality challenges & QMS adaptation in Indian MSME to offer insights-out facts to the readers. Around 165 respondents were selected from special economic zones in various parts of India bases on convenience sampling technique. Further, the results have been represented in graphical form to visualize the facts in an appropriate form to provide more perceptions. Simple percentage analysis, regression Analysis of variance, correlation techniques used to interpret the results to provide more detailed views.

4. RESULTS SUMMARY

4.1 INSIGHT OUT ANALYSIS

Table - 1: Demographic Profile of Respondents

Gender Profile	**Respondents (N = 165)**	**Percentage**
Male	93	56.4%
Female	72	43.6%
Total	165	100.0%
Job Role		**Percentage**
Quality supervisor	13	7.9%
Quality Inspector	19	11.5%
Quality technician	19	11.5%
Managing director	20	12.1%
Business owner	17	10.3%
Chief Operating Officer	19	11.5%
Production head	19	11.5%
Quality manager	12	7.3%
Head of Quality	14	8.5%
Director -Production & quality	13	7.9%
Total	165	100.0%
Educational Profile		**Percentage**
Master degree	74	44.8%
UG level	55	33.3%
Diploma / Certification course	17	10.3%
Management Degree (MBA / PGDM)	19	11.5%
Total	165	100.0%
Age Group		**Percentage**
18-25 years	74	44.8%
25-45 years	55	33.3%
45-55 years	17	10.3%
Above 55 years	19	11.5%
Total	165	100.0%

Table - 2. Factual Data Based on Respondent Opinions

Company Profile / Business Focus Area	**Respondents (N = 165)**	**Percentage**
Automobile spares	38	23.0%

Child part manufacturing	37	22.4%
Chemical products	30	18.2%
Electrical Equipment manufacturers	13	7.9%
Battery Manufacturers	16	9.7%
SaaS IT Sector / Service providers	12	7.3%
Paper / pulp / packaging products	19	11.5%
Total	165	100.0%
Factors that Influence the Quality of Production		
Implementing supplier quality checks at the raw material agency	62	37.6%
Increasing the raw material inspection during the reception	59	35.8%
Testing more samples of manufactured products	58	35.2%
Reports the repeated failure/manufacturing defects	56	33.9%
Deploying experienced employees	33	20.0%
Providing adequate quality testing & training	39	23.6%
Installing advance equipment	44	26.7%
Ensuring small issues / minor breakdowns in machinery	43	26.1%
Paying more attention to improving quality plans	38	23.0%
Increase the robustness of quality checks	32	19.4%
Counterchecks at various stages	31	18.8%
Production incentive based on reduction of manufacturing defects	34	20.6%
Total	529	320.6%
Focusing On Quality Management		
Very Often	88	53.3%
Rarely	37	22.4%
Occasionally	26	15.8%
Not at all	14	8.5%
Total	165	100.0%

Table - 1 represents Demographic profile of respondents, Table - 2 indicates Factual data based on respondent opinions and Table - 3 presents Factual data about quality management from the view of respondents.

