

Impact of Quality Management on Employee Performance: An Indian Manufacturing Case Study

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Abstract: - Perspectives on quality management (QM) supports businesses organise, track, and document all quality procedures digitally. It provides assurance that the products are made accurately, flawlessly, and in line with all applicable and mandated standards in India. The major aim of the study is to comprehend how QM affects the growth of employee performance especially the Indian manufacturing sector. This shall ensure that the goods are manufactured correctly and without error in India, meeting all necessary and relevant standards. Today, a corporate role is deemed necessary for the improvement of managerial abilities, problem resolution capabilities, customer demand management, and other areas. Several significant Indian manufacturers have obtained ISO 9000/14000/27000 certifications to the manufacturing safety and technical procedures. This study adopted secondary to further enable the research to complete a systematic literature review. The thematic analysis has been accomplished to evaluate appropriate themes for visualising the patterns of information about QM and its impact on the performance of employees in the Indian manufacturing sector. It is in this context that the vast scope of AM's design freedom and increased functionality, coupled with significantly reduced lead times, presents an opportunity to establish a roadmap for broad customisation. The Six Sigma method is commonly used in traditional sectors such as automotive and chip industries to plan quality assurance, Quality Control (QC), or continuous improvement through a heavy reliance on statistics, optimisation techniques, and data.

Key-Words: - Total Quality Management, Performance Excellence, Technology Acceptance Model, Innovation Management, Additive Manufacturing, Quality Assurance, Quality Control.

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1 Introduction

The act of monitoring overall operations, as well as task management that upholds a high level of excellence, is referred to as quality management. It comprises standards for quality assurance, control, and improvement because these viewpoints have the most positive effects on an organisation's employee performance. As a result, quality management perspectives assist firms in digitally documenting, managing, and tracking all quality processes, [1]. It guarantees that the goods are produced correctly, faultlessly, and in accordance with all required and relevant standards in India. In Hyderabad, Dr. V Krishnamurthy started the process of promoting quality management measures. Numerous significant Indian businesses, including Tata, Mahindra, TVS Group, Aditya Birla Group, L&T, and many more, also adopted the procedure, [2].

It is today considered a corporate role that is essential to improving managerial abilities, problem-solving capabilities, customer requirement management, and others. The ISO 9000, 14000, and

27000 certifications, which address manufacturing safety and technology procedures, have been obtained by several significant Indian manufacturing enterprises, [2]. From 1990–1991 to 2016–17, India's manufacturing sector's total sales revenue increased by a factor of 31, [3]. It has been noted that these gains have been made possible by the manufacturing sector's continual development over the past 25 years, thanks to quality management. It may be described as a significant performance improvement for the Indian manufacturing sector. Employees of businesses in India's industrial sector have adapted to digital quality management systems to increase organisational revenues. “Total Quality Management (TQM) and Performance Excellence (PE)” have been important drivers of recent growth in the industrial sector [3] as shown in Figure 1. The Indian manufacturing sector is developing the essential training and development programmes to prepare its employees to fulfil the required quality standards set by the Indian government.

1.1 Rationale of the Research

The concern relates to the potential impact of quality management procedures on worker productivity in Indian manufacturing companies. Due to its ability to affect both organisational effectiveness and employee well-being, this topic is of the utmost importance.

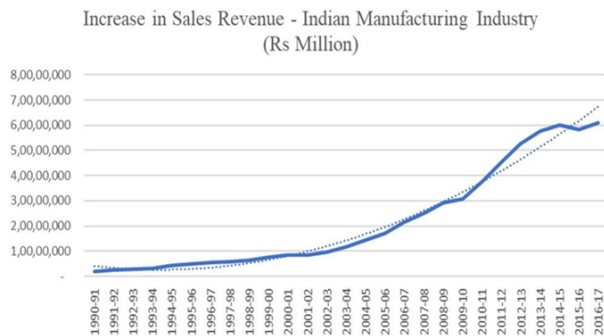


Fig. 1: Indian Manufacturing Growth

Source: [3]

QM procedures are crucial in the manufacturing environment of India in assuring the excellence of products and processes, [4]. While much research has examined how QM affects operational outcomes like product quality and customer happiness, understanding its influence on employee performance has received comparatively less attention. This study attempts to fill this gap by investigating a currently understudied relationship between QM practices and employee performance.



Fig. 2: Annual Production Growth Rate (2013-22)

Source: [5]

Due to the country's rapidly growing population, the manufacturing sector in India has emerged as a quickly expanding industry. During the fiscal year 2022, the manufacturing sector's annual growth rate of production was 11.4% [5] as shown in Figure 2. Leadership philosophies, organisational cultures, and training initiatives have all been the subject of prior research into the effects of various variables on employee performance, [6]. However, little research has been done on the precise relationship between

quality management practices which include procedures like "Total Quality Management (TQM), Six Sigma, and Lean Manufacturing" and worker performance. By investigating how the use of these quality management practices can affect employee motivation, job happiness, skill development, and overall job performance, this research aims to shed light on this unexplored terrain.

The study aims to fill this knowledge vacuum and offer important insights to both the academic community and business. The results of this study may offer Indian manufacturing companies evidence-based tactics for boosting worker productivity through efficient quality management implementation. The findings of the study may also result in suggestions for improving current quality management procedures so that they more closely match the requirements and goals of employees, thereby establishing an environment at work that is both harmonious and productive.

1.2 Problem Statement

Resistance to technology is the biggest issue with the implementation of quality management strategies for improving employee performance. The country's literacy rate is 77.70%, comprises a male literacy rate of 84.70% and a female literacy rate of 70.30%, [7].

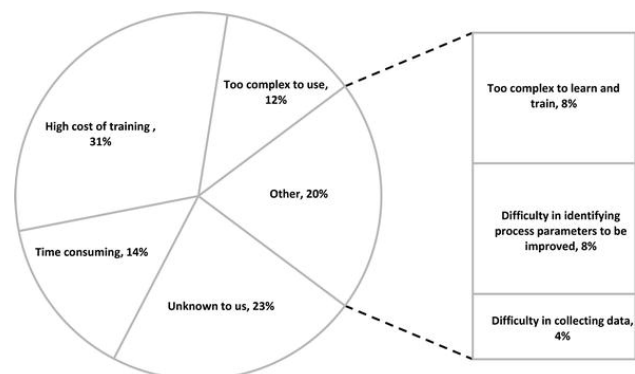


Fig. 3: Challenges with Quality Management in the Indian Manufacturing Sector

Source: [8]

Some of the key challenges associated with quality management in the Indian manufacturing sector are shown in Figure 3. Another significant concern affecting the Indian manufacturing sector is the lack of adequate supplies of high-quality equipment and the costs associated with poor training and development, [9]. Lack of understanding of emerging technologies and incompatibility with new equipment or work processes made it extremely difficult for the manufacturing sector to adopt the most recent QM techniques. System challenges,

service problems, and design errors are all connected to India's manufacturing industry.

1.3 Research Aim and Objectives

Research aims to understand the impacts of quality management (QM) on employee performance development in the Indian manufacturing industry. The key research objectives are discussed below.

- RO1. To justify the different processes associated with quality management (QM) in the Indian manufacturing sector.
- RO2. To understand the impacts of QM on employee performance.
- RO3. To identify different challenges associated with QM in the Indian manufacturing sector.
- RO4. To recommend different practices that can be adopted to improve QM in the Indian manufacturing sector.

The **research questions** of the research are as below.

- RQ1. What are major processes associated with QM in the Indian manufacturing sector?
- RQ2. How does QM drive positive impacts on employee performance?
- RQ3. What are challenges associated with QM in the Indian manufacturing sector?
- RQ4. How can QM practices be improved in the Indian manufacturing sector?

