



VILNIUS UNIVERSITY

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION

BUSINESS PROCESS MANAGEMENT

Aishwarya Sreedhar

MASTER THESIS PROJECT

LEAN PRAKTIKŲ POVEIKIS DARBUOTOJŲ VEIKLOS REZULTATAMS IR GEROVEI, MEDIJUOJANT MOTYVACIJAI IR STRESUI	INVESTIGATING THE EFFECTS OF LEAN PRACTICES ON EMPLOYEES' PERFORMANCE AND WELL-BEING, USING MOTIVATION AND STRESS AS MEDIATING FACTORS: A CASE STUDY OF INDIA MANUFACTURING INDUSTRY
---	---

Supervisor Asst. Prof. Dr. Darius Ruželė

Vilnius 2026

TABLE OF CONTENTS

LIST OF TABLES	IV
LIST OF FIGURES.....	V
INTRODUCTION.....	1
Introduction.....	1
Research Problem.....	1
The aim of the thesis.....	2
The objectives of the thesis.....	2
Research question.....	2
Structure of Research.....	2
CHAPTER 1: LITERATURE REVIEW	4
1.1 Lean, Lean Manufacturing: Core Principles and Practices	4
1.2 Implementation Challenges and Success Factors.....	6
1.3 Job Demands Resource Model and Self-determination Theory (SDT)	8
1.4 Lean Practices, Stress, and Well-being.....	10
1.5 Lean Practices and Motivation	12
1.6 Lean Practices and Performance.....	14
1.7 Theoretical Framework.....	15
1.8 Conceptual Framework.....	17
1.9 Hypothesis.....	24
CHAPTER 2: METHODOLOGY.....	25
2.1 Research Design - Mixed-Method Concurrent.....	25
2.2 Research Population and Sampling	26
2.2.1 Data Collection Methods	26
2.2.2 Data Analysis Methods	26
2.3 Reliability and Validity Considerations.....	27
2.4 Addressing Research Limitations and Ethical Considerations.....	28
CHAPTER 3: DATA ANALYSIS AND RESULTS	29
3.1 Response Rate	29
3.2 Reliability Test	29
3.2.1 Lean Practices Implementation	29
3.2.2 Employee Performance.....	31
3.2.3 Employee Wellbeing	32
3.2.4 Intrinsic/Extrinsic Motivation	33
3.2.5 Workplace Stress.....	34

3.3	Validity	35
3.4	Demographic Factors	38
3.4.1	Lean Practices Implementation	39
3.4.2	Employee Wellbeing	40
3.4.3	Intrinsic/Extrinsic Motivation	41
3.4.4	Workplace Stress	42
3.5	Linear Regression	42
3.5.1	Impact of Lean Manufacturing Practices on Employee Performance	42
3.5.2	Impact of Lean Manufacturing Practices on Employee Well-being.....	43
3.5.3	Impact of LPI and EWB mediated by WS	44
3.5.4	Impact of LPI and EP mediated by IM/EM	46
3.8	Qualitative Results	48
CHAPTER 4: DISCUSSION		50
4.1	Introduction	50
4.2	Discussion of Findings.....	50
4.2.1	Effect of lean practices on employee performance.....	50
CONCLUSION & RECOMMENDATION		55
References.....		57
APPENDIX: Survey Questionnaire		63

LIST OF TABLES

Table 3. 1: Response Rate	29
Table 3. 2: Lean Practices Implementation Reliability	30
Table 3. 3: Employee Performance Reliability	31
Table 3. 4: Employee Wellbeing Reliability	32
Table 3. 5: Internal and External Motivation Reliability	33
Table 3. 6: Workplace Stress Reliability.....	34
Table 3. 7: LPI Component Matrix, KMO and Bartlett’s test	35
Table 3. 8: EP Component Matrix, KMO and Bartlett’s Test	36
Table 3. 9: EWB Component Matrix, KMO and Bartlett’s Test	36
Table 3. 10: IM/EM Component Matrix, KMO and Bartlett’s Test	37
Table 3. 11: WS Component Matrix, KMO Bartlett’s Test	38
Table 3. 12: Demographic Factors.....	38
Table 3. 13: Lean Practice Implementation.....	40
Table 3. 14: Employee Wellbeing	41
Table 3. 15: Internal and external motivation	41
Table 3. 16: Workplace Stress.....	42
Table 3. 17: LPI and EP Model Summary	43
Table 3. 18: LPI and EP ANOVA	43
Table 3. 19: LPI and EWB Model Summary	44
Table 3. 20: LPI and EWB ANOVA	44
Table 3. 21: LPI and EWB Coefficients	44
Table 3. 22: LPI and WS Coefficients	45
Table 3. 23: LPI-WS and EWB Coefficients	46
Table 3. 24: LPI and EP Coefficients	47
Table 3. 25: LPI and IM/EM Coefficients	47
Table 3. 26: LPI-IM/EM and EP Coefficients.....	48

LIST OF FIGURES

Figure 2. 1: Conceptual framework	23
---	----

INTRODUCTION

Introduction

The use of lean principles such as Just in Time, Kanban, value stream mapping, and Kaizen has increasingly been embedded into corporate strategies to boost efficiency. These tools have helped companies cut costs and optimize their workforce (Losonci et al., 2017). However, their impact on employees remains under-researched, particularly regarding job satisfaction, well-being, stress, and burnout (Nielsen et al., 2017). Focusing on the manufacturing industry in India represents an optimal research context due to the various factors, such as the labor-intensive nature of the operations and the rapid technological advancements taking place (Valente et al., 2020). The sector contributes significantly to India's economic growth and employs millions of workers. Therefore, understanding how lean methodology affects employees' outcomes is vital in creating a sustainable business performance model and promoting human resource management.

Research Problem

Most of the existing literature predominantly focuses on the operational metrics of lean methodology. Some elements it focuses on include reductions in the production cycle times, recalls, and defects. It is, therefore, evident that Lean methods can potentially improve quality and productivity using standardized processes and structure (Valente et al., 2020). However, there is a gap in potential downsides, such as increased psychological strain and work intensification. According to Nielsen et al. (2017), lean environments may induce high expectations, creating constant performance monitoring that causes employee stress.

Different theoretical frameworks help to understand the psychological impact of lean implementation within the manufacturing industry. Self-determination theory, for example, helps provide an analytical insight into how lean practices influence employee motivation. This is done by analyzing satisfaction or thwarting basic psychological needs such as competence, relatedness, and autonomy (Ryan & Deci, 2020). Using the Job Demands-Resources model also helps to conceptualize

how lean practices function with job demands and job resources (Bakker & Demerouti, 2017). The two theoretical perspectives play an important role in analyzing the potentially paradoxical effects of using standardized work procedures, which, on the one hand, may enhance efficiency while also diminishing perceived autonomy among the employees. While continuous improvement may help the company remain innovative and productive, it can also affect employee competencies, thus increasing performance pressure. Therefore, while some of the research has explored these different dimensions within Western contexts, there remains an in-depth depth of localized studies focusing on the Indian manufacturing industry. The industry is unique, given the diversity when it comes to cultural dimensions, Labor Relations, and working conditions, which differ from other Western environments.

The aim of the thesis

This study aims to define the effect of lean practices on employee performance and well-being within the manufacturing industry, with a particular focus on how motivation and stress mediate these relationships.

The objectives of the thesis

1. To identify and conceptualize the lean practices
2. To define both the direct and indirect impact of Lean practices on employees' performance and well-being.
3. To define the mediating roles of motivation and stress in the relationship between Lean practices and employee outcomes.
4. To define the relationships among Lean practices, motivation, stress, performance, and well-being.

Research question

How do Lean practices influence employees' performance and well-being in manufacturing companies, and what role do motivation and stress play in mediating these effects?

Structure of Research

Chapter 1 introduces the research background, relevance, problem statements, aim, objective, research gap, and the issue's significance. Chapter 2 helps to review the literature on lean practices, motivation, stress, performance, and well-being. It also establishes the theoretical framework on which the problem is best, synthesizing current knowledge on lean implementation and its human effects. Chapter 3 outlines the research design being used, which is a mixed-method approach. It also outlines the data collection instruments and analytical techniques that will be used. Chapter 4 presents and analyzes the research findings, which integrate both the quantitative and qualitative data. This helps to understand how lean practices influence employee outcomes. Chapter 5 summarizes the study conclusion, discussing the limitations and offering recommendations for future research. It also provides a practical implementation of the findings.

CHAPTER 1: LITERATURE REVIEW

1.1 Lean, Lean Manufacturing: Core Principles and Practices

The lean manufacturing methodology is based on the Toyota Production System. In the modern world, it has emerged as a transformative tool focused on minimizing waste while maximizing value for the company through efficient processes (Antony et al., 2021). Initially, the methodology was developed for the manufacturing industry using lean principles. However, it has expanded to diverse sectors, including healthcare and software development (D'Andreamatteo et al., 2015). The global significance of using lean implementation systems is evidenced by its ability to reduce production costs by 15% to 20%. It has also been known to increase the throughput by 25% (Jasti & Kodali, 2015). The approach encompasses identifying customer value, ensuring flow, optimizing the value streams, and implementing pull systems that help to ensure continuous improvements that foster respect for people. It allows the companies to develop a problem-solving culture and ensure they use standardized working processes (Antony et al., 2021; Tortorella et al., 2018; Pokinska & Swartling, 2018). There are various principles in which the lean manufacturing methodology is implemented, such as value stream mapping, Kanban, 5S, and Kaizen. The Indian manufacturing industry, particularly electronics, also benefits from lean manufacturing methodology. The sector contributes 3.4% to GDP and employs over 13 million people (IBEF, 2023). Despite growth potential, Indian manufacturers face global competition and rapid technological changes, which necessitate the need to find practical and sustainable solutions. In summary, lean is key in reducing waste and maximizing value. It has evolved over industries and is becoming an essential tool for global competitiveness. The literature review, therefore, integrates multiple theoretical perspectives and research findings to examine Lean implementation through the employee-centric lens.

The lean manufacturing methodology aims to minimize waste within manufacturing systems while maximizing productivity. Taiichi Ohno and Eiji Toyoda were the ones who designed the system to eliminate production waste and improve efficiency (Ohno, 2019). Toyota was, by then, a small

Japanese auto producer, but through the methodology, it grew and became the world's largest automotive manufacturer. The Toyota Production System integrated social and technical management systems, which helped organize manufacturing and logistics. It aided in addressing interactions with clients and suppliers. Therefore, they built the system based on Toyota's management philosophies and lean manufacturing processes. These philosophies emphasized the importance of continuous improvement, respect for humanity, and the systematic elimination of waste.

Customer value is one of the core principles of lean manufacturing. Identifying customer value entails focusing on the most critical item for the end user. Hence, every activity contributes its share. Such an idea requires tremendous knowledge of customer requirements to prioritize value-generating activities over wasteful ones by using real-time information or market data (Antony et al., 2021). The other principle is optimizing the value stream, which involves analyzing and refining processes to remove waste, such as excess inventory, waiting times, or unnecessary steps. By mapping out the entire process, organizations can identify inefficiencies and streamline operations to deliver value more effectively (Pokinska & Swattling, 2018). Flow is the other value that entails working to move seamlessly through processes without interruptions, reducing bottlenecks. Antony et al. (2021) address that this principle focuses on eliminating delays and ensuring that each step in the process is synchronized to maintain a steady production or service delivery pace. Pull systems ensure production is driven by demand, preventing overproduction and waste. This principle relies on just-in-time production, where resources are only utilized when there is a clear customer need, minimizing excess inventory (Pokinska & Swattling, 2018). The principles promote continuous improvement, consisting of incremental, step-by-step process changes enabled through employee involvement (Bortolotti et al., 2015). This approach creates an innovation and problem-solving culture across the organization at all levels (Tortorella et al., 2018). Continuous improvement has been linked to enhanced quality and efficiency in manufacturing settings (Antony et al., 2021).

However, the constant need to improve can lead to stress among employees if they lack the

authority or means to get things done. Such principles foster respect for people, empowering employees, valuing their input, and creating a collaborative environment. This principle recognizes that engaged and respected workers are more likely to contribute to process improvements and sustain lean practices. In turn, it builds a culture of problem-solving, promoting proactive identification and resolution of issues to sustain lean practices. Tortorella et al. (2018)¹ encourage teams to address the root causes of inefficiencies rather than applying temporary fixes, fostering a mindset of long-term impact. The other practice that arises from using the principles is establishing standardized work, which refers to creating consistent, documented task procedures to ensure quality and efficiency. This principle reduces process variability, enables easier training, and provides a baseline for continuous improvement by ensuring best practices are followed (Pokinska & Swatling, 2018). Lean has been critical in competitive sectors, such as electronics manufacturing, though its success often depends on organizational culture and management style. In summary, value stream mapping, flow pull systems, and standard work play a role in promoting continuous improvement and customer value. They empower employees through the creation of efficient, standardized, and respectful workplaces.

1.2 Implementation Challenges and Success Factors

Implementing lean manufacturing has come with its challenges and facilitators. One of the primary challenges affecting the implementation process is cultural resistance. Cultural resistance refers to the resistance created by employees and management when introducing change initiatives. It mainly affects the employees who are accustomed to traditional manufacturing methods (Pakdil & Leonard, 2017). Overcoming such challenges, therefore, requires strong leadership and commitment to continuous improvement, which most companies do not have. The other challenge affecting the implementation process is the need for a long-term vision (Goodridge et al., 2015). The lean manufacturing method is not a quick fix but a continuous journey that requires constant iteration and improvement. Companies must, therefore, be willing to invest time and resources in training and development to ensure that the staff is aware of the methodology and competent. Some of the

successful factors for implementing lean manufacturing methodology include effective leadership and employee involvement (Rotter et al., 2019).