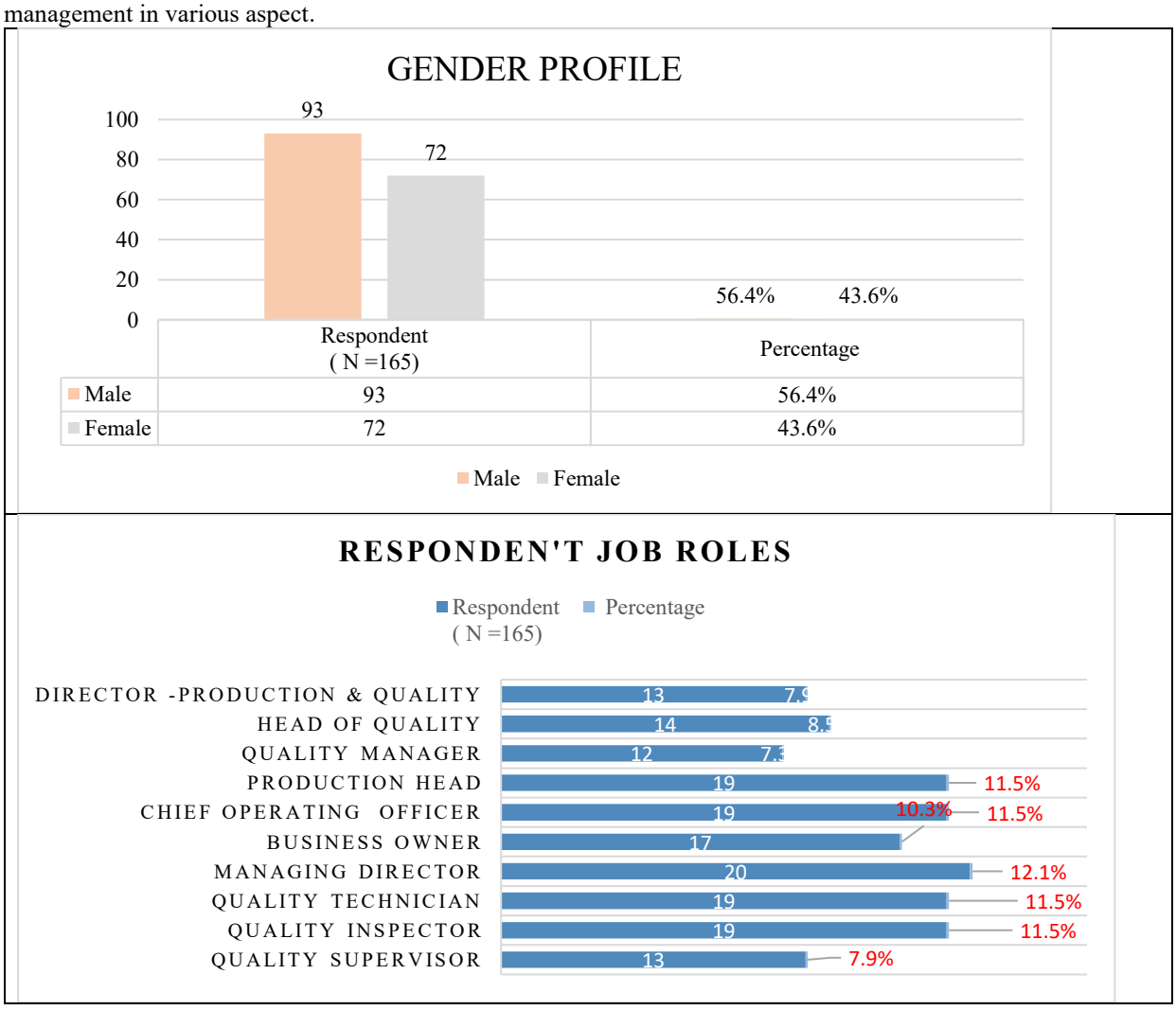
Table - 3. Factual Data about Quality Management from the View of Respondents

Cost Impact due to Quality Management	**Respondents (N = 165)**	**Percentage**
Raw materials selection	47	28.5%
Failure rejection / repurchase cost	22	13.3%
Time delay in production / Addition production cost	13	7.9%
Penalty or payment retention from customer	51	30.9%
Increase in unusable raw material	32	19.4%
Total	165	100.0%

Influence of Quality Management in Various Aspect	Respondents (N = 165)	Percentage
Helps better in marketing the product	49	29.7%
Increase sales / revenues	35	21.2%
Increase profitability of the firm	21	12.7%
Improves the brand name and goodwill	23	13.9%
Standardizing the modus operandi	13	7.9%
Cost & defect reduction	10	6.1%
Retaining the customer's interest	6	3.6%
Manufacturing lead time reduces	8	4.8%
Total	165	100.0%

Figure - 1 indicates the Gender, Age and Job Role Factual Analysis, Figure - 2 figures out the Business profile and educational Factual Analysis, Figure - 3 shows the Quality Management & Cost Impacts Factual Analysis,

Figure - 4 looks at Factors influencing the quality of production and Figure - 5 looks at Influence of quality management in various aspect.