1.4 Significance of research

The Indian manufacturing sector has been the primary focus of this study since it is characterised by quality management concepts that support the improvement of organisational performance. Only when employee performance grows and aids in overcoming obstacles can organisational performance be improved, [10]. The study has also benefited the growth of overall staff performance and the various QM strategies used by India's largest manufacturing firms. Understanding the QM procedures and how they may be further enhanced to meet Indian manufacturing norms can be helpful, [1]. Like that, through harmonising ideas and comprehending the consequences of the theories pertinent to the research topic, a greater knowledge has been produced in this study. To fully comprehend the subject as well as to draw on the literature, methodological techniques have been required. It has been depicted based on the above elaboration that due to the implementation of QM procedures, the Indian manufacturing sector has experienced a sharp increase in sales revenue, which has had an impact on employee performance. Quality management has advantages, including lower defect

levels, fewer raw material usage, higher organisational efficiencies, and product innovation.

2 Literature Review

The section reviews existing literature of research topic, as QM, employee performance, and the impact of QM on employee performance. While surveying an article, paying little heed to the field, the writer begins by examining past exploration to frame and evaluate the examination field to rouse the goal of the study as well as help the examination question. A writing survey serves as the establishment for fostering hypothesis or reasonable model, and it could be helpful while endeavouring to outline the development of a specific report subject across time.

2.1 Theoretical Background

Technology Acceptance Model (TAM)

The TAM is widely regarded as the most prominent and widely used theory to characterise an individual's adoption of "information systems", including its emphasis on technological qualities and two primary elements, namely "usefulness and ease of use", [11]. The TAM is an established concept that has been proven via various research involving the use and acceptance of "information technology (IT)". TAM arose from the "theory of reasoned action (TRA)" and is a well-known paradigm to predict and explain individual behaviour, [12]. The TAM forecasts IT system utilisation among employees in the manufacturing industry. Individual behavioural intents to utilize an IT influence system utilisation; they are concurrently driven by personal views toward IS employment as well as perceived usefulness. Several research studies found that perceived utility, however not perceived simplicity of utilisation, was connected to behavioural desires for utilising an IT as well as actual utilisation.

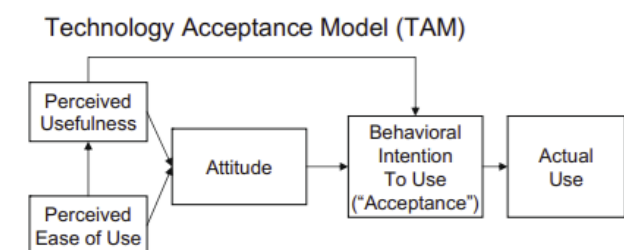


Fig. 4: Technology Acceptance Model

Source: [11], [13]

Technology has a significant role in improving employee performance in the manufacturing sector, hence various firms implement I4.0 to improve

employee as well as organisational performance. However, companies often faced challenges to improve employee performance due to a lack of technology acceptance by their employee. Therefore, this model has helped researchers to identify different aspects of employee performance. Figure 4 illustrates an example of TAM model.

Diffusion of Innovation Theory (DIT)

The DIT stated that in evaluating the acceptance of an invention, potential adopters consider several technical features: first, the relative benefit of the innovation over competitors and its suitability with current facilities are the most important adoption drivers, [14]. Second, regarding trialability and complexity, firms examine the external organisational environment in consideration of efficiency advantages or potential restrictions from the chosen innovation to consumers, governmental agencies, and suppliers, [15]. Figure 5 shows the key stages of the Diffusion of Innovation theory (DIT).

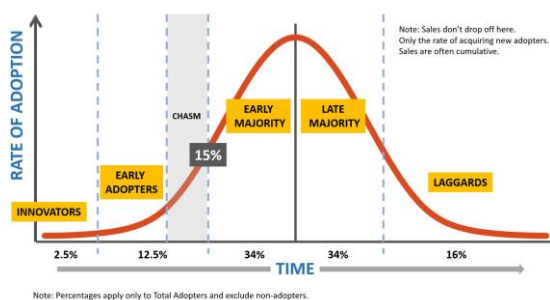


Fig. 5: Diffusion of Innovation Theory
Source: [16]

DIT is used in various industrial businesses in India to promote innovative QM techniques and assist in the development of organizational performance. Early adopters employ technologies developed by innovators to establish usefulness in organisations. DIT presents five innovation features that are forebears to any adoption: relative advantages, complexity, compatibility, observability, and trialability, [17]. DIT is a broad psychological and social theory that seeks to anticipate how individuals make decisions to embrace new innovations by identifying and comprehending their adoption processes. DIT includes additional aspects of an invention that may be used to explain why users embrace the innovation or the way they arrive at a choice to adopt it.

2.2 Empirical Findings

QM in the Manufacturing Sector

Quality is an important factor in the implementation of new procedures, goods, or services, and

additionally determines the acceptance of innovative technologies for production. Organisations benefit from the establishment of a quality management system that has the purpose to align the requirements of involved parties (internal or external) within the set time, budget, and quality. An example model of a process-based QM system is shown in Figure 6, [18].

The introduction of additive manufacturing (AM) as a manufacturing method presents an opportunity to transform a wide range of enterprise-related operations, from manufacturing to supply chain management (SCM).

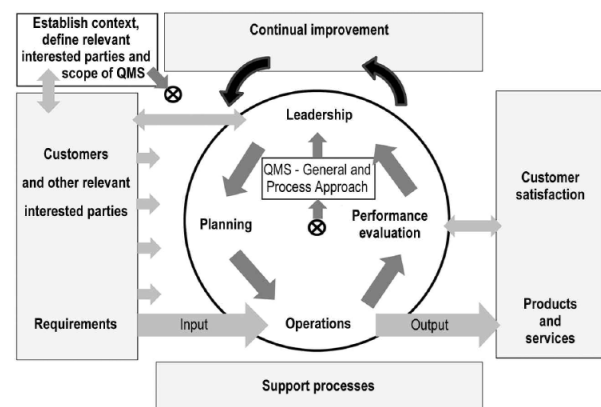


Fig. 6: Process-based QM System Model
Source: [18]

AM's unparalleled degree of design freedom and improved functionality, combined with much-decreased lead times, presents an opportunity for laying the path for mass customisation.

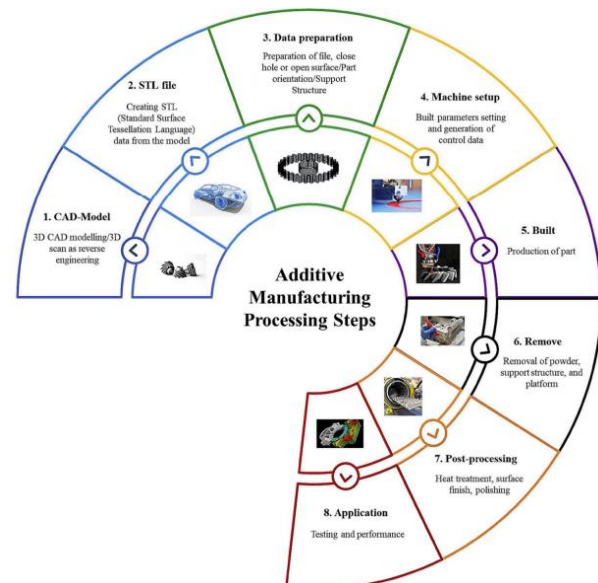


Fig. 7: Steps Applied for AM Process
Source: [19]

The most effective QM process used in the Indian manufacturing industry has been discussed below.

An example of the AM process for the design and fabrication is shown in Figure 7, [19].

Six-Sigma QM - Six Sigma (6S) is a commonly used approach in conventional manufacturing sectors (e.g., automotive and semiconductor industries) for “quality assurance (QA), quality planning, Quality control (QC), and continuous enhancement through the heavy use of statistics, optimisation, and data”, [20]. 6S employs a data-driven “Define, Measure, Analyse, Improve, and Control” (DMAIC) process, as seen in Figure 8. The 6S approaches aim to identify and eliminate the underlying causes of problems to enhance the quality of the final product, [21].