Strong leadership supporting the organization helps to drive the Lean initiative, ensuring that the vision is set and implemented (Goodridge et al., 2015). Engaging employees is important in ensuring they are aware of the change, prepared for it, and receive the necessary training and involvement regarding feedback and iteration. Companies with a culture of continuous improvement are also known to implement lean methodology effectively. According to Tortorella et al. (2018), embracing a culture of change and continuous improvement helps ensure the organization is always prepared to improve and iterate the method to make it work. It also makes other processes, such as standardization, easier because it establishes standardized processes to ensure consistency and efficiency over time.

Developing economies have been able to embrace lean methodology effectively. The adoption of lean principles in such places has been driven by the need to reduce costs, improve efficiency, and enhance competitiveness within a global market (Rotter et al., 2019). According to Camuffo et al. (2017), one of the developing nations' success factors has been adapting lean principles within local contexts. An example is using "frugal Engineering" principles, which have been integrated into lean practices. The concept helps to focus on creating high-quality products at a lower cost. However, several factors affect India's implementation of Lean, including infrastructure limitations. According to Antony et al. (2021), inadequate infrastructure within developing nations can hinder the smooth flow of materials and products, affecting the methodology's effective implementation. Factors like the skills gap have also impacted the implementation process. The lack of skilled labor and expertise in implementing lean practices can slow its progress, hindering the organization's ability to utilize the methodology fully. Cultural barriers also remain a persistent issue when it comes to the adoption of lean principles. There are challenges regarding employee involvement and continuous improvement, making it hard to implement the method.

As many countries globally have continued adopting lean methodology, the most important facilitators have been leadership, commitment, and vision. According to Maware et al. (2022), leadership and commitment emerge as the most critical factors in successful lean implementation within electronics manufacturing. Organizations that have a clear vision and sustained leadership have been able to demonstrate significantly higher success rates in lean transformation initiatives. The other benefit of having effective leadership is that it helps to offer the right resources, remove the implementation barriers, and maintain focus on long-term objectives. According to Goodridge et al. (2015), leadership teams actively participate in lean activities and model desired behaviors that achieve more successful outcomes among such companies. Leadership is especially an important element when it comes to the lean principles in the manufacturing industry, given the high technical complexity of the industry. Digital technology integration is also an important facilitator when it comes to promoting lean principles (Wang et al., 2021).

Many companies have been able to take advantage of the advanced technologies that are emerging today, such as Industry 4.0 Technologies. This includes using real-time data analytics, IoT services, and artificial intelligence. Such technologies have laid the foundation for adopting lean methodology, as companies have the right infrastructure that allows and facilitates their ability to implement their methodology (Cifone et al., 2021). Digital lean manufacturing allows electronic manufacturers to address some of the traditional challenges they experienced before, such as addressing visibility, predictive maintenance of the systems, and automated quality control. In summary, challenges include a lack of vision and effective leadership, cultural resistance, and skill gaps that derail implementation. Lean success depends on leadership strength, contextual adaptation, and employee engagement.

1.3 Job Demands Resource Model and Self-determination Theory (SDT)

Self-determination theory (SDT) offers a robust framework for understanding how lean practices affect employee motivation and outcomes. According to Ryan and Deci (2020), SDT

postulates that three universal psychological needs drive human motivation. These ecological needs include competence, autonomy, and relatedness. In lean manufacturing, these needs serve as an essential mediator between lean practices and employee performance. Some lean practices, such as Kaizen and employee involvement in problem-solving, align with the SDT principles. The practices play an essential role in satisfying the psychological needs of their employees. For instance, workers participate in Kaizen activities as they experience enhanced autonomy through decision-making input. The act builds and improves their confidence as they develop and apply new skills (Theurer et al., 2018). Similarly, using sanitized work processes offers clarity and structure, which assists employees in building competence.

Job demands resource models also play an important role in offering a complementary theoretical lens to understand how learning practices influence well-being and stress. The JDR model conceptualizes the work environment as balanced, balancing job demands. That means balancing the aspects that require sustained efforts against those that help achieve goals and reducing the demands (Bakker & Demerouti, 2017). Best practices within the lean manufacturing environments can either help or function as either demands or resources. For example, using the pool systems and continuous improvement practices helps increase job demands through tighter production schedules and performance expectations. Also, standardized work processes serve as a resource by providing structure and reducing uncertainty, which improves worker participation. The JDR model helps to explain contradictory findings regarding lean practices and employees' stress, as noted within their literature. Nielsen et al. (2017) indicate that optimizing value streams can reduce stress by creating predictable workflows. According to Tortorella et al. (2018), continuous improvement can increase stress when implementation increases worker demands without the corresponding resource enhancement practice. The model is relevant in the Indian manufacturing context, which is characterized by high production pressures and competitive markets. Using the JDR perspective is valuable in helping to cope with the demands and ensuring a balance that promotes productivity.

In summary, the two models are complementary and offer a perspective on the complex relationships between lean practices and employee outcomes. Scott explains motivation pathways through the fulfilment of psychological needs. JDR illuminates stress and well-being pathways by balancing workplace demands and resources. The integrated theoretical approach, therefore, enables a more comprehensive analysis of how lean implementation affects the manufacturing industry in different aspects, such as performance, motivation, stress, and well-being. By combining these two frameworks, the research contributes to the theoretical understanding of lean implementation in a context significantly different from other origins, such as Japan.

1.4 Lean Practices, Stress, and Well-being

While stress refers to adverse reactions to a trigger that can be physical or mental, well-being refers to the opposite state of being comfortable, healthy, and happy (Valente et al., 2020). "Workplace stress" describes the emotional and physical strain employees endure due to their jobs. Tight deadlines, excessive workloads, and a lack of control are the usual causes of stress in high-stress industries like electronics manufacturing, which can result in burnout. Such conditions are prevalent in fast-paced manufacturing environments, as Mazzocato et al. (2014) reported. On the contrary, organized and predictable work environments can reduce stress by restricting frustration and uncertainty. However, the effect greatly depends on how workplace changes are carried out, as Nielsen et al. (2017) hypothesized.

The relationship between lean principles and stress levels is two-sided, both positive and negative, depending on how it is implemented. Nielsen et al. (2017) offer those principles like maximizing value stream and enhancing flow can reduce stress by eliminating inefficiencies to create a work environment with predictability. For example, when an electronic manufacturing firm eliminates unnecessary processes from its cycle, the staff feel less frustrated and less delayed, lowering their stress levels. However, values such as installing pull systems and pursuing continuous improvement amplify stress in high-pressure settings. In a factory that must produce customer orders

strictly, the constant pressure to be efficient can foster an environment of incessant pressure, provided that workers lack the resources or latitude to make accommodations.

Tortorella et al. (2018) added that establishing standard work, as beneficial as it is to uniformity, can also contribute to stress if the standards appear too inflexible or exigent, mainly where employees already function under heightened baseline pressure. For instance, having a hard-and-fast procedure with no buffer for mistakes might induce stress upon employees who fear making mistakes. Work pressure is internal within the manufacturing economy, and the inefficient application of lean approaches exacerbates pressure in the manufacturing context, as argued by Valente et al. (2020), towards the rational deployment of lean philosophy to avoid creating unwanted effects.

Employees' physical, mental, and emotional well-being directly affects their job satisfaction and general quality of life. Nielsen et al. (2017) point out that meaningful work surroundings and organization can improve well-being in manufacturing settings. However, a daily heavy workload in electronics assembly work can lead to burnout and compromised psychological well-being, as Moraros et al. (2016) reported. Well-being is related to stress levels, which reduce overall health and satisfaction, as Hu et al. (2016) elaborated. Lean principles can, therefore, improve or worsen the welfare of employees based on their implementation in the real world. Bortolotti et al. (2015) recognize that individuals who respect and esteem others enhance their sense of belonging and purpose in life, and this boosts psychological well-being. In an electronics manufacturing company, involving workers in the decision-making process is likely to make them feel valued, less disconnected, and have enhanced emotional health. Poksinska and Swartling (2018) also said that optimizing the value stream and implementing standardized work enables well-being through the promotion of a systematic and predictable workplace, which reduces frustration and enhances job satisfaction. For instance, an employee who has precise knowledge of what is expected of them and is less distracted will be happier and more comfortable.

However, values like continuous improvement and application of pull systems can increase

pressure in high-pressure situations to induce burnout when targets are unachievable. In a factory with extended working hours, pressure to continuously improve or meet just-in-time demands might be too demanding for employees, affecting their physical and mental well-being. Stress acts as a critical mediator factor in this process, as lean implementation often generates excessive stress that typically results in overall health deterioration, Nielsen et al. (2017) observe, indicating the need for balanced implementation of lean principles to the detriment of workers' health in the manufacturing sector. Therefore, lean practices impact stress and well-being in dual ways. High-pressure working environments and rigid standards elevate stress while streamlined processes reduce it. It thus depends on how lean tools are implemented.

1.5 Lean Practices and Motivation

Employee motivation is the internal and external state of mind that drives individuals to work effectively in their roles. Ryan and Deci (2020) bring to focus via Self-Determination Theory (SDT) that motivation results from satisfying three psychological needs: autonomy, competence, and relatedness (Gagné & Deci, 2005). Motivated staff in factory settings will most likely adopt new practices and apply efforts toward organizational goals, according to Tortorella et al. (2018). However, high-pressure cultures, characteristic of the electronics manufacturing industry, can depreciate motivation unless accompanied by healthy leadership, a key factor in maintaining employee motivation.

Lean principles can significantly influence employee motivation by fulfilling the psychological needs outlined in Self-Determination Theory (SDT), such as autonomy, competence, and relatedness (Ryan & Deci, 2020). For instance, Antony et al. (2021) argue that encouraging respect for people and developing a problem-solving culture empowers employees by involving them in decision-making. When workers in electronics manufacturing firms are encouraged to identify issues and offer solutions, they perceive themselves as more autonomous and capable, enhancing their intrinsic motivation. Similarly, Tortorella et al. (2018) state that working towards ongoing improvement allows employees

to experience visible improvements in their tasks, enhancing their sense of fulfillment and further stimulating them.

Standard work development also introduces clarity and consistency, reducing uncertainty in routine operations. Disadvantageously, applying principles such as preserving flow and utilizing pull systems generates complications. During situations under pressure, the principles could bring extra workload or stringent production timelines, undermining independence and turning intrinsic motivation extrinsic if the employees feel they are highly monitored or compelled towards goal accomplishment (Tortorella et al., 2018). Thus, while lean principles tend to enhance motivation, their impact in the manufacturing context depends on how they are blended with employee-centered leadership and support systems.

Different lean tools used have varying impacts on motivation types. In a quasi-experimental study done to examine how lean practices affected motivation types among manufacturing industries, the results showed varying outcomes. For example, Kaizen events and quality cycles stimulated intrinsic motivation among the employees by satisfying needs for competence and autonomy (Klein et al., 2022). This allowed for creative problem-solving opportunities, which improved their confidence. 5S implementation enhanced extrinsic motivation by clearly outlining outcomes and ensuring recognition. The use of synthesized evaluation systems also helps to provide external reinforcements and, therefore, motivates the employees.

On the other hand, the value stream mapping method occupied the middle ground as it activated both the intrinsic and extrinsic motivations. It did so by stimulating intellectual challenges among the employees and helping them demonstrate their contribution towards the organizational goals. The other factor was timing and the sequence of lean tool implementation, which significantly impacted motivational outcomes. Klein et al. (2022) found that beginning lean journeys with problem-solving-focused tools before implementing other metrics, such as standardization, helps to build stronger intrinsic motivation among the employees, reducing resistance to other changes. In summary,

motivation, as explained using self-determination theory, enhances autonomy, competence, and fosters intrinsic motivation. When lean practices are misapplied, they reduce autonomy and motivation.

1.6 Lean Practices and Performance

Performance refers to the process of executing an action in professional or artistic contexts. In manufacturing, performance looks at how well employees are doing their work according to the job description and specifications. Performance measurement evaluates how individuals contribute to organizational achievement, often measured through productivity, quality, and effectiveness. Poksinska and Swartling (2018) argue that manufacturing improvements are closely related to sophisticated processes and employees' devotion. Nevertheless, certain forces, like resource availability problems or infeasible aims, may hinder performance, as noted by Bortolotti et al. (2015). Motivation is crucial, with motivated employees likely to deliver high-quality and consistent results, as argued by Nielsen et al. (2017).

Lean principles positively impact employees' performance by eliminating complexity and enhancing efficiency, even though the process is not directly related. Poksinska and Swartling (2018) argue that customer value definition and value stream optimization ensure that employees' efforts are focused on what is truly vital to the organization. In developing nations, electronics manufacturing would translate to balancing production to match the customers' requirements, reducing wasteful effort, and allowing employees to deliver more. Antony et al. (2021) say that sustaining flow and creating pull systems also minimize delays and overproduction, allowing employees to work steadily and deliver consistent output. For example, a factory that produces only what is ordered does away with the chaos of excess inventory, which can streamline workflows and enhance output quality. Pursuing ongoing improvement is also significant, considering Tortorella et al. (2018) note that it leads to employees anticipating and avoiding inefficiencies, thereby decreasing defects and cycle times.

Nevertheless, the stress of meeting lean objectives, particularly with standards like ensuring flow, can be tiresome, especially in high-demand environments where employees are bound to be bogged down by the workload. Motivation serves as a mediating factor in such a relationship. It drives employees to be more prone to embracing lean principles and transforming them into performance enhancement, as Nielsen et al. (2017) noted, calling for a productive work culture to sustain such benefits. In summary, lean practices enhance performance by reducing work complexity and aligning employee efforts with customer value. Standardized work and pull systems enhance consistency. However, excessive demands undermine motivation and well-being.