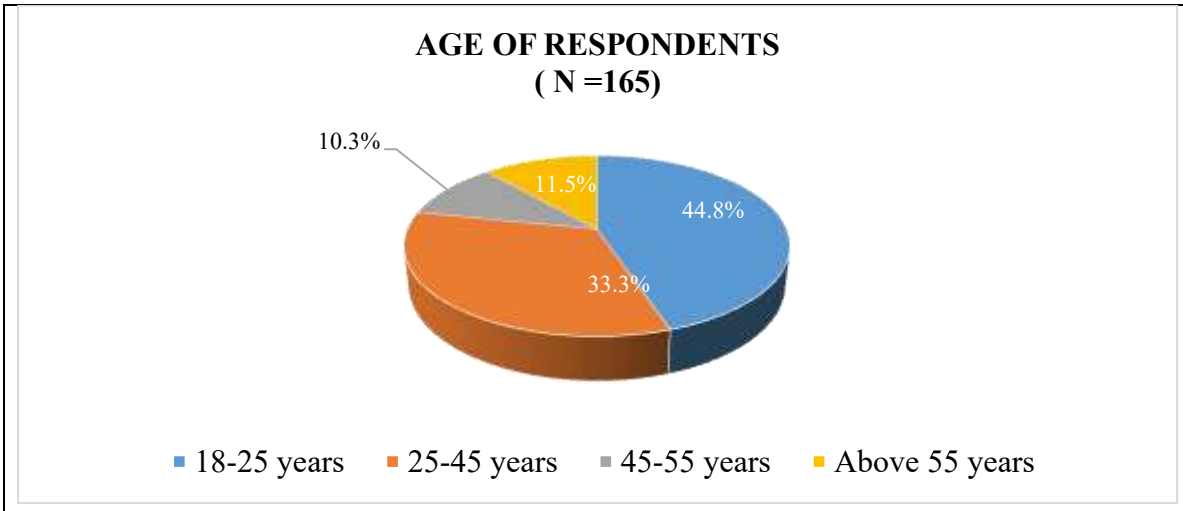
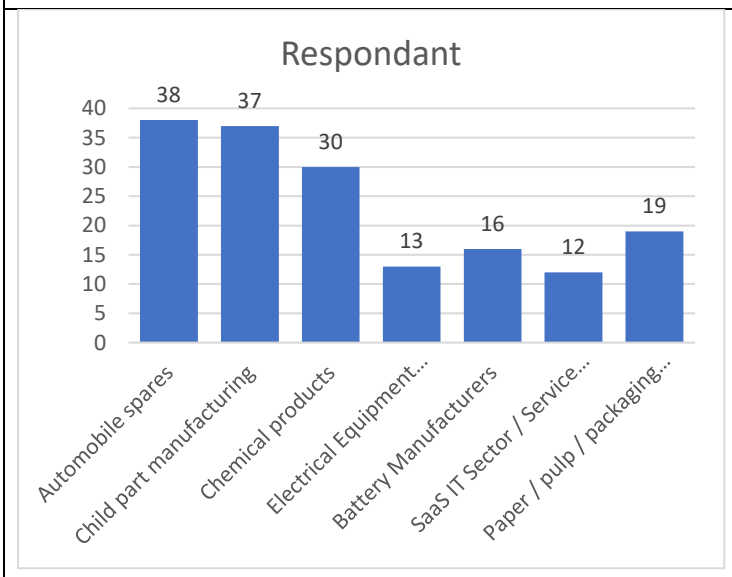
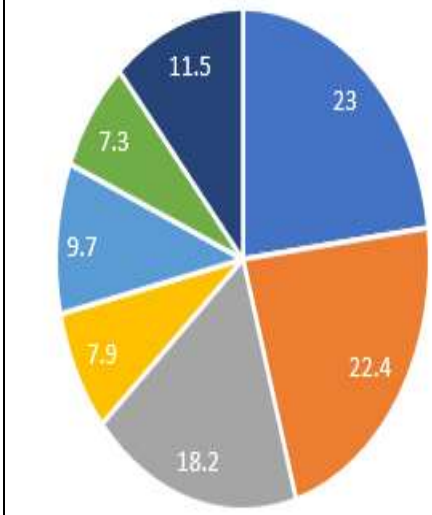