Fig. 8: DMAIC Methodology

Source: [20]

The 6S program was developed to fulfil the demands of large-scale production in the automobile and semiconductor sectors, and it has had tremendous success throughout the last century.

The 5Ps of QM - Efficient manufacturing processes promote stability in growth and assist with maintaining product quality in India's manufacturing sector. To increase organisational performance, major corporations such as Tata, Aditya Birla, and Mahindra Group have used cutting-edge quality management approaches. Furthermore, the top manufacturing businesses in India are focusing on the areas of Purpose, Process, People, Performance, and Platform to achieve huge quality and operational excellence, [22]. It is the primary paradigm of lean production and serves an important role in maintaining product or service quality. In the Indian manufacturing industry, the basic goal of making a product is defined and correctly linked with what customers want. Furthermore, it is linked to the core purpose of achieving the ISO 9001 Standard.

Impacts of QM on Employee Performance

Manufacturing businesses are significantly impacted by QM since it supports overall organisational growth while also assisting in employee development. Through continuous improvement helps the staff focus on the quality of the product or service. To achieve long-term success for both the company and its clients, organisations can build more cultural values, [23]. The primary goal of applying QM practices in the Indian manufacturing sector is to improve output and boost production capacity. Employees can also be forward-thinking when it comes to work that is competitive inside the company and important for cutting expenses and related services. An important research field with broad implications for organisational effectiveness and employee well-being is the relationship between QM and employee performance in India's manufacturing sector. Studies showed that to improve product quality and customer satisfaction, QM techniques, including “Total Quality Management (TQM), Six Sigma, and Lean Manufacturing” have become more popular, [24]. An example TQM is shown in Figure 9. Since I4.0 revolution has opened doors to digital perspectives, QM practices also help employees expand their abilities. As a result, organisational procedures in the manufacturing sector are evolving and leading to more digitised methods, which are assisting the development of IT or digital skills among the workforce, [25].

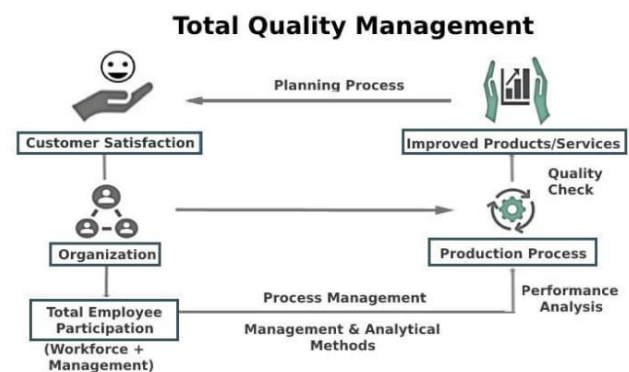


Fig. 9: Total Quality Management

Source: [26]

Implementing quality management procedures can improve workers' job satisfaction. Employee pride in their job and its influence on the product is more likely to exist in organisations that place a high priority on quality. This sense of direction can promote job satisfaction, which can boost levels of dedication and lower turnover rates. Additionally, QM procedures frequently involve clear communication and duties that are well defined,

which lessen ambiguity and tension among workers and thereby improve performance.

Manufacturing procedures that require human interaction and take a lot of time are currently being eliminated, [27]. The use of technologies is assisting the workers to perform correct procedures in manufacturing by removing faults; however, these processes were linked to defects in earlier production. Like how it influences customer satisfaction development, it also has an impact on the organisation's overall success. QM techniques can promote a continuous improvement culture by placing a strong emphasis on employee involvement in spotting and addressing operational inefficiencies. Employee motivation may increase because of their sense of ownership and contribution to the organisation's success. Additionally, QM practices frequently place an emphasis on skill development and training, giving workers essential competencies that improve their performance on the job and career advancement.

The Indian manufacturing sector has a complex link between QM procedures and worker performance. Although these procedures have the potential to improve employee motivation, job satisfaction, skill development, and general performance, their successful implementation necessitates careful consideration of the concerns of the workforce and efficient change management. Organisations that understand how QM and employee performance are linked are better equipped to foster a collaborative workplace that fosters both operational excellence and employee well-being, [28]. Therefore, more investigation and hands-on work should be done to optimise the use of QM concepts so that businesses and their people win. The competency and job satisfaction of employees are increased by investments made by quality-focused organisations in their skill development and training. This boosts product quality by increasing efficiency and reducing errors.

Clear communication and well-defined roles improve employee morale by lowering stress and absence. Employing techniques like TQM improves employees' feelings of accountability and ownership. It promotes a collaborative atmosphere and gives staff members the freedom to share ideas, which has a good effect on innovation and overall performance.

Challenges Faced by the Indian Manufacturing Sector in QM and Employee Performance

Although QM is viewed from a wider viewpoint in manufacturing, this stage's processes take longer to implement. In the Indian manufacturing sector, applying quality management practices presents

several difficulties because it affects the organisation's total performance. The outdated status of technology and infrastructure is one major barrier. The application of improved QM practices is hampered by outdated equipment and a lack of access to contemporary technologies. Employee skill development and training are also impacted by inadequate technology, making it more difficult for them to adjust to changing market demands, [29]. India's manufacturing sector is plagued by a skills gap since the available labour pool frequently lacks the required technical capabilities. Due to the need for qualified personnel to carry out complicated operations, this has an impact on the successful adoption of QM practices. This problem is made worse by a deficient educational system and a lack of training possibilities, which prevents workers from realizing their full potential.

Application of QM approaches is significantly hampered by resistance to technology, [30]. As personnel are instructed to adapt to these changes, technology significantly improves skill sets and industrial processes. However, it is frequently seen to need a lot of time and resources to implement by the organisations' higher management. Like this, the Indian community's lack of technological development understanding is a significant factor in the resistance to adopting new technology. Process, role, and responsibility adjustments are frequently part of QM. Employees may, however, fight these changes because they are uncomfortable or worried about losing their jobs. This opposition may prevent the implementation of QM measures, thus having a negative influence on employee performance.

Adopting new technologies would necessitate more employee training and development programmes, which would increase budget expenses. Employees in the Indian manufacturing sector are having a difficult time adjusting to QM practices due to the increased complexity of contemporary technologies, [31]. An intricate regulatory system governs the Indian manufacturing industry, which can cause confusion and inefficiency. The implementation of QM systems while simultaneously adhering to regulatory standards can be a difficult endeavour that takes resources away from investing in improving employee performance and development. It might be difficult to gauge employee performance beyond simple productivity. Productivity is crucial, but so are other factors like skill development, creativity, and teamwork. A restricted focus on one-dimensional goals may emerge from a lack of broad performance measurements, leaving room for overall improvements unnoticed.

In India, certain manufacturing companies still practise a traditional hierarchical culture. This can obstruct free communication and teamwork between staff and management, restricting innovation and preventing the sharing of ideas required for improving quality and maximising performance. Employees find it difficult to adopt the most recent QM practices since these procedures are frequently difficult to understand and train for, and because improper data is not properly conveyed to the workforce. The Indian manufacturing sector is further hampered by a lack of access to high-quality equipment, which makes it difficult to apply QM practices. An organisational culture shift in favour of one that is more adaptable and inclusive can encourage creativity and employee engagement. Performance measures can more accurately reflect employee contributions if they are in line with a broad range of indicators, such as innovation and skill development.

2.3 Strategies for Improving QM Practices in Manufacturing Sector

To improve QM practices, manufacturing businesses in India must make decisions based on evidence. The consolidation of quality control data is required to improve the overall quality management viewpoint in manufacturing, and data is increasingly important in helping businesses adapt to new practices, [32]. In a similar vein, to improve QM procedures, the supply chains of manufacturing companies must be transparent, and supplier performance must be monitored. Application of compliance software is essential at this level because it can give organisational stakeholders a transparent and understandable platform from which to operate in terms of QM. The effectiveness and precision of the manufacturing process are improved by upgrading equipment, tools, and production facilities. Automation and data analytics are examples of advanced technologies that can increase product quality while streamlining processes. Additionally, giving employees access to contemporary tools gives them the ability to complete their responsibilities more successfully.