1.7 Theoretical Framework

From the review of the literature, there is a complex interplay between lean manufacturing practices and employee outcomes. There is an ecosystem where stress, well-being, motivation, and performance are interlinked through different pathways. The literature demonstrates that these factors do not operate in isolation but rather form an interconnected web that determines the success of implementing the methodology. The relationship existing between lean practice and stress appears bidirectional. Depending on the implementation approach, it functions as both a mitigator and an amplifier. For example, the use of value stream optimization and standardized work processes eliminates inefficiencies and reduces employee frustrations (Nielsen et al., 2017).

However, on the other hand, the use of continuous improvement initiatives and a pulse system can intensify pressure, therefore affecting employees' well-being (Tortorella et al., 2018). This stress dynamic, therefore, impacts employees' well-being, leading to issues such as burnout and diminished psychological health. Motivation is important in the relationship between lean practices and performance outcomes. According to self-determination theory, lean principles that fulfill employees' psychological needs, such as autonomy and competence, enhance intrinsic motivation (Ryan & Deci, 2020). These principles allow employees to engage in problem-solving, which satisfies their competence and autonomy needs. Intrinsic motivation drives employees to embrace practices such as

lean principles, which result in sustained performance improvements.

The timing and sequence of lean implementation also significantly influence the motivation pathways. Lean implementation begins with problem-solving tools, which help implement strict standardization processes that build intrinsic motivation and reduce resistance (Klein et al., 2022). The research, therefore, shows that the sequence of the approach helps impact the psychological dimensions of change management when it comes to lean transformation. Performance outcomes are also determined by how effectively the company navigates stress, well-being, and motivation dynamics. Lean principles can positively impact performance by eliminating their complexity and enhancing efficiency within the processes. However, the same benefits can be undermined when the implementation process generates excessive stress or fails to engage the employee's motivation (Poksinska & Swartling, 2018). The application of the Job Demands resource model helps to offer insights into how the system is interconnected. It explains how lean practices can function as either resources or demands depending on how they are implemented. In the case that lean practices increase job demands through tighter schedules without the corresponding resource enhancements, it generates stress and strain, undermining employees' well-being as shown in Figure 1 (Hu et al., 2016).

The relationship between lean practices, employee well-being, and performance

The Indian manufacturing context is characterized by highly competitive markets and production pressures; therefore, ensuring a balance is important in promoting sustained productivity among the employees (Nielsen et al., 2017). Companies need to recognize the psychological dimensions when it comes to lean implementation to make it effective. They need to address stress, foster intrinsic motivation, and promote the overall well-being of their employees to achieve more sustained results. Success (Tortorella et al., 2018). Therefore, the use of the integrated perspective acknowledges that Lean is not merely a technical system but one where employees' psychological experiences directly impact their outcomes.

In summary, lean manufacturing principles and practices are at the core, affecting well-being

and being influenced by motivation. Stress and well-being interact bi-directionally as they impact each other, therefore impacting the implementation approach and timing, which in turn influence motivation. The Indian manufacturing context is unique because it's competitive and therefore sets the pressure that affects implementing lean practices. This feedback loop and interactions demonstrate the ecosystem effect. The performance outcomes ultimately depend on the combined effects of well-being, stress, motivation, and lean practices.

1.8 Conceptual Framework

The proposed conceptual framework model of self-determination theory (SDT) and the job demands resource model (JDR) examines lean manufacturing effects on employee outcomes within the Indian electronic manufacturing industry. SDT theory posits that there are three basic psychological needs: autonomy, competence, and relatedness. On the other hand, the JDR model suggests that job characteristics can be categorized as demands or resources. Within the lean manufacturing context, practicing standardized work and Kaizen can simultaneously function as job resources and job demands. The dual nature of the element creates complex pathways that affect employee motivation and stress. The SDT and JDR framework proposed that lean practices affect the basic needs of satisfaction, which in turn affects the intrinsic motivation of their workers. Therefore, when lean practices satisfy basic psychological needs, they have the potential to enhance intrinsic motivation, thereby reducing stress and promoting performance and well-being. Conversely, using lean practices that create excessive demands without adequate resources for the employees can undermine satisfaction, increase stress, and affect their general well-being.

Independent variable

Lean practices include all the elements that help eliminate waste and improve efficiency. Using a multi-dimensional lean manufacturing scale will help measure elements such as value stream mapping, standardized work, Kaizen 5S, and pool systems. Various researchers have validated and used the tool in studies looking into lean practices in manufacturing (Tortorella et al., 2018; Antony

et al., 2021; Jasti & Kodali, 2015). The research will use the tool questions to measure the different aspects of lean implementation and how they affect other variables such as employee performance, well-being, motivation, and stress levels.

Questions

Lean practices implementation

Instructions: For each lean practice listed below, please indicate the extent to which it is implemented in your workplace using the following scale (Maware et al., 2022):

Scale: 1 = Not implemented at all | 2 = Rarely implemented | 3 = Sometimes implemented | 4 = Moderately implemented | 5 = Often implemented | 6 = Usually implemented | 7 = Fully implemented

<i>Kaizen (Continuous Improvement):</i>
Our company regularly conducts Kaizen events/workshops.
Employees are encouraged to suggest improvements.
Small, incremental improvements are continuously made.
Management actively supports continuous improvement initiatives.
<i>Gemba:</i>
Managers regularly visit the shop floor to observe processes.
Problems are solved at the place where they occur.
Management makes decisions based on actual workplace observations.
<i>Visual Management:</i>
Important information is displayed visually in work areas.
Performance metrics are visible to all employees.
Visual controls help guide work processes.
<i>Poka-yoke (Error Prevention):</i>
Systems are in place to prevent errors from occurring.

Processes are designed to make mistakes impossible.
Error-proofing methods are used in our operations.
<i>Value Stream Mapping:</i>
Our company maps the flow of materials and information.
Waste in processes is identified and eliminated.
Process improvements are based on value stream analysis.
<i>5S Implementation:</i>
Workplaces are kept clean and organized.
Tools and materials have designated places.
5S principles are consistently followed
<i>Standardized Work:</i>
Work procedures are clearly documented.
Standard operating procedures are followed consistently.
Work methods are standardized across similar operations.

Dependent variables.

Employee performance will be measured using the individual work performance questionnaire (IWPQ). According to Nguyen-Duc et al. (2024), the tool helps measure three dimensions of work, including task performance, contextual performance, and counterproductive work behavior dimensions among different cultural contexts. The scale consists of 18 questions, and the research will extract questions from each of the three scales to measure the outcomes within the manufacturing firms.

Individual Work Performance Questionnaire (IWPQ)

Instructions: The following statements are about your performance at work. Please indicate how often each statement applies to you using the following scale:

Scale: 1 = Never | 2 = Rarely | 3 = Sometimes | 4 = Often | 5 = Usually | 6 = Almost Always | 7 =

Always

Task Performance:	
	I managed to plan my work so that it was done on time.
	I kept in mind the results that I had to achieve in my work.
	I was able to set priorities.
	I was able to carry out my work efficiently.
Contextual Performance:	
	I took on extra responsibilities.
	I actively participated in work meetings.
	I worked on keeping my job-related knowledge up to date.
Counterproductive Work Behavior (Reverse Scored):	
	I complained about unimportant matters at work.
	I made problems at work bigger than they were
	I focused on the negative aspects of work situations.
	I talked to colleagues about the negative aspects of my work.
	I spent time on personal phone conversations during work.

Employee well-being will be operationalized to the PERMA (workplace version). This scale contains questions that measure the positive emotions, engagement, accomplishments, meaning, and workplace-specific well-being indicators (Jarden et al., 2023).

PERMA- Workplace Well-being

Instructions: Please indicate the extent to which you agree or disagree with each statement about your work experience using the following scale:

Scale: 1 = Strongly Disagree | 2 = Disagree | 3 = Slightly Disagree | 4 = Neither Agree nor Disagree |

5 = Slightly Agree | 6 = Agree | 7 = Strongly Agree

<i>Positive Emotions:</i>
When I am at work, I feel enthusiastic.
At work, I feel joyful.
I feel positive at work.
<i>Engagement:</i>
When I am working, I lose track of time.
I become absorbed in my work.
I feel excited and interested in my work.
<i>Relationships:</i>
I receive help and support from my colleagues when needed
My colleagues and I trust each other.
I feel a sense of belonging at work.
<i>Meaning:</i>
The work I do serves a greater purpose.
My work makes a positive difference in the world.
The work I do is worthwhile.
<i>Accomplishment:</i>
I regularly achieve the goals I set at work.
I feel a sense of accomplishment in my job.
I am progressing toward my professional goals.

Mediating variables

Intrinsic/Extrinsic motivation will be measured using the work motivation scale based on the SDT theory. The work motivation theory has proven effective in measuring motivation levels, external and

intrinsic regulation (Ryan & Deci, 2020).

Questions

Multidimensional Work Motivation Scale (Intrinsic Motivation Focus)

Instructions: Using the scale below, indicate to what extent each of the following items corresponds to the reasons why you are presently involved in your work:

Scale: 1 = Not at all | 2 = Very little | 3 = A little | 4 = Moderately | 5 = Strongly | 6 = Very strongly | 7 = Completely

<i>Intrinsic Motivation:</i>
Because I have fun doing my job
Because what I do in my work is exciting
For the moments of pleasure that this job brings me
<i>Identified Regulation:</i>
Because this job fulfills my career plans
For the satisfaction I experience when I am successful at doing a difficult task
Because this job fits my personal values

Workplace stress will be determined through the Job Content Questionnaire, which measures the job demands, the decision latitude, and social support (Bakker & Demerouti, 2017)

Workplace Stress Scale (WSS)

Instructions: Please indicate the extent to which you agree or disagree with each statement about your work experience using the following scale:

Scale: 1 = Strongly Disagree | 2 = Disagree | 3 = Slightly Disagree | 4 = Neither Agree nor Disagree | 5 = Slightly Agree | 6 = Agree | 7 = Strongly Agree

<i>Time Stress:</i>

Working here makes it hard to spend enough time with my family.
I have too much work and too little time to do it in
I must work very fast
I never seem to have enough time to get everything done.
My job gets to me more than it should
<i>Anxiety Stress:</i>
I worry about how my mistakes will affect my future.
A lot of times, my job makes me very frustrated or angry.
I often dread going to work.
Working here is usually quite stressful for me.

The following conceptual model was tested:

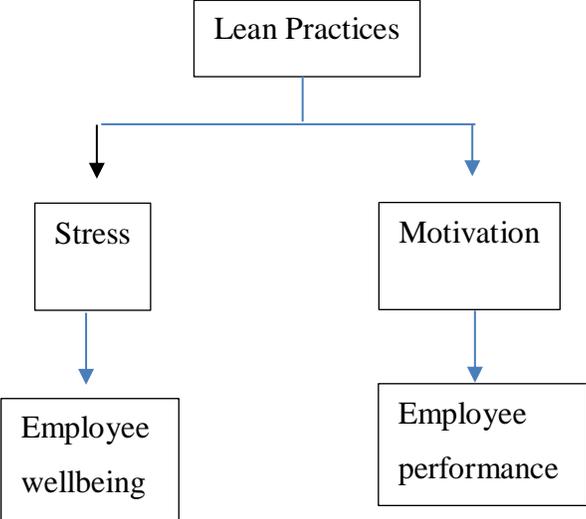


Figure 1. 1: Conceptual framework

Hu et al., 2016).

1.9 Hypothesis

Based on the developed conceptual model, the following hypotheses were tested:

H1. Lean manufacturing practices have a positive direct effect on employee performance

H2: Lean manufacturing practices have a positive direct effect on employee wellbeing

H3. Intrinsic/extrinsic motivation will mediate the relationship between lean practice implementation, and employee performance.

H4. Workplace stress will mediate the relationship between employee well-being and lean practice implementation.

CHAPTER 2: METHODOLOGY

2.1 Research Design - Mixed-Method Concurrent

The mixed method focuses on collecting and analyzing quantitative data and adding a few qualitative questions in the same questionnaire (Plano Clark, 2017). It is suitable in cases where qualitative data can help offer deep insight into complex quantitative results, offering a richer understanding of an issue (Creswell & Plano Clark, 2017; Schoonenboom & Johnson, 2017). Using only a purely quantitative approach might limit the ability to obtain enough data to conclude the issue. Quantitative analysis is important in providing statistical rigor and generalizability, which is important in capturing the nuanced cultural and contextual factors that affect lean practices. One adequately explained the why behind the statistical relationships that will be found. On the other hand, using a purely qualitative approach will also limit the research. Its benefit is that it will provide a rich contextual understanding, which will lack the statistical power to back it up and, therefore, limit the findings. Given the complexity of the SDT and JDR models integrated into the research, there are multiple mediating pathways, and only one method will be insufficient to validate (Fetters et al., 2013; Wisdom & Creswell, 2013).

Through a mixed approach, the researcher obtained complementary data that helped in explaining complex relationships and generalizable findings across the diverse Indian electronic manufacturing industry. The use of sequential explanatory design maximizes the strengths of both approaches while also minimizing their limitation (Creswell & Plano Clark, 2017). The quantitative data helped to establish a statistical relationship and test the hypothesis modelled through structural equation modelling. This offered empirical validation of the theoretical framework. Subsequently, the qualitative method was used to explain unexpected findings and explore the cultural nuances to offer deeper insights into how lean practices are experienced within the Indian manufacturing industry. The sequential nature of the methodology allowed for proper qualitative interview protocols to be implemented and refined based on the quantitative results. It also helped to conduct investigations that

addressed the most relevant elements of the previous findings. The approach is especially suitable for the Indian culture, which has organizational hierarchies, power distances, and collectivism that may influence lean practices and, ultimately, employee outcomes.