Figure -1. Gender, Age and Job Role Factual Analysis





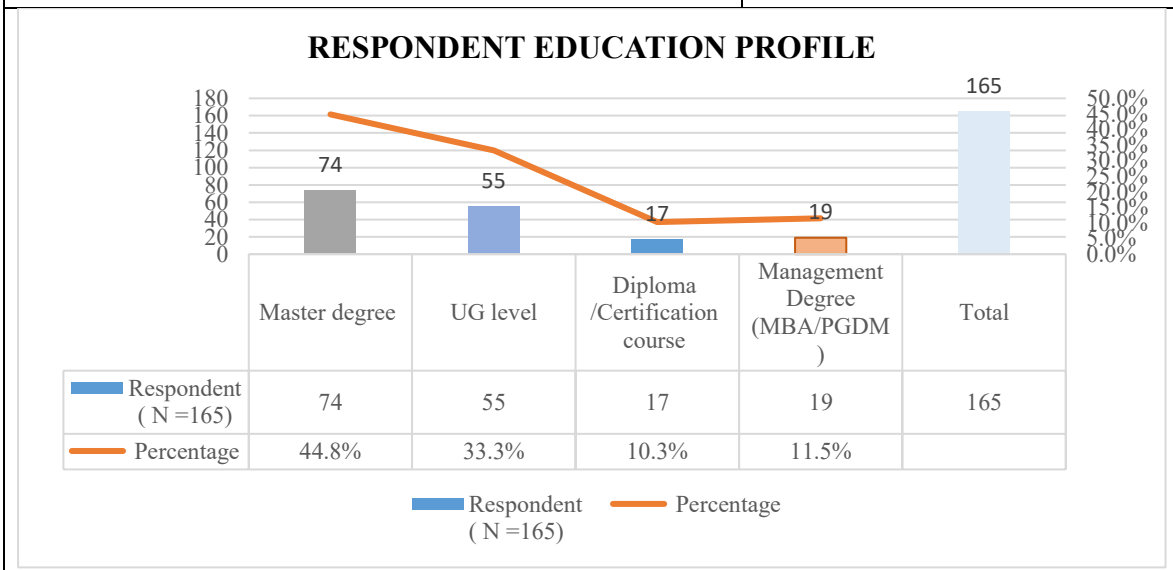


Figure - 2. Business Profile and Educational Factual Analysis

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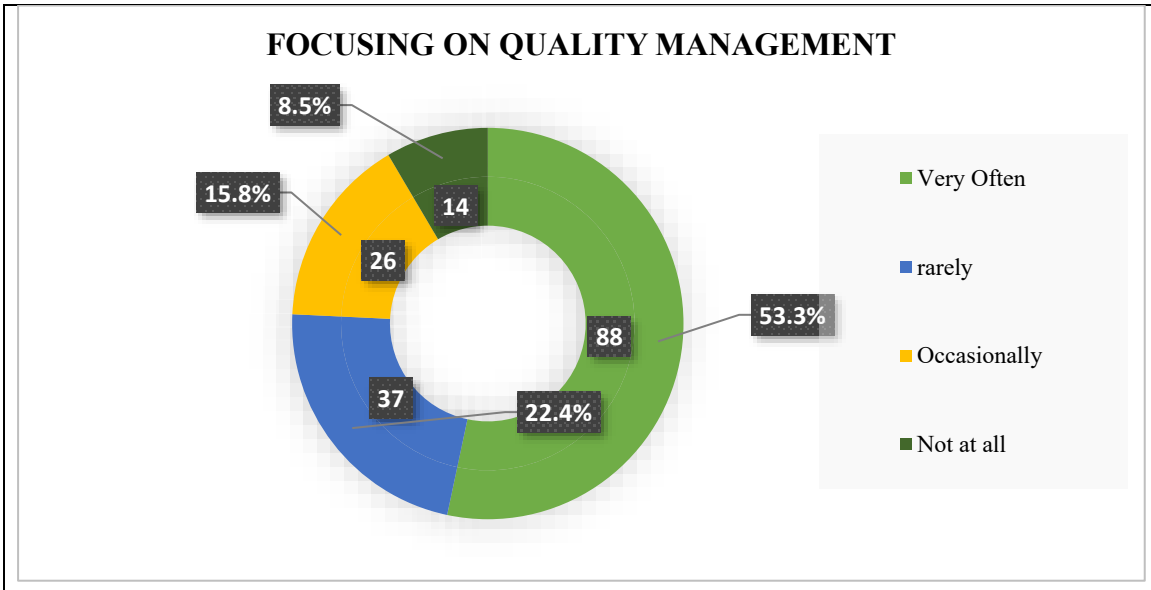