It suggests that consolidated data can be used to produce reports on any problems with the current production process. Like how automation technology can reduce human error and improve both quality and production in the industrial process, [33]. Inform staff members of all levels about the advantages and tenets of QM techniques like TQM, Six Sigma, and Lean. Employees are more inclined to actively participate in the execution of these practices when they are aware of how they contribute to

organisational success. Encourage open dialogue and cross-departmental cooperation among staff members. Employees who are encouraged to exchange ideas, learn from one another, and collaborate to overcome obstacles operate more innovatively. Enhancing a culture of improvement through praising and recognising innovative contributions.

The introduction of new QM practices frequently necessitate alterations to workflows and procedures. Employee participation in decision-making, addressing their concerns, and offering training and support during the transition are all essential components of effective change management. This encourages more seamless implementation and lowers resistance to change. Develop initiatives that improve staff engagement, job satisfaction, and general well-being. Offer chances for job progression, give praise for excellent work, and make sure there is a good work-life balance, [34]. Employee engagement increases motivation to support QM initiatives. Create a thorough set of performance measurements that go beyond just productivity. Include metrics for innovation, teamwork, problem-solving, and skill development. Employees and supervisors regularly meet to discuss performance and suggest areas for improvement.

Driving QM practices and encouraging employee performance depend on effective leadership. Managers should receive leadership education with a focus on motivating, effective communication, and resolving conflicts. A positive work environment and employee engagement are fostered by strong leadership. Encourage staff members to take charge of their work processes and make choices that advance quality. Employees are more inclined to put their all into their work when they feel trusted and empowered, which improves performance results. Make suppliers part of the team and apply quality control procedures all the way through the supply chain, [35]. Consistently high-quality resources and inputs help to produce excellent products overall. Keep the channels of communication between the management and the staff open. Inform staff members frequently of company objectives, achievements, and quality management adjustments. Encourage staff members to communicate opinions, ideas, and concerns to improve processes over time. Employees who continuously contribute to quality improvement and high-performance standards should be honoured and rewarded. A culture of excellence is strengthened by publicly recognising their efforts or by providing rewards to encourage moral conduct and integrity at all organisational levels. Employees are more inclined to dedicate themselves to QM

projects when they believe in their leaders and their ethics.

2.4 Conceptual Framework and Literature Gap

The literature that already exists on quality management and worker performance in India's manufacturing industry has mainly concentrated on how quality management practices affect operational outcomes like product quality and customer satisfaction. The intricate relationship between QM practices and their direct impact on many dimensions of employee performance, such as motivation, skill development, job satisfaction, and overall job performance, is, however, notably unexplored in the literature. Few research has particularly looked at how QM practices like TQM, Six Sigma, and Lean Manufacturing contribute to improving employee performance within the Indian manufacturing industry, even though certain studies have addressed employee performance in larger organisational contexts. Conceptual framework shown in Figure 10.

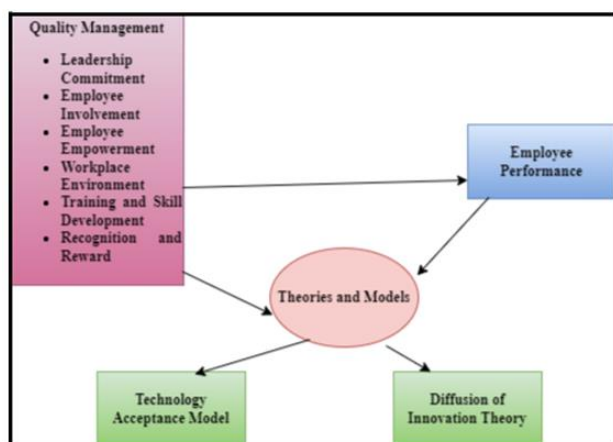


Fig. 10: Conceptual Framework

Source: Created by Authors

QM has a huge influence on manufacturing organizations since it promotes overall organizational success while also supporting personnel development. Employees can also be forward-thinking when it comes to competitive work inside the organisation, which is vital for cost-cutting and associated services. QM practices and worker performance are intricately linked in the Indian manufacturing industry. TQM procedures boost workers' sentiments of accountability and ownership. Consolidating quality control data is essential to improve overall QM in manufacturing, and data is becoming increasingly vital in assisting organisations in adapting to new practices. Changes to processes and procedures are usually required when implementing new QM practices.

3 Research Methodology

The numerous techniques, strategies, and approaches utilised in research are collectively referred to as research methodology. Research methods refer to the systems utilized by the specialist all through an exploration examination. These are, for the most part, arranged, esteem free, and logical. Hypothetical strategies, mathematical frameworks, factual philosophies, exploratory examination, etc are models. It is important to choose a scientific and accepted framework to apply all techniques of research methodology. In this context, the research onion framework has been considered.

3.1 Research Philosophy and Design

Interpretivism **research philosophy** has been employed in this research for data collection and analysis. Interpretivism refers to methods that emphasise the significant aspect of individuals as well as their engagement in cultural and social life. It describes research techniques that take the perspective that people's understanding of truth is something created by human agents, and hence explicitly excludes natural science approaches. Interpretivism encourages the importance of qualitative information in the search for knowledge, [36]. Interpretivism is a theoretically game-changing philosophical approach that emphasises the performance quality in individuals instead of abstract markets, stressing emergence instead of assuming the presence of opportunities, [37]. While interpretative research is acknowledged for its significance in giving contextual dimension, its findings are frequently criticised for a lack of validity, generalisability, and dependability. Studies stated that in interpretivism philosophy, the interpreter defines the thing to be comprehended and so stays unaltered by and outside of the interpretative process, [38]. Therefore, the Interpretivism philosophy is suitable to investigate "the impact of quality management on employee performance in the Indian manufacturing industry".

The **research design** is required for a scientific study. It should specify the numerous methodologies to be employed in resolving the research topic, as well as the data and sources linked to the research problem, as well as the time and financial budget. In essence, the research design serves as the framework for the whole study project, [39]. The design makes it easier and more methodical to complete the desired activity. In this research descriptive research design has been employed to investigate "the impact of quality management on employee performance". The primary goal of descriptive research design is to

explain the set of conditions as they currently exist. Ex post facto research has been utilised to elaborate on this form of research in many domains or themes of study, [40]. Descriptive research provides a precise representation of people, situations, or events. This design provides researchers with a profile of specified key components of the phenomenon of interest from a personal, industry-oriented, and organisational standpoint, [41]. As a result of this study approach, the researchers were able to collect data from a wide range of literature on the influence of QM on employee performance in the Indian manufacturing industry.

3.2 Research Approach and Strategy

In this research inductive approach has been employed to collect data for the investigation of the “impact of QM on employee performance in the Indian manufacturing industry”. The goals of employing an inductive approach are to reduce raw textual information into a summary, brief format; determine clear connections between assessment or study objectives as well as summary results based on the raw collected data; and establish an understanding of the fundamental framework of events or procedures apparent in the initial information, [42]. The inductive approach offers a simple and methodical set of techniques for interpreting qualitative information, resulting in trustworthy and accurate results. Though the inductive approach is not as effective as other logical methods like model or theory construction, it does give a simple, uncomplicated method for obtaining findings in the setting of targeted assessment questions, [43]. The inductive approach's major goal is to enable study results to arise from the dominating, significant, or frequent themes that accompany raw data, free of the constraints established by organised approaches.