2.2 Research Population and Sampling

A total of 110 participants were used in the research study. The use of random sampling was used to ensure representation of different firms across the subgroups. The stratification method stratified using the region (Bangalore, Chennai, Delhi NCR, Pune), company size (medium, small, large), and the role of employees (support, management, and production). Samples were obtained from each stratum, ensuring that all relevant categories are represented. Stratified random sampling helped enhance the findings' external and internal validity (Hossan et al., 2023; Taherdoost, 2016).

2.2.1 Data Collection Methods

The data was collected through online surveys, allowing participants to respond from their homes or workplaces. The data collection took place in shifts to ensure that it accommodated the shift changes of the workers and minimized disruption to production. The companies were contacted through a formal letter explaining the purpose of the research, ensuring confidentiality to participants, and requesting participation. Assigning you unique identifiers was key in ensuring the anonymity of the participant and, thus, confidentiality. The inclusion criteria were to find employees working within the electronic manufacturing companies. They also had to have a direct involvement in their production or support services. The companies also had to have a well-documented lean practice implementation procedure for at least six months. The research Questionnaire is attached to the Appendix.

2.2.2 Data Analysis Methods

Quantitative data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 28. The process followed a structured process from the beginning of data cleaning,

coding, and checking for outliers to ensure integrity and quality. The analysis produced descriptive statistics such as means and frequencies to understand the general characteristics of the sample. Reliability analysis was done using the Cronbach alpha to assess internal consistency of the measurement instruments used, with an acceptable threshold of $\alpha \geq 0.70$ (Tavakol & Dennick, 2011). Linear regression was used in testing the hypotheses. In testing the mediation effects of motivation and stress, the use of Hayes' PROCESS macro (model 4) helped to generate confidence levels for indirect effects (Hayes, 2017).

The next part of the data analysis was thematic analysis for qualitative data. The initial step was to establish a framework that helped ensure all the variables were captured. A hybrid deductive-inductive approach was used. Two independent researchers participated in developing the coding framework to ensure reliability. Using the first six approaches by Brown and Clark helped analyze the data. The initial step is repeated reading and initial noting. Next up is systematic coding, theme identification, theme review and refinement, theme definition and naming, and the last step is report writing (Braun & Clarke, 2006; Clarke & Braun, 2017).

The last part of the data analysis was the integration strategy for the mixed-methods analysis. After separating quantitative and qualitative data analysis, the researchers will identify the divergent, convergent, and complementary findings. Joint displays helped represent the areas of divergence and convergence between the statistical and qualitative themes. This helped develop a nuanced understanding of how lean practices affect the manufacturing industry in India.

2.3 Reliability and Validity Considerations

The researcher ensured validity and reliability considerations through the use of multiple approaches. The use of the Cronbach alpha coefficients helped to determine the consistency of the study, with a target exceeding 0.70 for all scales measuring lean practices, stress, motivation, well-being, and performance (Tavakol & Dennick, 2011; Taber, 2018). The use of the mixed method was also a way of ensuring reliability and validity, as it helps to provide qualitative and quantitative data,

therefore helping to measure congruence (Creswell & Creswell, 2018; Johnson et al., 2007). Content validity was ensured through the expert panel reviews within the Lean Manufacturing industry. This helped evaluate the tool's efficacy in measuring the variables within the Indian context, given the expert's experience working within the industry. The pilot study also played a vital role in ensuring validity and reliability, as it helped to test and determine whether the two considered the cultural factors and measured the variables to the full extent. Sampling across different geographical regions helps enhance external validity and improve generalizability.

2.4 Addressing Research Limitations and Ethical Considerations

There are several critical limitations inherent in lean manufacturing research. Asking questions regarding the lean implementation timing and supplementing with longitudinal elements where feasible can help to address the limitations. It also involved using multiple data sources to help ensure that any variance is measured and accounted for. The study also considers ethical considerations, as all participants will be informed of the need for consent and voluntary participation. Information was given to the participants to ensure they understood the research's risks and benefits. Participant confidentiality, protection, and the right to withdraw whenever possible. Having a company-level agreement also ensured that participation did not affect employment status, and therefore, reporting will protect the individuals' and the organization's confidentiality.

CHAPTER 3: DATA ANALYSIS AND RESULTS

This chapter presents data analysis results from the participants. The researcher presented descriptive and inferential statistics results necessary to answer the research objectives. The variables were assessed using different types of a seven-point Likert scale.

3.1 Response Rate

The sampled participants anticipated participating in the research study, and the data collection process was 110. Out of 110 questionnaires sent to the participants, 100 were considered valid for analysis and represented a rate of 91%. Thirty questionnaires, which represented 9% of the total questionnaires, were not included in the data analysis because they had errors and missing information.

Table 3.1 below shows the response rate.

Table 3. 1: Response Rate

Status of Questionnaires	Number	Percentage
Properly filled	110	91%
With errors and missing information	10	9%
Total	110	100%

Source: (Author, 2026)

3.2 Reliability Test

The reliability of the used questionnaire was tested using Cronbach's alpha to measure consistency of measurement. Each section of the questionnaire, measured through a particular Likert scale, was evaluated to ensure each section indicated an acceptable reliability of Cronbach's alpha value, 0.7 or above.

3.2.1 Lean Practices Implementation

The Cronbach alpha on Lean Practices Implementation items was at 0.965, demonstrating excellent internal consistency of the scale (1= *Not Implemented at all*, 2=*Rarely Implemented*, 3=

Sometimes Implemented, 4=Moderately implemented, 5=Often implemented, 6=Usually implemented, 7= Fully Implemented), confirming that the Likert scale used was highly reliable. This reliability analysis shows excellent internal consistency of the Lean Practices Implementation items, evidenced by an overall Cronbach's alpha that ranged between 0.952-0.970 if all eight survey items were deleted. All eight items possess high corrected item-total correlations that ranged between (.723-.970), indicating measurement of the same construct. LPI8, which measured “small, incremental improvements are continuously made,” indicated the strongest correlation (.970), while LPI4, which measured “visual controls help guide work processes,” showed the lowest vital statistic, but a strong correlation (.723). The results are shown in Table 3.2 below.

Table 3. 2: Lean Practices Implementation Reliability

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
LPI1 Our company regularly conducts Kaizen events/workshops	30.58	107.276	0.903	0.916	0.958
LPI2 Employees are encouraged to suggest improvements	30.34	102.509	0.938	0.943	0.955
LPI3 Small, incremental improvements are continuously made	30.87	101.124	0.97	0.959	0.952
LPI4 Visual controls help guide work processes	30.49	110.879	0.723	0.667	0.971
LPI5 Systems are in place to prevent errors from occurring	30.52	101.929	0.964	0.955	0.953
LPI6 Processes are designed to make mistakes impossible	30.61	109.493	0.733	0.72	0.97
LPI7 Error-proofing methods are used in our operations	30.67	103.395	0.911	0.87	0.957

Source: (Author, 2026)

3.2.2 Employee Performance

The Cronbach alpha on Employee Performance (EP) items was at 0.983, demonstrating excellent internal consistency of the scale (1= *Never*, 2=*Rarely*, 3= *Sometimes*, 4=*Often*, 5=*Usually*, 6=*Almost Always*, 7= *Always*), confirming that the Likert scale used was highly reliable. This reliability analysis shows excellent internal consistency of the employee performance items, evidenced by an overall Cronbach's alpha that would reach 0.975 and above if all five survey items were deleted. All five items possess high corrected item-total correlations that ranged between (.941-.974), indicating measurement of the same construct. EP2, which measured “ I was able to carry out my work efficiently,” indicated the strongest correlation (.974). The lowest correlations were (.915) by EP4, which stated “I actively participated in the work meetings”. The results are shown in Table 3.3 below.

Table 3. 3: Employee Performance Reliability

Item– Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
EP1 – I managed to plan my work so that it was done on time	17.46	48.534	0.949	0.912	0.978
EP2 – I was able to carry out my work efficiently	18.19	47.024	0.974	0.952	0.975
EP3 – I took on extra responsibilities	17.17	49.153	0.967	0.941	0.976
EP4 – I actively participated in work meetings	17.97	50.837	0.915	0.851	0.983
EP5 – I worked on keeping my job-related knowledge up to date	17.93	48.147	0.941	0.903	0.98

Source: (Author, 2026)

3.2.3 Employee Wellbeing

The Cronbach alpha on Employee Wellbeing (EWB) items was at 0.935, demonstrating a very high level of internal consistency of the scale (1=*Strongly Disagree*, 2=*Disagree*, 3=*Slightly Disagree*, 4=*Neither Agree nor Disagree*, 5=*Slightly Agree*, 6=*Agree*, 7=*Strongly Agree*), confirming that the Likert scale used was highly reliable. This reliability analysis shows excellent internal consistency of the employee wellbeing scale, evidenced by an overall Cronbach's alpha that would reach .901 or greater if all five survey items were deleted. All five items possess high corrected item-total correlations (.702-.925), effectively tapping into the same underlying construct. EWB4, which measures “ I feel a sense of belonging at work” (.925), had the highest correlation, while EWB2, which measures “ At work I feel joyful”, indicated the lowest but substantial correlation (.702). The squared multiple correlations (.662-.861) find no redundancies among the measure items and help confirm the factorial validity of the Likert scale used, and that each component contributes something to the measurement of employee wellbeing reliability. The results are shown in Table 3.4 below.

Table 3. 4: Employee Wellbeing Reliability

Item– Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
EWB1 – When I am at work, I feel enthusiastic	17.34	49.56	0.835	0.702	0.923
EWB2 – At work, I feel joyful	18.14	46.849	0.702	0.662	0.945
EWB3 – I feel excited and interested in my work	17.75	43.624	0.824	0.839	0.922
EWB4 – I feel a sense of belonging at work	17.83	42.021	0.925	0.86	0.901
EWB5 – The work I do serves a greater purpose	17.66	45.136	0.892	0.861	0.909

Source: (Author, 2026)

3.2.4 Intrinsic/Extrinsic Motivation

The Cronbach alpha on Internal Motivation (IM) and External Motivation (EM) items was at 0.896, demonstrating good internal consistency of the scale (1= *Not at all*, 2=, *Very Little*, 3= *A Little*, 4= *Moderately*, 5= *Strongly*, 6= *Very Strongly*, 7= *Completely*), confirming that the Likert scale used was reliable. This reliability analysis showed good internal consistency of the motivation scale used, evidenced by an overall Cronbach's alpha that would reach .836 or greater if all five survey items were deleted. All five items indicated corrected item-total correlations (.330-.916). IM3, which measured “Because what I do in my work is exciting”, showed the strongest correlation (.916), while EM2, which measured “Because I engage in my work to fulfil responsibilities to those who depend on my role”, showed the lowest but critical statistic (.330) which indicated that it contributed almost nothing to the internal consistency of the scale. The results are shown in Table 3.5 below.

Table 3. 5: Internal and External Motivation Reliability

Item–Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
IM1 – Because I have fun doing my job	16.54	41.503	0.899	0.954	0.84
IM2 – Because this job fits my personal values	16.04	41.716	0.875	0.837	0.845
IM3 – Because what I do in my work is exciting	16.64	40.798	0.916	0.958	0.836
EM1 – Because I engage in my work to achieve financial stability	16.28	42.143	0.813	0.771	0.858
EM2 – Because I engage in my work to fulfil responsibilities to those who depend on my role	16.06	51.693	0.33	0.133	0.966

Source: (Author, 2026)

3.2.5 Workplace Stress

The Cronbach alpha on Workplace Stress (WS) items was at 0.971, demonstrating a very high level of internal consistency of the scale (1=*Strongly Disagree*, 2=*Disagree*, 3=*Slightly Disagree*, 4=*Neither Agree nor Disagree*, 5=*Slightly Agree*, 6=*Agree*, 7=*Strongly Agree*), confirming that the Likert scale used was highly reliable. This reliability analysis shows excellent internal consistency of the workplace stress scale, evidenced by an overall Cronbach's alpha that would reach .962 and above if all seven survey items were deleted. All seven items possessed high corrected item-total correlations (.724-.959). WS7 had the highest correlation of .959, while WS2 indicated the lowest but critical correlation (.724). The squared multiple correlations (.607-.956) helped in confirming the factorial validity of the Likert scale used and that each component contributed something to the measurement of workplace stress reliability. The results are shown in Table 3.6 below.

Table 3. 6: Workplace Stress Reliability

Item– Description	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
WS1 – I have too much work and too little time to do it	24.19	111.085	0.937	0.91	0.964
WS2 – I must work very fast	23.9	107.364	0.724	0.607	0.983
WS3 – My job negatively affects my family life	23.96	108.968	0.932	0.923	0.964
WS4 – My job gets to me more than it should	24.13	108.458	0.897	0.823	0.966
WS5 – I find it hard to relax after work	24.13	107.347	0.951	0.955	0.963

Source: (Author, 2026)

3.3 Validity

Construct validity of the variables was measured through Exploratory Factor Analysis (EFA) to determine whether the variable items measured the intended concept. When the results report high factor loadings such as >0.50 , it shows that the items strongly relate to a specific factor, suggesting they measure the same underlying idea.