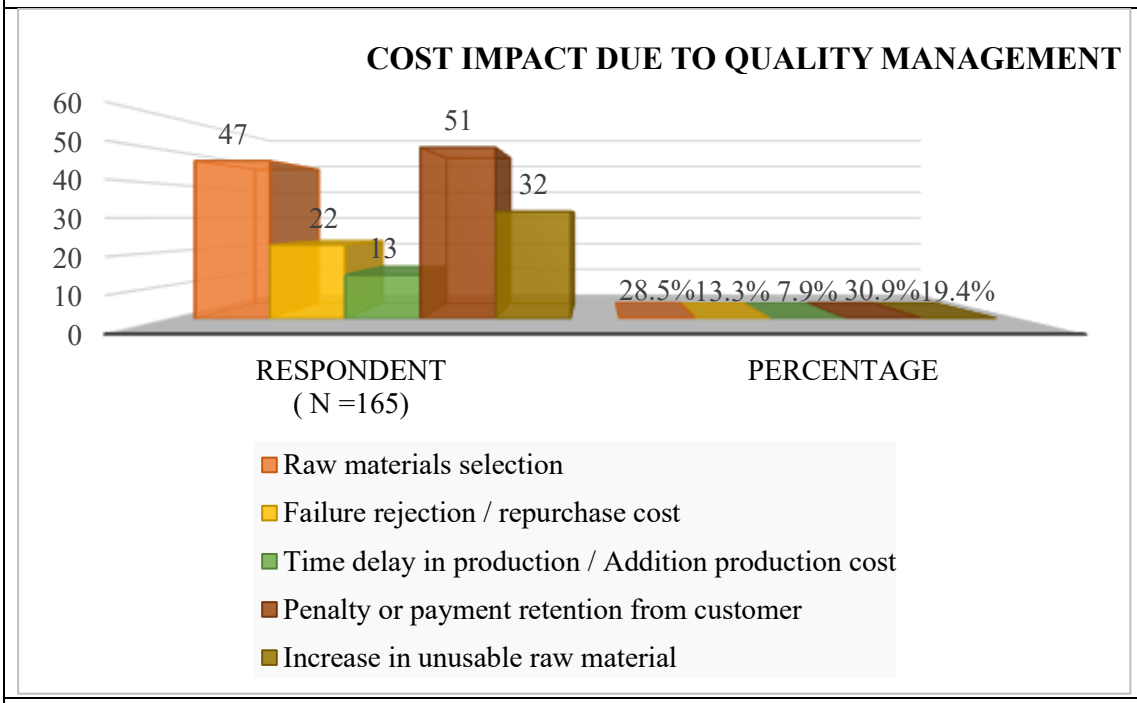

Figure - 3. Quality Management & Cost Impacts Factual Analysis

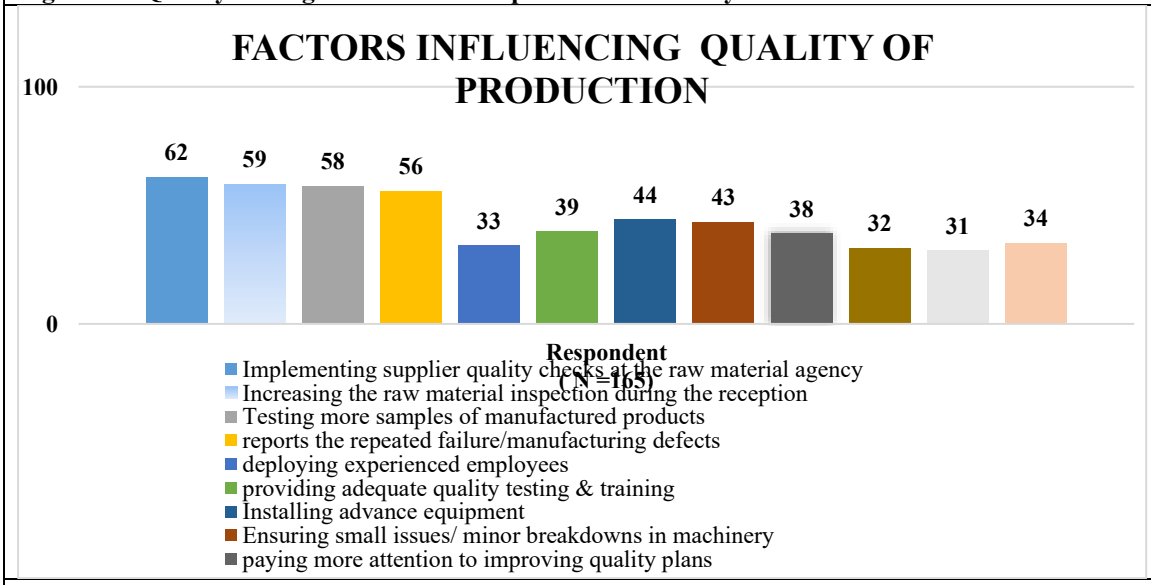