Research can be qualitative or quantitative or mixed. The quantitative method depends on the measurement of the amount or quantity whereas qualitative research addresses qualitative phenomena related to quality, [44]. In this research qualitative method has been considered where textual data has been collected to investigate “the impact of quality management on employee performance.” The qualitative method is descriptive, non-numerical, uses words, and applies reasoning. At the same time, it aims to get the feeling, meaning, and description of a situation. Two factors are shared by all qualitative methodologies. First, there is a focus on events that occur in natural surroundings, which means in the actual world. And the second is that they entail examining such occurrences in all their complexities.

However, with a quantitative method, the circumstances are reversed, [45]. This study method included inquiry methods such as phenomenology, ethnographies, narratives, grounded theory investigations, and case studies. In this research method, researchers are involved in investigating the how's and why's of decision-making. Therefore, with this research method, the researcher can investigate how and why QM impact employee performance in the manufacturing industry in India.

To investigate “the impact of QM on employee performance”, a Systematic literature review (SLR) has been conducted. The systematic review is likely the most accurate and rigorous technique for collecting publications due to there is confidence that all relevant data has been covered. Studies indicated that high-quality SLR supports better decision-making and helps researchers incorporate literature for review, [46]. However, this strategy demands a limited study question and may not be possible yet viable for many sorts of research. Following the discovery of several publications in the early literature inquires a relevant technique is established. Studies opined that SLR provides a set of critical discussions on the specific research theme, [47]. The inclusion criteria of the SLR were influenced by the study question chosen.

3.3 Data Collection

Data collection is required to complete the research procedure; hence data collection is the primary research instrument. The significance of data gathering derives from the requirement that research cannot be conducted without specific information. The information might be secondary or primary. Primary data-gathering methods in behavioural sciences often involve interviews, questionnaires, observation, and database searches.

Secondary data sources include published periodicals, journals, books, etc., [48]. In this research secondary data has been considered to generate the final outcomes. For the secondary data collection, different aspects been considered such as inclusion and exclusion criteria, keywords, database, and PRISMA Framework as shown in Figure 11.

Researchers may sometimes use details that are already saved in a database to avoid having to search the data. The big benefit of databases is that data is already organised, and it is easy to access, [48]. Keywords search is an effective method for data collection in secondary research. This technique helps to search relevant secondary resources for research. In this research, different keywords were used to search secondary resources shown in Table 1, with inclusion & exclusion criteria shown in Table 2.

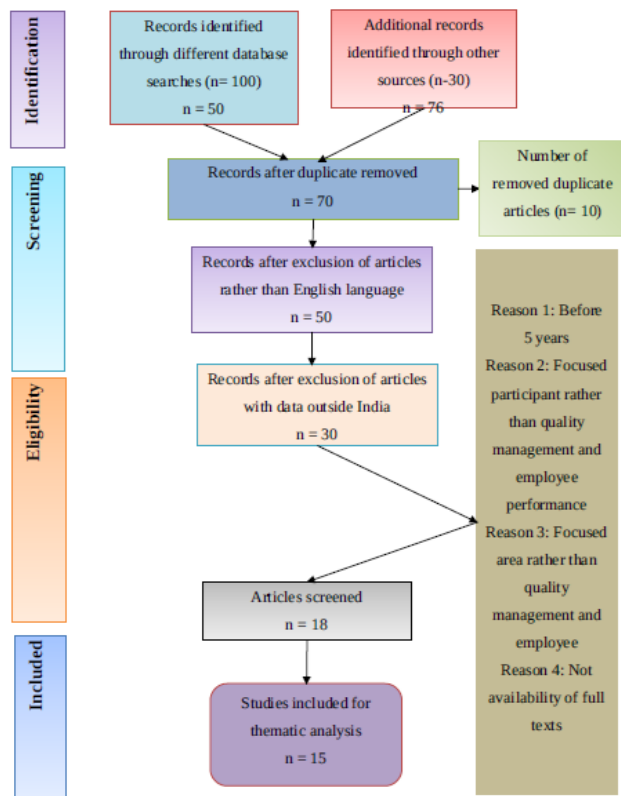


Fig. 11: PRISMA Framework
Source: Created by Authors

Table 1. Boolean Table

Factors	And	Or
Concept of Quality Management (QM)	Concept of employee performance (EP)	"Concept of QM and EP"
QM process	"QM process in manufacturing industry"	"QM process in the Indian manufacturing industry"
Employee performance management (EPM)	The strategy of EPM	"Strategy used for EPM in manufacturing industry"
"Impact Of QM On EP"	"What QM Effects EP"	"Does EP affect QM?"
"Challenges Associated with QM"	"Challenges Associated with EPM"	"Challenges Associated with QM and EP"
"How to Improve QM Practices"	"How to Improve QM Practices in the Manufacturing Sector"	"How to Improve QM Practices in the Indian Manufacturing Sector"

Source: Created by Authors

Table 2. Inclusion-Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Existing resources published between 2019-2023.	Existing resources published before 2019.
All existing literature conducted primary research or peer-reviewed.	All existing literature is not peer-reviewed.
All existing literature published in the English language	All existing literature published in another language
Full-text PDF is available	Full-text PDF is not available
Existing literature that has authors' names, and year of publication.	Existing literature does not have authors' names and years of publication.

Source: Created by Authors

3.4 Data Analysis Techniques

In this research, thematic analysis (TA) has been employed to analyse collected data. TA is a technique for analysing qualitative data which has grown in popularity. TA may be employed to address an extensive variety of research problems that arise from or need quite distinct conceptual structures, [49]. The flexible nature of TA also extends to evaluation, where the scholar must make some conscious decisions about how to handle data and analysis. One factor to examine is the theoretical perspective. TA is a six-stage analytic method, [50]. The initial phase of TA, familiarisation with the information, can occur throughout data collection. The next step is creating code that will involve the researcher more thoroughly in the information and serve as the foundation for analysis. As the coding advances, the scholar is probably to detect parallels and themes in the information. However, it remains critical to stay concentrated on coding the complete datasets before transitioning from coding to theme construction in the third stage. The themes developed by the researcher at this stage are like draft forms of an article of writing - unresolved yet open to modification - with the fourth step including examining prospective topics. A few strategies and queries are used to steer work toward establishing and identifying themes and then constructing the entire investigation during the sixth and final stage, generating the report.

All the processes used by the researcher throughout a research inquiry are referred to as research techniques. The research onion framework was used to choose all research methodological strategies. Interpretivism is a conceptually revolutionary philosophical paradigm that emphasises individual performance excellence. The basic purpose of a descriptive study design is to

describe the existing set of conditions. The purpose of using an inductive technique is to summarise raw textual material.

4 Data Analysis and Discussions

Findings are the main valuable part of every research as they help to separate specific and important data or information from the collected research articles. The section collected data shown in a tabular format by making a systematic literature review.

4.1 Data Finding (SLR)

All the collected data has been analysed here in the form of thematic analysis, and an overall discussion on this entire finding's has also been included in this section and covers the specific and depth knowledge for research topic as discussed in SLR within Table 3.