3.3.1 LPI Construct Validity

The results are shown in the tables below. From the results, the KMO test is ≥ 0.60 at 0.905, hence it's acceptable. The factor loadings are shown in component Table 3.7 below, whereby the loading is above >0.50 for each item.

Table 3. 7: LPI Component Matrix, KMO and Bartlett’s test

Item–Description	Component 1
LPI1 – Our company regularly conducts Kaizen events/workshops	0.929
LPI2 – Employees are encouraged to suggest improvements	0.947
LPI3 – Small, incremental improvements are continuously made	0.979
LPI4 – Visual controls help guide work processes	0.803
LPI5 – Systems are in place to prevent errors from occurring	0.97
LPI6 – Processes are designed to make mistakes impossible	0.789
LPI7 – Error-proofing methods are used in our operations	0.934
LPI8 – Waste in processes is identified and eliminated	0.864

Test	Statistic	Value
Kaiser–Meyer–Olkin Measure of Sampling Adequacy	KMO	0.905
Bartlett’s Test of Sphericity	Approx. Chi-Square	1237.878
	Degrees of Freedom (df)	28
	Significance (Sig.)	0

Source: (Author, 2026)

3.3.2 EP Construct Validity

The results are shown in the tables below. From the results, the KMO test is ≥ 0.60 at 0.910, hence it's acceptable. The factor loadings are shown in Table 3.8 below, whereby the loading of each item is above >0.50 .

Table 3. 8: EP Component Matrix, KMO and Bartlett's Test

Item-Description	Component 1
EP1 – I managed to plan my work so that it was done on time	0.968
EP2 – I was able to carry out my work efficiently	0.984
EP3 – I took on extra responsibilities	0.979
EP4 – I actively participated in work meetings	0.945
EP5 – I worked on keeping my job-related knowledge up to date	0.962

Test	Statistic	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	KMO	0.91
Bartlett's Test of Sphericity	Approx. Chi-Square	879.987
	Degrees of Freedom (df)	10
	Significance (Sig.)	0

Source: (Author, 2026)

3.3.3 Construct Validity of EWB

The results are shown in the tables below. From the results, the KMO test is ≥ 0.60 at 0.837, hence it's acceptable. The factor loadings are shown in Table 3.9 below, whereby the loading of each item is above >0.50 .

Table 3. 9: EWB Component Matrix, KMO and Bartlett's Test

Item-Description	Component 1
EWB1 – When I am at work, I feel enthusiastic	0.895
EWB2 – At work, I feel joyful	0.8
EWB3 – I feel excited and interested in my work	0.896
EWB4 – I feel a sense of belonging at work	0.953
EWB5 – The work I do serves a greater purpose	0.936

Test	Statistic	Value
Kaiser–Meyer–Olkin Measure of Sampling Adequacy	KMO	0.837
Bartlett’s Test of Sphericity	Approx. Chi-Square	512.367
	Degrees of Freedom (df)	10
	Significance (Sig.)	0

Source: (Author, 2026)

3.3.4 IM/EM Construct Validity

The results are shown in the tables below. From the results, the KMO test is ≥ 0.60 at 0.819, hence it's acceptable. The factor loading results are shown in Table 3.10 below, whereby the factor loadings of each item are >0.50 .

Table 3. 10: IM/EM Component Matrix, KMO and Bartlett’s Test

Item–Description	Component 1
IM1 – Because I have fun doing my job	0.963
IM2 – Because this job fits my personal values	0.947
IM3 – Because what I do in my work is exciting	0.971
EM1 – Because I engage in my work to achieve financial stability	0.912
EM2 – Because I engage in my work to fulfil responsibilities to those who depend on my role	0.431

Test	Statistic	Value
Kaiser–Meyer–Olkin Measure of Sampling Adequacy	KMO	0.819
Bartlett’s Test of Sphericity	Approx. Chi-Square	600.889
	Degrees of Freedom (df)	10
	Significance (Sig.)	0

Source: (Author, 2026)

3.3.5 WS Construct Validity

The results are shown in the tables below. From the results, the KMO test is ≥ 0.60 at 0.924, hence it is acceptable. The factor loading results are shown in Table 3.11 below, whereby the loadings of each item are >0.50 .

Table 3. 11: WS Component Matrix, KMO Bartlett's Test

Item-Description	Component 1
WS1 – I have too much work and too little time to do it	0.959
WS2 – I must work very fast	0.781
WS3 – My job negatively affects my family life	0.958
WS4 – My job gets to me more than it should	0.921
WS5 – I find it hard to relax after work	0.971
WS6 – I feel that I have little control over what I am doing	0.96
WS7 – Working here is usually quite stressful for me	0.975

Test	Statistic	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	KMO	0.924
Bartlett's Test of Sphericity	Approx. Chi-Square	1177.193
	Degrees of Freedom (df)	21
	Significance (Sig.)	0

Source: (Author, 2026)

3.4 Demographic Factors

The demographic factors were analysed to understand the population trends and composition.

Table 3. 12: Demographic Factors

Variable	Frequency	Percentage
Gender - Male	67	67%
Gender – Female	33	33%
Current Job Role – Production supervisor	15	15%
Current Job Role – Machine Operator	24	24%
Current Job Role – Quality control inspector	17	17%
Current Job Role – Maintenance Technician	26	26%
Current Job Role – Process improvement Officer	18	18%
Age in Years	41.42	
Length in X company	6.17	

Source: (Author, 2026)

The researcher inquired about the Gender of the respondents. From the results, 67 (67%) of the respondents were males, and 33 (33%) were females. The results showed that the researcher was gender sensitive when recruiting participants in the research.

The results showed that the lowest age was 23 years while the highest was 67 years. Average age is 41.42 years.

The inquiry about the job roles established that the participants were engaged in various responsibilities. The majority (26%) were maintenance technicians, 24% were machine operators, 18% were process improvement officers, 17% were quality control inspectors, and 15% were production supervisors.

The results indicated that the participants had different years of experience working in the manufacturing industry. The lowest experience was one year, while the highest was 25 years. The highest years of experience were recorded for the 8 years at 24%. 7 and 9 years also recorded the highest number of participants at 15% and 16% respectively.

The results showed that the participants in the X company had worked for different lengths of time. The shortest length was one year, while the longest length was 13 years. The highest number of participants, 18% had worked in X company for 6 years.

3.4.1 Lean Practices Implementation

The researcher examined lean practices aspects, and the results are presented in Table 3.13 below. The mean of the eight aspects was close and slightly above five (*Often implemented*), which demonstrates that the majority of the respondents strongly agreed with the statements about their work experience, by noting “*often implemented and usually implemented*”. Standard deviation results ranged from (1.720 -2.016), indicating high variability of the data points. The results based on each statement were; LPI1 (M 5.10, SD 1.720), LPI2 (M 5.34, SD 1.908), LPI3 (M 4.81, SD 1.926), LPI4 (M 5.19, SD, 1.846), LPI5 (M 5.16, SD 1.895), LPI6 (5.07, SD 1.909), LPI7 (M 5.01, SD 1.910), LPI

8(M 5.21, SD 1.800).

Table 3. 13: Lean Practice Implementation

Item-Description	N	Minimum	Maximum	Mean	Std. Deviation
LPI1 – Our company regularly conducts Kaizen events/workshops	100	1	7	5.1	1.72
LPI2 – Employees are encouraged to suggest improvements	100	1	7	5.34	1.908
LPI3 – Small, incremental improvements are continuously made	100	1	7	4.81	1.926
LPI4 – Visual controls help guide work processes	100	1	7	5.19	1.846
LPI5 – Systems are in place to prevent errors from occurring	100	1	7	5.16	1.895
LPI6 – Processes are designed to make mistakes impossible	100	1	7	5.07	1.908
LPI7 – Error-proofing methods are used in our operations	100	1	7	5.01	1.91
LPI8 – Waste in processes is identified and eliminated	100	1	7	5.21	1.8
Valid N (listwise)	100				

Source: (Author, 2026)

3.4.2 Employee Wellbeing

The researcher examined employee well-being, and the results are presented in Table 3.14 below. The means of the five statements ranged between (4.48-5.03), which demonstrates that the majority of the respondents slightly agreed and agreed with the statements. The standard deviation ranged from (1.529-2.031), indicating that the points were widely spread from the mean in each of the five statements, indicating a fair variability. General results for each statement were EWB1 (M 4.84, SD 1.529), EWB2 (M 4.04, SD 1.984), EWB3 (M 4.43, SD 2.031), EWB4 (M 4.35, SD 1.992), EWB5 (M 4.52, SD 1.795).

Table 3. 14: Employee Wellbeing

Item-Description	N	Minimum	Maximum	Mean	Std. Deviation
EWB1 – When I am at work, I feel enthusiastic	100	1	7	4.84	1.529
EWB2 – At work, I feel joyful	100	1	7	4.04	1.984
EWB3 – I feel excited and interested in my work	100	1	7	4.43	2.031
EWB4 – I feel a sense of belonging at work	100	1	7	4.35	1.992
EWB5 – The work I do serves a greater purpose	100	1	7	4.52	1.795
Valid N (listwise)	100				

Source: (Author, 2026)

3.4.3 Intrinsic/Extrinsic Motivation

The researcher examined the Intrinsic and Extrinsic motivation of the employees regarding their work experience, and the results are presented in Table 3.15 below. The means of the five statements ranged between (3.85-4.35), which demonstrates that the majority of the respondents strongly agreed. The standard deviation ranged from (1.850-2.132), indicating that the points were widely spread from the mean in each of the five statements, indicating a fair variability. General results for each statement were IM1 (M 3.85, SD 1.850), IM2 (M 4.35, SD 1.872), IM3 (M 3.75, SD 1.882), EM1(M 4.11, SD 1.938), EM2 (M 4.33, SD 2.132).

Table 3. 15:Internal and external motivation

Item-Description	N	Minimum	Maximum	Mean	Std. Deviation
IM1 – Because I have fun doing my job	100	1	7	3.85	1.85
IM2 – Because this job fits my personal values	100	1	7	4.35	1.872
IM3 – Because what I do in my work is exciting	100	1	7	3.75	1.882
EM1 – Because I engage in my work to achieve financial stability	100	1	7	4.11	1.938
EM2 – Because I engage in my work to fulfil responsibilities to those who depend on my role	100	1	7	4.33	2.132
Valid N (listwise)	100				

Source: (Author, 2026)

3.4.4 Workplace Stress

The researcher examined the work workplace stress of the participants, and the results are presented in Table 3.16 below. The means of the seven statements ranged between (4.38-4.96), which demonstrates that the majority of the participants strongly agreed. The standard deviation ranged from (1.818-2.021), indicating that the points were widely spread from the mean in each of the seven statements, indicating a fair variability. General results for each statement were WS1 (M 4.82, SD 1.914), WS2 (M 4.96, SD 1.818), WS3 (M 4.88, SD 1.912), WS4 (M 4.49, SD 1.880), WS5 (M 4.44, SD 1.976), WS6 (M 4.53, SD 1.869), WS7 (M 4.38, SD 2.021).

Table 3. 16: Workplace Stress

Item-Description	N	Minimum	Maximum	Mean	Std. Deviation
WS1 – I have too much work and too little time to do it	300	1	7	4.82	1.914
WS2 – I must work very fast	300	1	7	4.96	1.818
WS3 – My job negatively affects my family life	300	1	7	4.88	1.912
WS4 – My job gets to me more than it should	300	1	7	4.49	1.88
WS5 – I find it hard to relax after work	300	1	7	4.44	1.976
WS6 – I feel that I have little control over what I am doing	300	1	7	4.53	1.869
WS7 – Working here is usually quite stressful for me	300	1	7	4.38	2.021
Valid N (listwise)	300				

Source: (Author, 2026)

3.5 Linear Regression

Linear regression is a statistical technique for assessing the relationship between a dependent variable and one or more independent variables. Linear regression computes how altering the independent variable(s) causes changes in the dependent variable. Linear regression was conducted to test the five hypotheses.

3.5.1 Impact of Lean Manufacturing Practices on Employee Performance

Hypothesis 1a was tested to determine the impact of LPI on EP. The ANOVA results indicated that there was a statistically significant relationship between lean manufacturing practices and employee performance, $F(1, 98) = 1800.483, p < .000$. The regression equation explained a substantial amount

of variance in employee wellbeing based on the large F-statistic and extremely small p-value. Regression sum of squares was varied from the residual sum of squares (284.770 vs. 15.500). The model explained 95% of the variance in employee performance, as indicated by the model summary table in 3.17. This demonstrates that Lean manufacturing practices were a good predictor of employee well-being. Thus, hypothesis 1a, *lean manufacturing practices have a positive direct effect on employee performance*, was accepted.

Table 3. 17: LPI and EP Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.974	0.948	0.948	0.398

a. Predictors: (Constant), LPI

Source: (Author, 2026)

Table 4.18 shows the ANOVA results.

Table 3. 18: LPI and EP ANOVA

Model	Source	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	284.77	1	284.77	1800.483	0
	Residual	15.5	98	0.158		
	Total	300.27	99			

a. Dependent variable: EP

b. Predictors: (Constant), LPI

Source: (Author, 2026)

3.5.2 Impact of Lean Manufacturing Practices on Employee Well-being

The same hypothesis was also tested for the impact of LPI and EWB. The ANOVA results showed the existence of a statistically significant relationship between lean manufacturing practices and employee wellbeing, $F(1, 98) = 153.087, p < .000$. The regression equation explained a substantial amount of variance in employee wellbeing based on the large F-statistic and extremely small p-value. Regression sum of squares was very different from the residual sum of squares (168.685 vs. 107.985). The model explained approximately 61% of the variance in employee well-being, as noted by the model summary table in 3.18. This demonstrates that Lean manufacturing practices were a good predictor of employee well-being. Thus, hypothesis 1b, *lean manufacturing practices have a positive direct effect on well-being*, was accepted.