Figure - 4. Factors Influencing the Quality of Production

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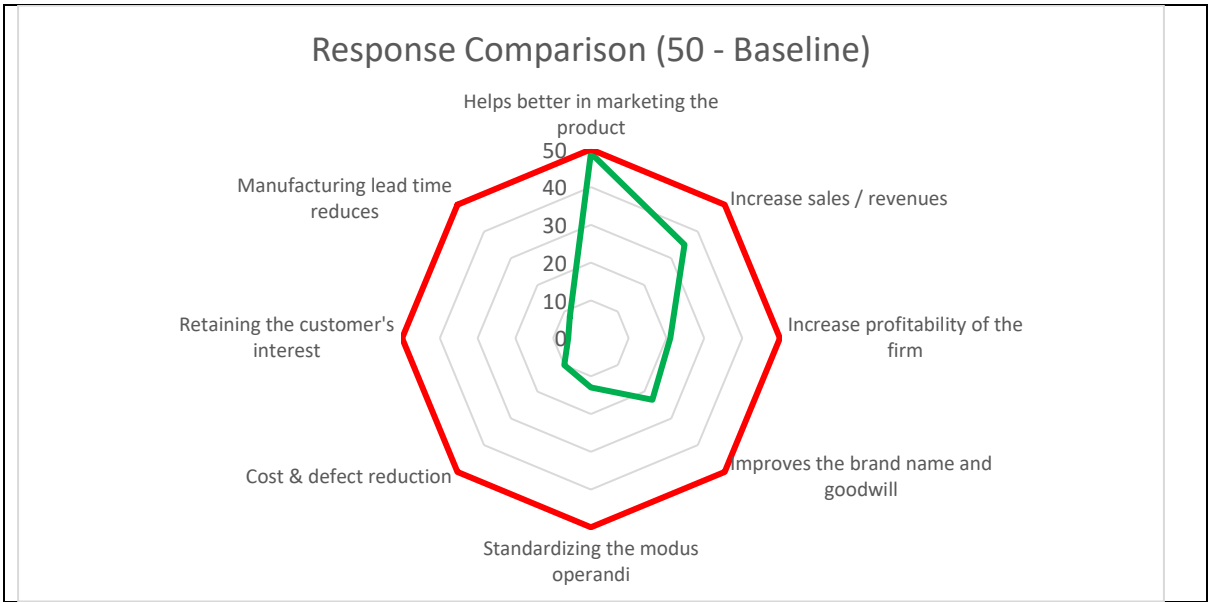