Table 3. Research Findings

Source	Aim/Research Findings
[51]	Aim: To investigate the connection between corporate sustainability (CS) and TQM, as well as the function of knowledge management (KM) as a mediator. Findings: The study's findings demonstrate that TQM has a considerable and advantageous impact on CS, proving that businesses that use TQM procedures are more likely to meet sustainability objectives. Furthermore, the study discovers that KM mediates the relationship between TQM and CS to some extent, indicating that good knowledge management techniques strengthen the positive effects of TQM on corporate sustainability.
[52]	Aim: To investigate how I4.0 technology, Lean Manufacturing Practises, and Sustainable Organisational Performance interact with Indian manufacturing firms. Findings: It highlights how adopting I4.0 technologies can have a good impact on both sustainable organisational performance and lean manufacturing practices, confirming the direct effects of I4T on both LMP and SOP. I4T improves SOP indirectly via having a good effect on lean manufacturing practices, according to the study, which also identifies LMP as a strong mediating variable.
[53]	Aim: To determine how TQM practices, such as customer focus, employee participation, continuous improvement, leadership & vision, and operations management, affect worker performance at the Qatar Ministry of Interior. Findings: The findings of the study demonstrate that TQM practices, including all its components, significantly and favourably affect employee performance. importantly, the study

	suggests that information sharing serves as a moderator in this relationship and that it enhances the impact of TQM practices on employee performance.
[54]	Aim: To investigate the factors that influence Lean Manufacturing (LM) deployment, especially in developing nations. Findings: The report highlights the significance of enhanced shop-floor management, QM, and manufacturing strategy as key drivers for LM adoption. The implementation of LM practices is greatly accelerated by these factors.
[55]	Aim: To investigate how TQM Techniques affect how well organisations perform. Findings: The results of the study show that TQM has very good impact on organisational performance in the setting of textile companies. This supports the claim that enables other researchers explore TQM practices.
[56]	Aim: To investigate how I4.0 innovations, surfaced because of the digitalization of service organisations, modify the relationship between Covid19 implications and employee performance (EP) Findings: The results of the study show that Covid19 implications, including elements such as a home office work environment, job instability, and virtual connections, due to varying degrees, affect EP. The study also shows that I4.0 technologies improve and moderate EP.
[57]	Aim: This study fills a gap in the literature by examining the drivers, obstacles, challenges, and applications of lean manufacturing in the furniture sector in emerging economies. Findings: The study found that enhancing productivity, organising the workplace, and maximising space utilisation are the driving forces behind lean implementation in the furniture business. While lean organisations encountered challenges linked to staff variables, such as a lack of resources, know-how, and aversion to change, non-lean companies reported knowledge-related concerns as implementation impediments.
[58]	Aim: In the context of Indian manufacturing, this study tries to investigate how temperature affects both productivity and labour supply. Findings: The results of the study show a significant inverse relationship between productivity levels in Indian manufacturing and temperature increases. Additionally, it was discovered that differences in temperature had an impact on the labour supply, with higher temperatures causing a decline in labour availability.

[14]	Aim: To meet the changing requirements for QM in the I4.0 era, which is characterised by the advent of cutting-edge digital technologies and an increase in the complexity of the global business environment. Findings: The study shows that predictive QM systems may be applied across industries and possible by cutting edge technology. These findings offer helpful guidance for developing and putting into practice efficient predictive QM systems that are suitable for the I4.0 era.
[20]	Aim: To improve the quality of AM processes, particularly in scenarios involving layer-wise production and mass customization, by leveraging data-driven methodologies like deep learning, machine learning, and network science. Findings: The results of the study offer information on how the six-sigma quality management principles can be successfully applied to AM, potentially unlocking its full potential by enhancing process repeatability and quality control, and so encouraging its wider adoption across a variety of industries. With a focus on lead time and energy consumption, new process control strategies are proposed to optimise the action plans after an anomaly is discovered.
[21]	Aim: To conduct an empirical Investigation into the constraints and new patterns of Six Sigma in manufacturing and service businesses. Findings: In this study, subject matter experts from major manufacturing and service firms in more than 20 countries discuss the top five Six Sigma limits and emerging trends. The top four restrictions were the same for manufacturing and service businesses, which is the key finding.
[23]	Aim: To examine how QM has changed in relation to I4.0. Findings: Along with technology advancements, the study seeks to understand how human factors influence QM practices and their effects on EP. It emphasises how technological developments have changed sectors but have also created new problems with quality. The study highlights the significance of developing a quality culture that emphasises leadership, employee involvement, and autonomy, and goes beyond rule-based procedures.
[30]	Aim: To create a QM Framework that is specially designed for “Digital Lean Manufacturing (DLM) systems”. Findings: According to the study's outcome, a specific “QM Framework” for DLM is necessary because of the special opportunities and problems that the combination of digital technologies and lean manufacturing principles

	presents.
[31]	Aim: To investigate the connection between Frontline Hotel Employees' (FHE) creative performance and TQM practices in northern Iraq's five-star hotels. Findings: The research model examines whether job embeddedness (JE), which includes top management participation, empowerment, training, rewards, and teamwork, has an impact on FHE's creative performance (CP), drawing on social exchange and JE theories. The findings support the put forward hypothesis and show that JE is essential in connecting TQM procedures to FHE's CP.
[32]	Aim: To investigate and clarify the structural links between operational performance, SC practices, and TQM in businesses. Findings: According to the study's outcome, companies can develop a durable competitive edge by using good SCM techniques. The study also offers proof of the direct connection between operational competence and SCM practices and a firm's performance.

Source: Created by Authors

4.2 Data Analysis (Thematic)

Theme 1: “Quality is an important factor in the implementation of New Procedures”

The quality of goods and services, as well as the acceptance of new technologies for production, are important factors to be considered when implementing new processes, products, or services. AM can transform a broad range of business activities, from manufacturing to SCM, when AM is used as the production method, [20]. The 6S will use a data-driven process named: Define, measure, analyse, improve, and control (DMAIC). To enhance the quality of the final product, 6S approaches are designed to identify and eliminate underlying causes for problems, [21]. To meet the demands of large-scale production for automobiles and semiconductors, a 6S programme was set up that has had tremendous success over the last century. Efficient production practices in India's manufacturing sector promote growth, stability, and assist the quality of products to be maintained. To enhance organizational performance, large companies like Tata Industries, Aditya Birla Group, and Mahindra group have adopted cutting edge QM practices. In addition, to achieve a large degree of quality and operational excellence, manufacturing companies focus on areas such as purpose, process, people, performance, and platform, [22].

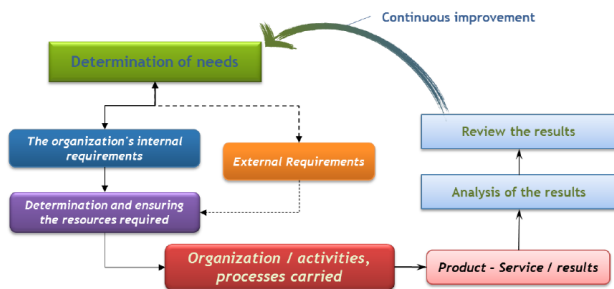


Fig. 12: Importance of Managing Quality
Source: [59]

This is the main paradigm of lean production, which has a major role to play in maintaining product or service quality. As shown in Figure 12 the basic goal of creating a product is clearly linked to what customers want and need, as part of the Indian manufacturing sector. In addition, it is linked to the objective of achieving the ISO 9001 standard.

Theme 2: “Manufacturing Businesses are significantly impacted by QM”

QM is an important factor in influencing the manufacturing sector because it contributes to a strong organizational growth and helps with the development of employees. It enables staff to focus on the quality of products and services by means of continuous improvement. Organisations could build more cultural values, to achieve a lasting success of both companies and their clients, [23]. Improving output and increasing production capacity is a primary goal of the implementation of QM practices in India's manufacturing sector. When it comes to a job that is competitive within the company and important in terms of reducing expenses and providing services, workers can also be forward-thinking. The relationship of quality control and employee performance in India's manufacturing sector is one of the most significant research areas, with broad implications for organizational effectiveness and worker wellbeing. Studies have shown QM techniques such as TQM, Six Sigma Production, and Lean Manufacturing are becoming more common to improve product quality and customer satisfaction, [24]. QM practices also help workers to develop their skills in view of the I4.0, which has given rise to digital perspectives.

As shown in Figure 13. Knowledge Management (KM) has led to the development and deployment of more modern organizational practices in the manufacturing sector, which help develop IT or digital skills for workers [25]. Workers' satisfaction in their jobs can be enhanced by the implementation of QM procedures. In organizations that place a high priority on quality, employee pride in their job and its influence on the final product may be more

apparent. That sense of direction may provide a boost to job satisfaction, thereby increasing commitment levels and reducing turnover rates. Furthermore, clear communication and obligations that are well laid down have often been part of quality control procedures with a view to reducing uncertainty and tension among the staff to improve performance.