Was confirmed. The results are indicated in Table 3.19 below.

Table 3. 19: LPI and EWB Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.781	0.61	0.606	1.05

a. Predictors: (constant), LPI

Source: (Author, 2026)

Table 3. 20: LPI and EWB ANOVA

Model	Source	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	168.685	1	168.685	153.087	0
	Residual	107.985	98	1.102		
	Total	276.67	99			

a. Dependent Variable: EWB

b. Predictors: (Constant), LPI

Source: (Author, 2026)

3.5.3 Impact of LPI and EWB mediated by WS

The mediation impact of WS between LPI and EWB was calculated through several steps.

1. Step 1- A bivariate regression estimating the impact of LPI and EWB was conducted...Name (B)
2. Step 2-A bivariate regression estimating the impact of LPI and WS was conducted. Named (a)
3. Step 3a: multiple regression estimating the direct impact of LPI and EWB, whereby LPI and WS are predictors, and EWB is the dependent variable. named (c)
4. Step 3b- A Multiple regression estimating the impact of WS and EWB, with LPI and WS as the predictors and EWB as the dependent variable.
5. Step 4-Use the Sobel test to estimate and test the indirect impact for the statistical significance (a*b).

The results for step 1 are shown in Table 3.21 below.

Table 3. 21: LPI and EWB Coefficients

		Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.471	.337		1.395	.166	-.199	1.140
	LPI	.776	.063	.781	12.373	.000	.651	.900

a. Dependent Variable: EWB

Source: (Author, 2026)

ANOVA^a

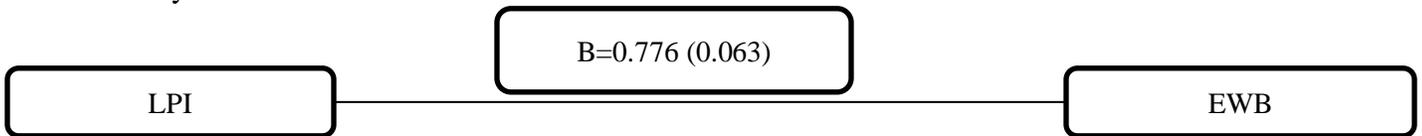
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	168.685	1	168.685	153.087	.000 ^b
	Residual	107.985	98	1.102		
	Total	276.670	99			

a. Dependent Variable: EWB

b. Predictors: (Constant), LPI

Source: (Author, 2026)

Whereby:



Step 2 Results are shown in Table 4.22 below:

Table 3. 22: LPI and WS Coefficients

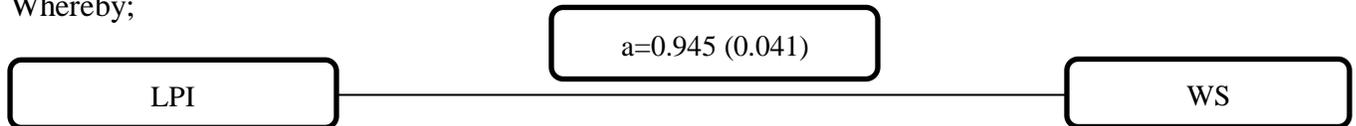
Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.811	.218		-3.713	.000	-1.245	-.378
	LPI	.945	.041	.920	23.264	.000	.864	1.026

a. Dependent Variable: WS

Source: (Author, 2026)

Whereby;



Step 3a and b results are shown in Table 4.23 below.

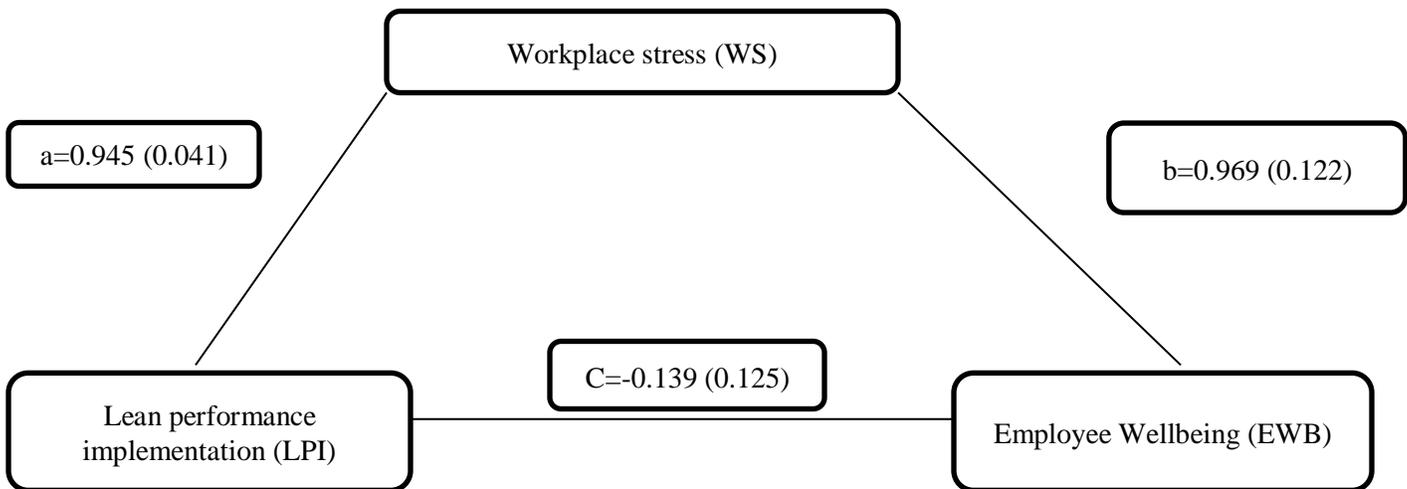
Table 3. 23: LPI-WS and EWB Coefficients

Model		Coefficients ^a						
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.256	.282		4.455	.000	.697	1.816
	LPI	-.139	.125	-.140	-1.112	.269	-.388	.109
	WS	.969	.122	1.001	7.935	.000	.726	1.211

a. Dependent Variable: EWB

Source: (Author, 2026)

Whereby:



Step 4: Sobel test for the indirect impact of LPI and EWB (a*b)

Input:		Test statistic:		Std. Error:	p-value:
a	0.945	Sobel test:	7.50926635	0.12194334	0
b	0.969	Aroian test:	7.5029569	0.12204588	0
s _a	0.041	Goodman test:	7.51559174	0.12184071	0
s _b	0.122	Reset all	Calculate		

Thus, the indirect relationship between LPI and EWB via WS is statistically significant, as shown by the $p < .000$. Thus, Hypothesis three (H3): *Workplace stress will mediate the relationship between employee well-being and lean practice implementation was accepted.*

3.5.4 Impact of LPI and EP mediated by IM/EM

The mediation impact of WS between LPI and EWB was calculated through several steps.

6. Step 1- A bivariate regression estimating the impact of LPI and EP was conducted...Name (B)
7. Step 2-A bivariate regression estimating the impact of LPI and IM/EM was conducted. Named (a)
8. Step 3a-A multiple regression estimating the direct impact of LPI and EP was conducted, whereby LPI and IM/EM were predictors and EP was the dependent variable was conducted. named (c)
9. Step 3b- A Multiple regression estimating the impact of IM/EM and EP, with LPI and IM/EM as the predictors and EP as the dependent variable.
10. Step 4-Use the Sobel test to estimate and test the indirect impact for the statistical significance. (a*b)

Step 1 results are shown in Table 3.24 below.

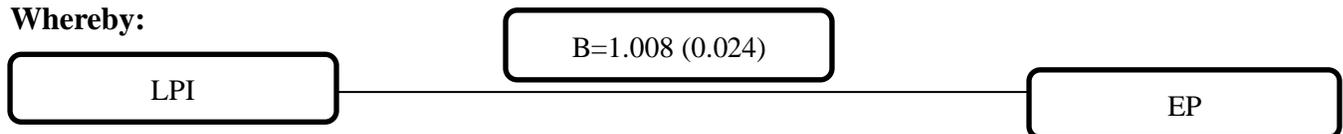
Table 3. 24: LPI and EP Coefficients

		Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.716	.128		-5.606	.000	-.970	-.463
	LPI	1.008	.024	.974	42.432	.000	.961	1.055

a. Dependent Variable: EP

Source: (Author, 2026)

Whereby:



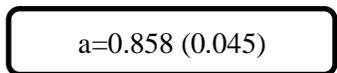
Step 2 results are shown in Table 3.25 below:

Table 3. 25: LPI and IM/EM Coefficients

		Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.310	.243		-1.273	.206	-.793	.173
	LPI	.858	.045	.887	18.967	.000	.769	.948

a. Dependent Variable: IMEM

Source: (Author, 2026)



LPI

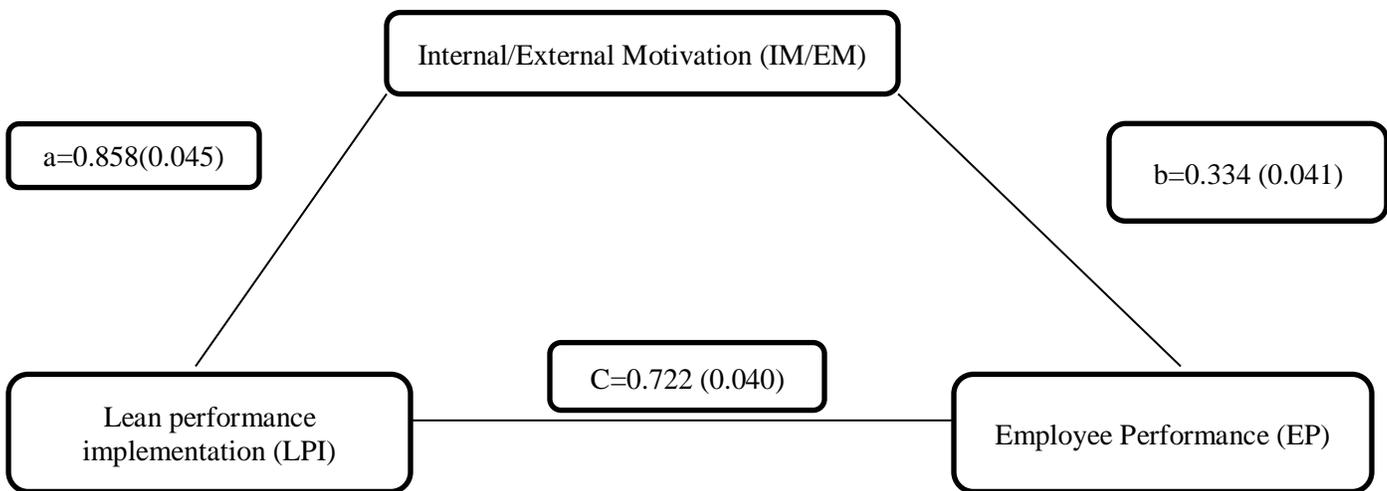
IM/EM

Steps 3a and 3b are shown below.

Table 3. 26: LPI-IM/EM and EP Coefficients

Model		Coefficients ^a						
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-.613	.100		-6.131	.000	-.811	-.415
	LPI	.722	.040	.697	18.111	.000	.643	.801
	IMEM	.334	.041	.312	8.104	.000	.252	.415

a. Dependent Variable: EP



Step 4: Sobel test for the indirect impact of LPI and EP (a*b)

Input:	Test statistic:	Std. Error:	p-value:
a 0.858	Sobel test: 7.49123342	0.03825431	0
b 0.334	Aroian test: 7.48253585	0.03829878	0
s _a 0.045	Goodman test: 7.4999614	0.0382098	0
s _b 0.041	Reset all	Calculate	

Therefore, the indirect relationship between LPI and EP via IM/EM is statistically significant as shown by the $p < .000$. Thus, Hypothesis three (H4): *Internal and external motivation will mediate the relationship between employee performance and lean practice implementation* was accepted.

3.8 Qualitative Results

The main theme that was generated by the qualitative data is the dual nature of lean practices on the employee psychological states. The employees showed that when employees worked with lean

methodologies, they had a simultaneous motivational effect and a source of stress. The employees reported that implementing 5S and creating standards for their workplaces led to clarity in the daily work they do and an increase in employee engagement with their work environment due to their organized and defined work area and predictable routines. Continuous improvement initiatives, specifically Kaizen activities, were frequently mentioned as sources of intrinsic motivation for employees, as they have an opportunity to generate ideas and see the tangible results of those ideas being put into action.

At the same time, the same activities created performance pressure for employees. Standardizing the way in which employees perform tasks has at times created a perception of a rigid plan for them to follow, which has limited their autonomy to accomplish their tasks. Additionally, the continual emphasis on the elimination of waste and measurement of productivity caused employees to experience increased anxiety to achieve those goals, especially when they had to work within limited resources. Employees reported that while lean tools offered structure to their work environment and brought a sense of purpose, the degree of implementation of the lean tools led employees to either experience feeling empowered or exhausted. This means that external context affects how employees respond to lean tools and their psychological well-being.

During the interview, the employees were able to clearly identify the relationship between how they responded psychologically to the impact of lean practices and how it subsequently affected their performance. The employees stated that when lean practices helped foster motivation by recognizing their input and making changes to improve the workplace in a visible way, they also reported an increase in productivity, as well as increased awareness of quality and proactive approaches to solving problems. On the other hand, when the implementation of standardized processes or continual checks of productivity led to increased levels of stress related to their work and minimal support systems, the performance of the participants experienced a decline with decreased creativity, an increase in errors, and withdrawal tendencies. It appears that participants were motivated by the implementation of the practices of lean to engage more in their work and be committed to the goals of the organization. Conversely, increased work stress from high expectations and rigid compliance with standards depletes cognitive and emotional resources for performing the work. Therefore, lean practices directly influence performance through the motivation and stress levels of employees, and provide evidence of the mediating framework suggested in this study. The results reinforce the findings generated through the quantitative analysis.