Figure - 5. Influence of Quality Management in Various Aspect

4.2 REGRESSION ANOVA ANALYSIS & INTERPRETATION

Table – 4. Regression ANOVA Results

Source	DF	Sum of Square	Mean Square	F Statistic (df_1, df_2)	P-Value
Regression (between $\hat{y}_i$ and $\bar{y}$)	1	1083.2158	1083.2158	4200.6382 (1,163)	0.0001
Residual (between y_i and $\hat{y}_i$)	163	42.0327	0.2579		
Total (between y_i and $\bar{y}$)	164	1125.2485	6.8613		

Regression line equation $\hat{Y} = 1.3899 + 0.8924X$ and Table - 4 indicates Regression ANOVA Results. QMS will improve your organization's profit predicted paying attention on quality will improve Company performance, R2 = .96, F (1,163) = 4200.64, $p < .001$. $\beta = .89$, $p < .001$, $\alpha = 1.39$, $p < .001$. Figure 6 indicates the regression line plot & Figure - 7 indicates the Prediction interval & Figure - 8 indicates the residual plots.

Figure - 6 Regression Line Plot

Paying attention to quality will improve Company performance and QMS will improve your organization's profit relationship R-squared (R2) equals 0.9626. This means that 96.3% of the variability of paying attention to quality will improve Company performance is explained by QMS will improve your organization's profit. Correlation (R) equals 0.9811. This means that there is a precise robust undeviating connexion between QMS will improve the organization's profit and paying attention on quality will improve Company performance. The Standard deviation of the residuals (Sres) equals 0.5078.The slope: b_1=0.8924 CI [0.8652, 0.9195] means that when effort increase on QMS will improve the organization's profit by 1, and the value of paying attention to quality will improve Company performance by 0.8924.The y-intercept: b_0=1.3899 CI[1.2231, 1.5568] means that when QMS will improve the organization profit equals 0, the prediction of paying attention to quality will improve Company performance's value is 1.3899. The x-intercept equals -1.5576.

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Figure - 7. Prediction Interval

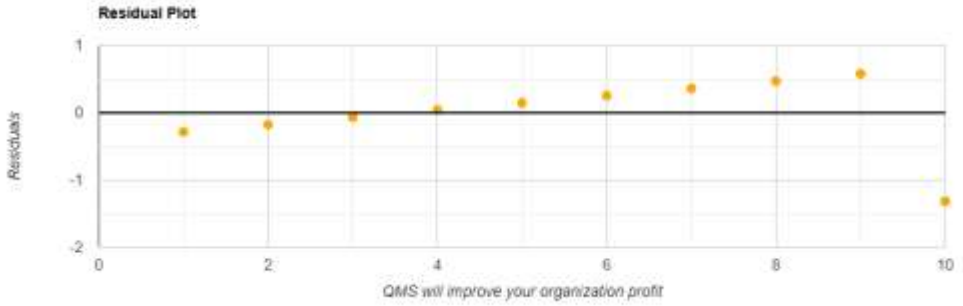

Figure - 8. Residual Plot

Overall regression: right-tailed, F (1,163) = 4200.6382, p-value = 0. Since p-value < α (0.05), we reject H0.The linear regression model, Y = b0+ b1X + ε, provides a better fit than the model without the independent variable resulting in Y = b0 + ε. The slope (b_1): two-tailed, T(163)=64.8123, p-value = 0. For one predictor it is the same as the p-value for the overall model. The y-intercept (b_0): two-tailed, T(163) = 16.4487, p-value = 0.0001. Hence, b_0 is significantly different from zero