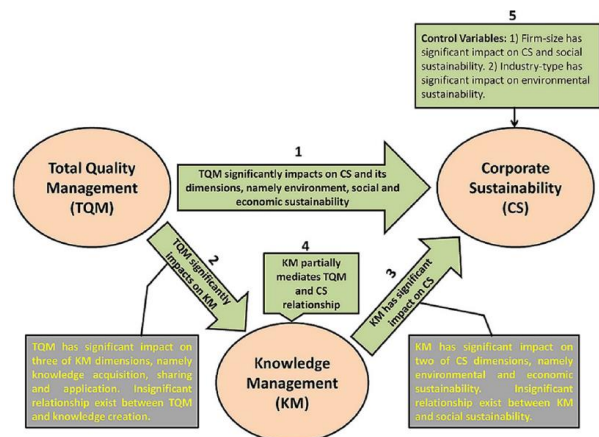


Fig. 13: TQM Impact on Corporate Sustainability
Source: [51]

Theme 3: “Application of QM Approaches is significantly hampered by Resistance to Technology”

In terms of production, QM is viewed from a broader perspective, and processes at this stage take longer to be implemented. The implementation of QM techniques is facing several problems in India's manufacturing sector, due to their effects on the overall performance of an organisation. One of the main obstacles is the outdated status of technology and infrastructure. The use of outdated equipment and a lack of access to modern technologies hinders the application of improved QM practices.

Lack of technologies also has a negative impact on the development and training of employees, making their adjustment to changes in market requirements more challenging, [29]. The skill gap in the manufacturing sector of India is often due to an insufficient supply of skilled labour, which may not be able to carry out the required technical tasks.

As shown in Figure 14 it has a negative impact on the adoption of QM practices in view of the need to recruit competent staff for complex operations, [29]. A weak educational system and a lack of training opportunities make this situation worse, making it difficult for workers to realise their full potential.

Resistance to technology makes it significantly more difficult to use QM approaches, [30]. Technology significantly enhances skills and

processes as workers are trained to cope with these changes.

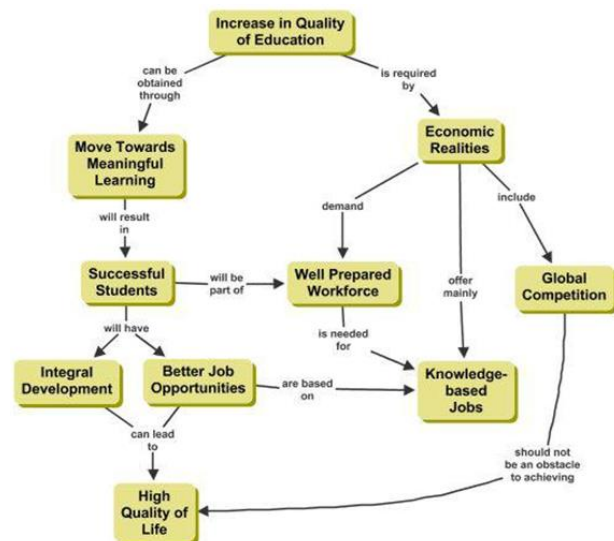


Fig. 14: Ways to manage difficulties in TQM
Source: [29]

However, it is often observed that the organisation's higher leadership needs a considerable amount of time and resources to implement this. Similarly, there is a significant barrier to the adoption of new technologies in India's society because they do not understand technology development. Changes in the way processes, roles, and responsibilities work are often part of QM. However, employees may be opposed to such changes due to their discomfort or fear of losing their jobs. Such opposition could hinder the implementation of measures to ensure QM, which would have negative effects on employee performance.

New technology adoption would require an increased number of training and development programs for staff, increasing spending on the budget. Due to the greater complexity of modern technology, employees from India's manufacturing sector are having trouble adjusting to quality management practices, [31]. India's manufacturing industry is governed by an intricate system of regulations, which can create confusion and inefficiency. It can be difficult to implement quality management systems at the same time as ensuring compliance with legal standards, which is why resources are being diverted from investment in the improvement of employee performance and development. Beyond simple productivity, it might be hard to assess the performance of employees.

Theme 4: "Consolidation of quality control data is required to improve the overall QM viewpoint"

The manufacturing industry in India needs to make decisions based on evidence with a view to improving QM practices. Consolidation of data on quality controls is an essential step in improving a better view of manufacturing QM, which will make it more important for companies to adjust to new practices, [32]. Similarly, the SC of manufacturers must be made public so that they can monitor supplier performance and improve QM procedures. Compliance software shall be used at this level, because it can provide transparent and comprehensible platforms for the functioning of QM practices by organisational stakeholders. Improvements to equipment, tools, and production facilities shall improve the efficiency and precision of manufacturing processes. An example of advanced technology that can improve the quality of products while streamlining processes is automation and data analysis. Moreover, it enables employees to meet their responsibilities more easily by granting them access to modern tools.

It recommends that any problems encountered by the existing production process can be reported using consolidated data. In the industrial process, how automation technology can reduce human error and increase both quality and production, [33]. Information on the benefits and principles of QM procedures, such as TQM, Six Sigma, or Lean to employees at all levels. When employees are aware of the contribution these practices make to their organisation's success it is more likely that they will be active in implementing them. To encourage staff to work together in open and cross departmental dialogue. They operate more innovatively when employees are encouraged to share ideas, learn from one another, and cooperate in overcoming obstacles. Therefore, to promote and recognise innovative contributions to improve the culture of improvement.

Studies have eliminated manufacturing processes that involve interaction with people and take a lot of time, [27]. The use of technology assists workers in making the right manufacturing practice by eliminating defects, and these processes have been linked to previous production errors. This also plays an important role in the organisation's overall success, as does how it affects customer satisfaction development. In placing significant emphasis on employees' involvement in identifying and addressing inefficiencies of operation, QM techniques could contribute to an ongoing improvement culture. The sense of ownership and contribution made by employees to the success of a firm can also lead to increased employee motivation.

In addition, QM practice is often based on skill development and training, with workers having essential competencies that help them to perform better at work and advance in their careers.

4.3 Key Discussions

It is often necessary to adapt work processes and procedures because of the introduction of new quality management practices. The basic elements of effective change management are employees participating in decision-making, responding to their concerns, and offering training and support as part of the transition, [60]. Moreover, it encourages a more efficient implementation and reduces resistance to change. Establish initiatives to increase the level of engagement, satisfaction with employment, and overall quality of life for staff. Give opportunities for advancement, praise good work, and make sure there's a good work-life balance, [34]. The motivation to promote QM is increased by the involvement of employees. Create a comprehensive set of performance measures that considers more than productivity. Measures for innovation, teamwork, problem solving, and skills development should be included. Meetings are held regularly between staff and supervisors where they discuss the performance and suggest areas for improvement.

The study showed a significant and favourable impact on employee performance by the TQM practice that included all its components. This study shows that information sharing serves as a mediator between these two relationships and adds to the impact of TQM practices on employee performance, [61]. These findings emphasise the potential of TQM practices and information sharing as a tactical tool for improving employee performance within an organisation. The study stresses the significance of building a culture of knowledge sharing, together with its implementation, to maximise the benefits derived from TQM for staff performance within the Qatar Ministry of Interior.

The findings of the study shows that employee performance is influenced largely by pandemic impacts, which include factors such as home office environments, job instability, and virtual connections. In addition, the study showed that I4.0 technologies have improved and stabilised employees' performance. The amounts and nature of these moderations will be determined by the type of pandemic influence that is being analysed, as well as a specific performance metric. In view of the spread of remote work and digitalisation in post-pandemic societies, this study provides useful theoretical and practical insights into how to improve employee performance within service organisations, [62]. The

state of infrastructure and technology is a key obstacle, based on these research findings. Enhanced QM practices are hard to implement due to the lack of new technologies access and outdated equipment.