CHAPTER 4: DISCUSSION

4.1 Introduction

The focus of this research was to examine the effect of lean practices on employee performance and well-being within the manufacturing industry, with a particular focus on how motivation and stress mediate these relationships. The study included the following objectives: To identify and evaluate the level of implementation of lean practices; To examine both the direct and indirect impact of Lean practices on employees' performance and well-being; To analyze the mediating roles of motivation and stress in the relationship between Lean practices and employee outcomes; To define the relationships among Lean practices, motivation, stress, performance, and well-being. The findings provided in Chapter Four, as discussed in this chapter, confirmed all three hypotheses, demonstrating how lean practices implementation affects employee performance and well-being when mediated by workplace stress, internal and external motivation. In this chapter, the findings from Chapter Four were integrated into previous literature, resulting in an understanding of what the findings mean and their subsequent implications for theory, practice, and policy. The chapter also provides the conclusion, recommendations, and suggestions for future research.

4.2 Discussion of Findings

Through a thorough examination of lean practices in manufacturing in India, this research shows that proper implementation of lean practices can lead to improved employee performance and well-being. The findings of this study indicate statistically significant positive correlations between lean practices and employee performance and employee well-being. Similar positive correlation is also noted when mediating variables, workplace stress, and internal/external motivation are applied to employee wellbeing and employee performance, respectively. Overall, these findings promote practical implications of lean practices in promoting employee well-being and performance in the Indian manufacturing industry.

4.2.1 Effect of lean practices on employee performance

The results of this research indicated a positive relationship between lean practices and employee performance, supporting Hypothesis 1a. “Lean manufacturing practices have a positive direct effect on employee performance. Within manufacturing, performance refers to how well the employees do their work according to the job specifications. Performance measurement evaluates how individuals contribute to organizational achievement, often measured through productivity, quality, and effectiveness. The findings are consistent with Poksinska and Swartling (2018), who noted that lean practices in manufacturing lead to improved employee performance that is attained through high productivity and efficiency.

Also, Lean principles positively impact employees' performance by eliminating complexity and enhancing efficiency, even though the process is not directly related. The findings are also echoed by Poksinska and Swartling (2018), who found that customer value definition and value stream optimization ensure that employees' efforts are focused on what is truly vital to the organization. Antony et al. (2021) note that sustaining flow and creating pull systems also minimize delays and overproduction, allowing employees to work steadily and deliver consistent output. For example, a factory that produces only what is ordered does away with the chaos of excess inventory, which can streamline workflows and enhance output quality. Additionally, Tortorella et al. (2018) implement lean practices, which makes employees avoid inefficiencies that lower production.

4.2.2 Effect of lean practices on employee well-being

The findings of this research showed a positive relationship between lean practices and employee well-being, supporting Hypothesis 1b. “Lean manufacturing practices have a positive direct effect on employee well-being. Through lean practices, employee well-being is achieved through increased job satisfaction, whereby the employees get empowered at the workplace by being involved in decision-making and having opportunities for skill development. This finding aligns with Nielsen et al. (2017) point out that the implementation of lean practices in manufacturing has promoted employee autonomy through their involvement in decision making and continuous learning. Improved communication and teamwork have also been linked to the proper implementation of lean practices in the manufacturing industry. By improving the work processes, it’s easy for lean practices to foster communication and collaboration among the employees.

While stress refers to adverse reactions to a trigger that can be physical or mental, well-being refers to the opposite state of being comfortable, healthy, and happy (Valente et al., 2020). "Workplace stress" describes the emotional and physical strain employees endure due to their jobs. Tight deadlines, excessive workloads, and a lack of control are the usual causes of stress in high-stress industries like electronics manufacturing, which can result in burnout. Such conditions are prevalent in fast-paced manufacturing environments, as Mazzocato et al. (2014) reported. On the contrary, organized and predictable work environments can reduce stress by restricting frustration and uncertainty. However, the effect greatly depends on how workplace changes are carried out, as Nielsen et al. (2017) hypothesized.

4.2.3 Mediating role of Internal and external motivation on employee performance

The findings of this research indicated an excellent positive relationship between the mediating role of internal and external motivation on the effect of lean practices and employee performance, supporting Hypothesis 4. The findings align with Ryan and Deci (2020), who noted that lean practices significantly influence employee motivation by fulfilling the psychological needs outlined in Self-Determination Theory (SDT) through aspects such as autonomy, competence, and relatedness. For

instance, Antony et al. (2021) stated that encouraging respect for people and developing a problem-solving culture empowers employees by involving them in decision-making. When workers in electronics manufacturing firms are encouraged to identify issues and offer solutions, they perceive themselves as more autonomous and capable, enhancing their intrinsic motivation.

The findings are also consistent with the work of other authors, such as Tortorella et al.(2018), who noted that when companies focus on a continual improvement approach, employees can see improvements in their daily job tasks, leading to increased job satisfaction and a continued motivation to perform at a higher level. They also indicate that improving a standard work process provides employees with more clarity on what is expected of them when completing their daily tasks, which reduces uncertainty and confusion in the workplace. On the negative side, "maintaining flow" and using a "pull" production approach may create challenges in certain situations for production operations, especially when there is significant pressure to get things done quickly or at the lowest possible cost. Under these types of situations, the implementation of lean practices can create additional workload pressure and/or strict timeframes for the completion of jobs, and can also create a feeling of reduced autonomy on the part of employees and lead to a change from intrinsic motivation to extrinsic motivation if employees feel they are being heavily monitored and/or forced to achieve certain goals when following lean principles(Tortorella et al., 2018). Therefore, when blending lean practices with employee-centered leadership and support systems in the manufacturing context, lean principles have a considerable effect on employee motivation.

4.2.4 Mediating role of workplace stress on the effect of lean practices on employee well-being

The findings of this research indicated an excellent positive relationship between the mediating role of workplace stress on the effect of lean practices and employee well-being, supporting Hypothesis 3. These findings align with Nielsen et al. (2017), who note that the relationship between lean principles and stress levels is two-sided, both positive and negative, depending on how it is implemented. For example, when an electronic manufacturing firm eliminates unnecessary processes from its cycle, the staff feel less frustrated and less delayed, lowering their stress levels. The findings are also echoed by Tortorella et al. (2018), who stated that establishing standard work, as beneficial as it is to uniformity, can contribute to stress if the standards appear too inflexible or exigent, mainly where employees already function under heightened baseline pressure. For instance, having a hard-and-fast procedure with no buffer for mistakes might induce stress upon employees who fear making mistakes. Work pressure is internal within the manufacturing economy, and the inefficient application of lean approaches exacerbates pressure in the manufacturing context, as argued by Valente et al.

(2020), towards the rational deployment of lean philosophy to avoid creating unwanted effects.

According to Nielsen et al. (2017), meaningful work surroundings and organization can improve well-being in manufacturing settings. However, a daily heavy workload in electronics assembly work can lead to burnout and compromised psychological well-being, as Moraros et al. (2016) reported. Well-being is related to stress levels, which reduce overall health and satisfaction, as Hu et al. (2016) elaborated. Lean principles can, therefore, improve or worsen the welfare of employees based on their implementation in the real world. Bortolotti et al. (2015) recognize that individuals who respect and esteem others enhance their sense of belonging and purpose in life, and this boosts psychological well-being. In an electronics manufacturing company, involving workers in the decision-making process is likely to make them feel valued, less disconnected, and have enhanced emotional health. Poksinska and Swartling (2018) also say that optimizing the value stream and implementing standardized work enables well-being through the promotion of a systematic and predictable workplace, which reduces frustration and enhances job satisfaction. For instance, an employee who has precise knowledge of what is expected of them and is less distracted will be happier and more comfortable.

According to Poksinska and Swartling (2018), while the use of continuous improvement and pull systems can have positive effects on employees' motivation during times of extreme pressure or when the likelihood of burnout is significant, it is equally important to note that unrealistic goals set by organizations can lead to employee burnout. For instance, in a situation where employees have to work long hours in a manufacturing facility, the pressure placed on them to meet ongoing improvement or to satisfy customer demand using just-in-time techniques may become so overwhelming, it harms their physical and mental health. Lean implementation generates a great degree of stress, and stress can be viewed as a major moderator of the health and well-being of employees, as shown in studies by Nielsen et al. (2017), who specifically say companies should balance how they implement lean practices to protect workers' health.

Therefore, lean practices can affect both stress and employees' well-being in two ways; while the former increases stress in high-pressure workplaces and through strict guidelines, the latter reduces it through more effective and streamlined processes. In conclusion, it primarily depends on the method of implementation of the various lean tools as to whether lean practices pose a health risk to employees.

CONCLUSION & RECOMMENDATION

1. This study concludes that lean practices impact the performance and well-being of employees through motivation and stress as mediators. Lean manufacturing techniques improve employee motivation and decrease stress levels when used correctly, resulting in higher performance levels and increased employee well-being. On the other hand, if lean pressures are too high, they negatively affect motivation and stress, and thus impede performance and well-being. Therefore, organizations should implement lean practices with a holistic approach; by focusing on employee support in terms of motivation, managing stress, as well as improving operational efficiency. The research provides important information to manufacturers who want to implement an optimal lean system and still provide a good workplace, as well as achieve sustainable human resource results.
2. To ensure that lean manufacturing works correctly and is viewed as an employee-centered approach, organizations must give their employees access to complete training, maintain an open communication system, and encourage them to participate in the development of new policies and procedures. Management needs to regularly assess their employees' stress levels and motivational levels through the use of feedback, while also considering how to implement lean initiatives that provide maximum efficiency for the organization, while providing a healthy environment for employees. Organizations can enhance both performance results and long-term sustainable success through the establishment of supportive work environments with suitable resources, employee recognition systems, and programs for stress management. These aspects are comprehensively covered in the subsequent sections on recommendations.
3. When implementing lean practices, organizations should first focus on involving the employees in the development of continual improvement processes and creating channels for providing feedback to each employee so as to minimize the stress associated with introducing a new system. Before implementing lean manufacturing practices, management should provide employees with sufficient training and resources to avoid the potential for an increased workload that negatively impacts an employee's overall health. When assessing workload distribution and levels of stress for employees, management should determine how quickly to implement lean manufacturing practices based upon periodic evaluations of employee feedback. Creating a supportive team environment and recognizing contributions from employees to the continual improvement process will continue to foster employee motivation and provide the performance advantages of consent-based lean manufacturing systems.

4. When implementing lean manufacturing practices, leaders and policymakers should ensure that employees remain the center of a lean-driven organization by employing a strong communication channel for employees to communicate issues associated with increased workloads and uncertainties regarding job responsibilities. Comprehensive training programs should be put in place and need to cover not only technical competencies but also stress management and adaptive coping strategies. Additionally, organizations should conduct regular psychological assessments to assess employee stress levels and motivation levels to ensure early intervention occurs if any aspects of a lean initiative detrimentally impact employee well-being. To add to this, employee recognition systems should provide rewards for both increased productivity as well as sustainable work practices, and there should be an introduction of flexible working arrangements to help cushion the impact of Lean on employees. Lastly, management must ensure adequate staffing levels during Lean transitions and must not fall into the trap of thinking that employing fewer people will allow them to continue to produce the same level of output while providing no additional support structures or resources.
5. Additional research studies are needed to explore the impacts of lean practices on employee performance and well-being. Longitudinal designs should be used to explore the effects of lean implementation over time on employee performance. Further, longitudinal studies will provide researchers with a more comprehensive understanding of the influence of variables such as Organizational culture, Leadership style, and the industry. On how lean practice motivates and impacts employee performance. Further, researchers could gain deeper insight into how psychological factors contribute to employee motivation and levels of stress by exploring employee experiences in lean environments through qualitative studies. By utilizing comparative studies to determine whether and how the implementation of lean has differed among manufacturing sectors and regions, researchers will be able to draw more generalizable conclusions about lean practices relative to employee performance. Lastly, testing specific lean tools in experimental designs could give researchers the ability to investigate the effects of each of these on employee well-being and, therefore, refine the theoretical framework that explains the relationship between lean operational practices and human resource outcomes.