5. DISCUSSION

Every industrial sector is now more conscious than ever of the importance of implementing QM principles in the pursuit of continuous quality improvement in production processes. The majority of industrial businesses employ quality as a strategic strategy to improve their competitiveness in the global market. Every industrial sector in the current corporate world works hard to implement QM principles in order to get competitive advantages in areas such as quality, pricing, flexibility, delivery speed, innovation, and time. The study's findings demonstrated that MSMEs had a high level of agreement with one another about the use of QM methods in the pursuit of quality performance (Murugesan, T. K., et al 2020).Another study looks at the relationship between the performance indicators of small and medium-sized businesses (SMEs), suggests an integrated index of company performance and quality practices, and examines how the QMS affects business performance. The findings demonstrate how important the staff component is to process efficiency, customer happiness, and financial success. Processes and staff happiness lead to customer satisfaction. The causal relationship between business performance variables and QMS is established by the influence that QMS has on processes and personnel performance. QMS has short-term financial effects but long-term advantages. It depends on two things: the level of understanding of QM and how they are used in business (Bagodi, V., et al 2021). The country's economy has benefited greatly from small and medium-sized businesses (SMEs), although their development has been erratic due to a high death rate. Industry 4.0, which is being implemented globally in the manufacturing sector, presents a Technology Index as a criterion to determine a firm's production effectiveness. Each unit had a different level of quality consciousness, and there was little willingness to put quality control procedures in place. Industry 4.0 deployment seems to require benchmarking of these elements, specifically individuals, procedures, and excellence preparedness. According to the study's findings, staff engagement and customer satisfaction are directly impacted by the less automated procedures in Indian SMEs. This is a change from the conclusion that automated enterprises' procedures affect their customers' pleasure. Consequently, Industry 4.0 increases the efficiency and reliability of Indian SMEs (Bagodi, V., Sinha, D., & Bagodi, V., 2022). Price has a beneficial influence on MSME product purchase decisions, according to additional research findings. Stated differently, for MSME items, greater price values translate into higher decision values, whereas lower price values translate into lower decision values. Additionally, the results show that MSME manufactured goods buying resolutions are positively and significantly impacted by service quality. Stated differently, choices to purchase MSME items will be more strongly influenced by higher

service quality ratings and less strongly by lower service quality values. They buy products from MSMEs. The final finding demonstrates that service quality is a modest mediating factor even if it has a substantial impact. Price continues to have a more direct influence on purchasing decisions than facility excellence has a mediating effect (Indrawati, M., & Halima, N., 2024). The growth of MSME businesses in Indonesia during two time periods is examined via the innovation business model. It is anticipated that individuals in charge of regulating MSMEs and legislators in general would assist small and medium-sized businesses in enhancing service excellence and product revolution to function better during the epidemic. This was made evident when it contrasted the regression findings of the pre-pandemic and post-pandemic conditions and their effects on Indonesian MSMEs with respect to customer loyalty, product innovation, and service quality. Five quality aspects - tangibility, dependability, assurance, responsiveness, and empathy - were covered in the service quality approach, which was used to gauge service quality (Sunarta, S., et. al. 2025).

6. CONCLUSION

From this standpoint, Quality plays a vital role in any industry, but it comes with a cost. The cost of quality mainly involves the expertise of the manufacturer, quality of raw materials, manufacturing productivity factors, equipment and tools used for production, and quality check & assurance compliance. These are the cost contributors that make sure that the product has supreme or excellent quality. Maintaining these QMS takes place a crucial role. This cost will be heavy for MSMEs, where they want to cut those costs to maximise their profit by reducing the cost of production. However, if the effort of quality is reduced, then it affects the goodwill of the company, which results in a reduction in sales and revenues. Therefore, placing the right quality plan makes the MSME survive for a longer period. Hence, this study marks evidence of the importance of quality in MSMEs for sustainable business.

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