The lack of technology is also affecting workforce skills development and training, which makes it more difficult for staff to adjust to changes in market demands. India's industrial sector is plagued by a skills mismatch due to a persistent lack of technical qualifications in the labour force. The use of quality control systems is greatly hampered by technological resistance, [30]. Technological advances will significantly enhance the skills and manufacturing processes of workers, so that they are trained to cope with these changes. Workers in the Indian manufacturing sector find it difficult to adjust to QM practices as new technologies become more complex.

There is an uneven regulatory structure in India's production sector, which may cause confusion and inefficiency. Effective management plays a crucial role in driving good governance and encouraging employee performance. An education on leadership that focuses on the development of effective communication and conflict resolution should be given to managers, [63]. Good quality products are produced in general thanks to a consistent supply of good quality resources and inputs. Access to communication channels with the management and staff should be maintained. The objectives of the company, achievements, and QM adjustments should be communicated to employees at regular intervals.

To assist and help staff to communicate their views, ideas, and concerns with the aim of improving processes over time. Recognition and rewards should be given to workers who constantly make a difference in improving quality and raising the standards of excellence. By publicly acknowledging the efforts of their employees and by rewarding them with incentives, they reinforce a culture of excellence. At all levels of the organization, encourage ethical conduct and integrity. When employees believe in the leadership and feel ethical, they are more willing to spend their time on quality management projects.

QM is a major influence on organisations that operate in the manufacturing sector because it promotes overall organisational success as well as staff development. When it comes to competitive work within the organization, which is of crucial importance for cost-cutting and associated services, employees may also be more forward-thinking. The Indian manufacturing industry is intimately linked to quality management practices and the performance of workers. The TQM procedures foster an

employee's sense of responsibility and ownership. It is necessary to consolidate data on quality control measures to better manage total quality at all stages of manufacturing, and this will become increasingly important as organisations adapt to new practices.

5 Conclusions and Recommendations

The top Indian manufacturing companies are concentrating on the areas of purpose, process, personnel, performance, and platform to achieve exceptional quality and operational excellence. It is at the heart of lean production and plays a crucial role in protecting quality standards for final goods or services. Effective production practices help to ensure the quality of products and stabilize growth in India's manufacturing sector. To improve organisational efficiency, leading companies such as TATA, Adani, Birla, and Mahindra Group have been using cutting-edge QM techniques. To improve product quality and customer satisfaction, it has become popular to implement a QM System, which includes TQMs, Six Sigma, or Lean Manufacturing.

The use of clear communications and defined tasks in QM methods is widely accepted to reduce misunderstandings and stress on the part of staff, while enhancing their performance. In the present case, there are currently efforts underway to eliminate labour burdensome and time-consuming manufacturing processes. By eliminating flaws, technologies are helping workers carry out the proper manufacturing procedures, yet these procedures were tied to flaws in earlier production.

5.1 Linking with Objectives

RO1: Processes for QM in Indian Manufacturing

A variety of business-related functions, from manufacturing to supply chain management, could be transformed because of the use of additive manufacturing (AM) as a manufacturing technique. In traditional manufacturing industries (such as the automotive and semiconductor industries), the Six Sigma (6S) methodology is frequently applied to "quality assurance (QA), quality planning, quality control (QC), and continuous enhancement through the heavy use of statistics, optimisation, and data" [20]. To attain exceptional quality and operational excellence, the top manufacturing companies in India are concentrating on the areas of "Purpose, Process, People, Performance, and Platform", [22]. It is the cornerstone of lean production and plays a crucial part in preserving the calibre of the final good or service. In India's manufacturing industry, effective production procedures help to maintain product

quality and stabilise growth. Major companies like Tata, Aditya Birla, and Mahindra Group have employed cutting-edge quality management techniques to improve organisational performance.

RO2: Impacts of QM on Employee Performance

Applying QM practices is mostly done to increase output and production capacity in the Indian manufacturing sector. When it comes to work that is competitive inside the organisation and crucial for reducing costs and related services, employees can also be forward-thinking. The relationship between quality management and employee performance in India's manufacturing industry is a significant research area with extensive implications for organisational effectiveness and employee well-being. Accordingly [24], quality management systems, including "TQM, Six Sigma, and Lean Manufacturing" have gained popularity to enhance product quality and customer satisfaction. Clear communication and well-defined tasks are widely used in QM methods to reduce ambiguity and employee anxiety and boost performance. The elimination of labour-intensive, time-consuming manufacturing processes is currently taking place, [27]. By eliminating flaws, technologies are helping workers carry out the proper manufacturing procedures, yet these procedures were tied to flaws in earlier production.

RO3: Different QM Challenges for Indian manufacturing sector"

Based on the above research that one significant hurdle is the state of the infrastructure and technology. A lack of access to modern technologies and out-of-date equipment makes it difficult to apply enhanced QM practices. Inadequate technology also affects employee skill development and training, making it more challenging for employees to adapt to changing market demands. Due to a persistent dearth of technical skills in the worker pool, India's industrial sector is suffering from a skills gap. Resistance to technology greatly hinders the application of QM systems, [30]. Technology greatly enhances skill sets and industrial processes as workers are trained to adapt to these changes. Due to the rising complexity of modern technologies, workers in India's industrial sector are finding it challenging to adapt to QM practices. The Indian manufacturing sector is governed by a complex regulatory structure that is confusing and ineffective.

RO4: Recommend Practices for QM Adoption

Based on the evaluation of the research, it has been depicted that the supply chains of manufacturing

organisations must be transparent, and supplier performance must be tracked, to improve QM methods. The adoption of compliance software at this level is crucial because it may provide organisational stakeholders with a clean and intelligible operating environment from which to conduct QM. By modernising machinery, tools, production facilities, the manufacturing process becomes more efficient and precise. Examples of cutting-edge technology that can improve product quality while streamlining procedures include automation and data analytics.

5.2 Limitations, Recommendations and Future Research

The impact of QM practices on operating outcomes, such as product quality and customer satisfaction, is a focus of literature existing in India's manufacturing sector concerning QM and worker performance. Many dimensions of employee performance, such as motivation, skills development, job satisfaction and overall career achievement are linked to the complex link between QM practices and their direct impact are notably unexplored in the literature. Even though some studies have addressed the performance of staff in broader organizational contexts, little research has been carried out with a particular focus on how QM practices such as TQM, Six Sigma and Lean Manufacturing can improve employee performance within India's manufacturing sector. Some of the key recommendations from the findings of this study are summarised as below.

- To Promote the thorough integration of Quality Management (QM) practises into the operations of Indian manufacturing companies.
- To utilise the spending on QM-focused personnel training and development programmes – provision of appropriate training for staff that impacts on their performance.
- To make provision for leadership's commitment to QM initiatives. And to promote a culture of quality throughout the firm while top management should actively support quality improvement initiatives.
- Creating systems for measuring performance that offer timely feedback on both team and individual performance. This can assist in locating problem areas and highlighting top-performing workers.
- To encourage employee participation and engagement in QM procedures. Actively participating employees tends to perform better and favourably impact firm's objectives.
- To encourage more research and information exchange within the Indian industrial sector.

Encourage academic and industrial cooperation to investigate cutting-edge QM techniques and their effects on worker performance.

- Reiterate that QM efforts should be thought of as long-term investments. While they might not show results right once, they can have a long-term, significant impact on employee performance. Work-life balance, a positive work environment, and support networks can all improve employee performance.

This study has been aimed at the manufacturing sector in India, since it is characterised by a QM system which encourages improvement of organizational performance. The performance of an firm can only be improved if its workforce performs better and helps overcome obstacles. The study has also given rise to the growth in total employee performance, as well as several quality control strategies implemented by major Indian manufacturers. It may be helpful to know the QM procedures and how they might have been improved to ensure compliance with production standards.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

The authors wrote, reviewed and edited the content as needed and they have not utilised artificial intelligence (AI) tools. The authors take full responsibility for the content of the publication.

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