References

- Antony, J., Psomas, E., Garza-Reyes, J. A., & Hines, P. (2021). Practical implications and future research agenda of lean manufacturing: a systematic literature review. *Production planning & control*, 32(11), 889–925.
- Bakker, A. B., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273.
- Bishnoi, V. (2019). Make in India initiative: A key for sustainable growth. *South Asian Journal of Marketing & Management Research*, 9(3), 21–27.
- Bonde, J. P., Gullander, M., Hansen, Å. M., Grynderup, M., Persson, R., Høgh, A., ... & Kolstad, H.
- Bortolotti, T., Boscari, S., & Danese, P. (2015). Successful lean implementation: Organizational culture and soft lean practices. *International Journal of Production Economics*, 160, 182-201.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Byrne, B. M. (2016). *Structural equation modelling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge.
- Camuffo, A., De Stefano, F., & Paolino, C. (2017). Safety reloaded: lean operations and high involvement work practices for sustainable workplaces. *Journal of Business Ethics*, 143, 245-259.
- Cifone, F. D., Hoberg, K., Holweg, M., & Staudacher, A. P. (2021). ‘Lean 4.0’: how can digital technologies support lean practices?. *International Journal of Production Economics*, 241, 108258. <https://doi.org/10.1016/j.ijpe.2021.108258>
- Clarke, V., & Braun, V. (2017). Thematic analysis. *The Journal of Positive Psychology*, 12(3), 297–298.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- D’Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in healthcare: a comprehensive review. *Health policy*, 119(9), 1197-1209.
- Dodkey, M. D., & Khabeer, Q. (2015). Lean practices and supply chain trends in the Indian auto

- industry. *IJAR*, 1(10), 40–54.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behaviour Research Methods*, 41(4), 1149-1160.
- Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods design principles and practices. *Health Services Research*, 48(6), 2134-2156.
- Goodridge, D., Westhorp, G., Rotter, T., Dobson, R., & Bath, B. (2015). Lean and leadership practices: development of an initial realist program theory. *BMC Health Services Research*, 15, 1–15.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(2), 2-24.
- Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). Guilford Press.
- Hines, P., Tortorella, G. L., Antony, J., & Romero, D. (2023). Lean Industry 4.0: Past, present, and future. *Quality Management Journal*, 30(1), 64–88.
- Hossan, D., Dato'Mansor, Z., & Jaharuddin, N. S. (2023). Research population and sampling in a quantitative study. *International Journal of Business and Technopreneurship (IJBT)*, 13(3), 209–222.
- Hu, Q., Schaufeli, W. B., & Taris, T. W. (2016). Extending the job demands-resources model with guanxi exchange. *Journal of Managerial Psychology*, 31(1), 127-140.
- Iid, I. I., Kumar, S., Shukla, S., Kumar, V., & Sharma, R. (2020). Putative antidiabetic herbal food ingredients: Nutra/functional properties, bioavailability, and effect on metabolic pathways. *Trends in Food Science & Technology*, 97, 317-340.
- Jiang, W. Q., Li, J. S., Chen, G. Q., Yang, Q., Alsaedi, A., Ahmad, B., & Hayat, T. (2016). Mercury emissions are embodied in Beijing's economy. *Journal of Cleaner Production*, 129, 134-142.
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1(2), 112–133.
- Kaltenbrunner, M., Mathiassen, S. E., Bengtsson, L., & Engström, M. (2019). Lean maturity and

- quality in primary care. *Journal of health organization and management*, 33(2), 141-154.
- Klein, L. L., Vieira, K. M., Feltrin, T. S., Pissutti, M., & Ercolani, L. D. (2022). The Influence of Lean Management Practices on Process Effectiveness: A Quantitative Study in a Public Institution. *SAGE Open*, 12(1). <https://doi.org/10.1177/21582440221088837> (Original work published 2022)
- Kline, R. B. (2023). *Principles and practice of structural equation modelling* (5th ed.). Guilford Press.
- Kwon, O. J. (2019). The diverging paths of skilled immigration in Singapore, Japan, and Korea: policy priorities and external labour market for skilled foreign workers. *Asia Pacific Journal of Human Resources*, 57(4), 418–444.
- Losonci, D., Kása, R., Demeter, K., Heidrich, B., & Jenei, I. (2017). The impact of shop floor culture and subculture on lean production practices. *International Journal of Operations & Production Management*, 37(2), 205–225.
- Mareth, T., Thomé, A. M. T., Cyrino Oliveira, F. L., & Scavarda, L. F. (2016). Systematic review and meta-regression analysis of technical efficiency in dairy farms. *International Journal of Productivity and Performance Management*, 65(3), 279-301.
- Maware, C., Okwu, M. O., & Adetunji, O. (2022). A systematic literature review of lean manufacturing implementation in manufacturing-based sectors of the developing and developed countries. *International Journal of Lean Six Sigma*, 13(3), 521-556.
- Moraros, J., Lemstra, M., & Nwankwo, C. (2016). Lean interventions in healthcare: Do they actually work? A systematic literature review. *International Journal for Quality in Health Care*, 28(2), 150-165.
- Nielsen, K., Nielsen, M. B., Ogbonnaya, C., Känsälä, M., Saari, E., & Isaksson, K. (2017). Workplace resources to improve both employee well-being and performance: systematic review and meta-analysis. *Work & Stress*, 31(2), 101-120.
- Nguyen-Duc, T., Nguyen, L. P., Phuong, T. T., Nguyen, H. T. H., & Cao, V. T. H. (2024). Validation of the individual work performance questionnaire in a Vietnamese context. *European Journal of Training and Development*, 48(9), 896-916.
- Ohno, T. (2019). *Toyota production system: beyond large-scale production*. Productivity Press.
- Oprime, P. C., Lizarelli, F. L., Pimenta, M. L., & Achcar, J. A. (2019). Acceptance X-bar chart considering the sample distribution of capability indices, \hat{C}_p and \hat{C}_{pk} : A practical and

- economical approach. *International Journal of Quality & Reliability Management*, 36(6), 875-894.
- Pakdil, F., & Leonard, K. M. (2017). Implementing and sustaining lean processes: the dilemma of societal culture effects. *International Journal of Production Research*, 55(3), 700-717. <https://doi.org/10.1080/00207543.2016.1200761>
- Pawelski, J. O. (2022). The positive humanities: Culture and human flourishing. *The Oxford handbook of the positive humanities*, 17-42.
- Poksinska, B., & Swartling, D. (2018). From successful to sustainable Lean production—the case of a Lean Prize Award Winner. *Total Quality Management & Business Excellence*, 29(9-10), 996-1011.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.
- Rotter, T., Plishka, C., Lawal, A., Harrison, L., Sari, N., Goodridge, D., ... & Kinsman, L. (2019). What is lean management in health care? Development of an operational definition for a Cochrane systematic review. *Evaluation & the health professions*, 42(3), 366–390.
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary educational psychology*, 61, 101860.
- Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 69(2), 107-131.
- Secchi, R., & Camuffo, A. (2019). Lean implementation failures: the role of organizational ambidexterity. *International journal of production economics*, 210, 145-154.
- Singh, J., & Singh, H. (2019). *Strategic implementation of a continuous improvement approach*. SpringerBriefs in Operations Management. <https://doi.org/10.1007/978-3-319-93121-0>
- Su, H. C., Linderman, K., Schroeder, R. G., & Van de Ven, A. H. (2014). A comparative case study of sustaining quality as a competitive advantage. *Journal of Operations Management*, 32(7-8), 429-445.
- Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), 1273–1296.

- Taherdoost, H. (2016). Sampling methods in research methodology: How to choose a sampling technique for research. *International Journal of Academic Research in Management*, 5(2), 18-27.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55.
- Theurer, C. P., Tumasjan, A., & Welpel, I. M. (2018). Contextual work design and employee innovative work behavior: When does autonomy matter? *PloS one*, 13(10), e0204089.
- Tortorella, G. L., de Castro Fettermann, D., Frank, A., & Marodin, G. (2018). Lean manufacturing implementation: leadership styles and contextual variables. *International Journal of Operations & Production Management*, 38(5), 1205-1227.
- Valente, C. M., Sousa, P. S. A., & Moreira, M. R. A. (2020). Assessment of the Lean effect on business performance: the case of manufacturing SMEs. *Journal of Manufacturing Technology Management*, 31(3), 501-523.
- Van der Klink, J. J., Bültmann, U., Burdorf, A., Schaufeli, W. B., Zijlstra, F. R., Abma, F. I., ... & Van der Wilt, G. J. (2016). Sustainable employability—definition, conceptualization, and implications: a perspective based on the capability approach. *Scandinavian journal of work, environment & health*, 71-79.
- Van der Voet, J., & Vermeeren, B. (2017). Change management in hard times: Can change management mitigate the negative relationship between cutbacks and the organizational commitment and work engagement of public sector employees? *The American Review of Public Administration*, 47(2), 230-252.
- Wang, C., Zou, Z., & Geng, S. (2021). Green technology investment in a decentralized supply chain under demand uncertainty. *Sustainability*, 13(7), 37.
- Wisdom, J. P., & Creswell, J. W. (2013). Mixed methods: Integrating quantitative and qualitative data collection and analysis while studying patient-centred medical home models. *Agency for Healthcare Research and Quality*, 13-0028-EF.
- Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, 73(6), 913-9.

APPENDIX:

**INVESTIGATING THE EFFECTS OF LEAN PRACTICES ON EMPLOYEES' PERFORMANCE AND WELL-BEING, USING
MOTIVATION AND STRESS AS MEDIATING FACTORS**

Section B: Lean Practices Implementation

Instructions: Please indicate the extent to which you agree or disagree with each statement about your work experience

	<i>Not Implemented at all</i>	<i>Rarely Implemented</i>	<i>Sometimes Implemented</i>	<i>Moderately implemented</i>	<i>Often implemented</i>	<i>Usually implemented</i>	<i>Fully Implemented</i>
Our company regularly conducts Kaizen events/workshops.							
Employees are encouraged to suggest improvements.							
Small, incremental improvements are continuously made.							
Visual controls help guide work processes.							

Systems are in place to prevent errors from occurring.							
Processes are designed to make mistakes impossible.							
Error-proofing methods are used in our operations.							
Waste in processes is identified and eliminated.							

Instructions: Please indicate the extent to which you agree or disagree with each statement about your work performance

	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Usually</i>	<i>Almost Always</i>	<i>Always</i>
I managed to plan my work so that it was done on time.							
I was able to carry out my work efficiently.							
I took on extra responsibilities.							
I actively participated in work meetings.							
I worked on keeping my job-related knowledge up to							

date.							
-------	--	--	--	--	--	--	--

Section D: Employee Wellbeing

Instructions: Please indicate the extent to which you agree or disagree with each statement about your work experience

<i>Positive Emotions</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Slightly Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Slightly Agree</i>	<i>Agree</i>	<i>Strongly Agree</i>
When I am at work, I feel enthusiastic.							
At work, I feel joyful.							
I feel excited and interested in my work.							
I feel a sense of belonging at work.							
The work I do serves a greater purpose.							

Section E: Intrinsic/Extrinsic motivation

Please indicate the extent to which you agree or disagree with each statement about your work experience using the following scale:

<i>Intrinsic Motivation</i>	<i>Not at all</i>	<i>Very Little</i>	<i>A Little</i>	<i>Moderately</i>	<i>Strongly</i>	<i>Very Strongly</i>	<i>Completely</i>

Because I have fun doing my job							
Because this job fits my personal values							
Because what I do in my work is exciting							
<i>Extrinsic Motivation</i>							
Because I engage in my work to achieve financial stability							
Because I engage in my work to fulfil responsibilities to those who depend on my role							

Section F: Workplace Stress

Please indicate the extent to which you agree or disagree with each statement about your work experience using the following scale.

<i>Workplace stress</i>	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Slightly Disagree</i>	<i>Neither Agree nor Agree</i>	<i>Slightly Agree</i>	<i>Agree</i>	<i>Strongly Agree</i>
I have too much work and too little time to							

do it.							
I must work very fast.							
My job negatively affects my family life.							
My job gets to me more than it should							
I find it hard to relax after work.							
I feel that I have little control over what I am doing.							
Working here is usually quite stressful for me.							

SECTION F: QUALITATIVE QUESTIONS

1. In what ways do you view the effect of any of the lean practices (5S, standardization, or continuous improvement) on the motivational and engagement levels daily?
2. Which lean management practices affect your experiences of work, particularly around work-related stress, in both positive and negative ways?
3. How do your levels of motivation and stress, as impacted by lean practices - positively or negatively - impact your overall performance at work?

Section A: Demographic Information

(Please tick or fill in the appropriate option.)

1. What is your age in years?

.....

2. What is your gender?

.....

3. What is your current job role?

.....

4. How many years of experience do you have in the manufacturing industry?

.....

5. How long have you worked in X Company?

.....

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
LP11-Our company regularly conducts Kaizen events/workshops	30.58	107.276	.903	.916	.958
LP12-Employees are encouraged to suggest improvements	30.34	102.509	.938	.943	.955
LP13-Small, incremental improvements are continuously made	30.87	101.124	.970	.959	.952
LP14-Visual controls help guide work processes	30.49	110.879	.723	.667	.971
LP15-Systems are in place to prevent errors from occurring	30.52	101.929	.964	.955	.953
LP16-Processes are designed to make mistakes impossible	30.61	109.493	.733	.720	.970
LP17-Error-proofing methods are used in our operations	30.67	103.395	.911	.870	.957

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EP1-I managed to plan my work so that it was done on time	17.46	48.534	.949	.912	.978
EP2-I was able to carry out my work efficiently	18.19	47.024	.974	.952	.975
EP3-I took on extra responsibilities	17.17	49.153	.967	.941	.976
EP4-I actively participated in work meetings	17.97	50.837	.915	.851	.983
EP5-I worked on keeping my job-related knowledge up to date	17.93	48.147	.941	.903	.980

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
EWB1-When I am at work, I feel enthusiastic	17.34	49.560	.835	.702	.923
EWB2-At work, I feel joyful	18.14	46.849	.702	.662	.945
EWB3-I feel excited and interested in my work	17.75	43.624	.824	.839	.922
EWB4-I feel a sense of belonging at work	17.83	42.021	.925	.860	.901
EWB5-The work I do serves a greater purpose	17.66	45.136	.892	.861	.909

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
IM1-Because I have fun doing my job	16.54	41.503	.899	.954	.840
IM2-Because this job fits my personal values	16.04	41.716	.875	.837	.845
IM3-Because what I do in my work is exciting	16.64	40.798	.916	.958	.836
EM1-Because I engage in my work to achieve financial stability	16.28	42.143	.813	.771	.858
EM2-Because I engage in my work to fulfill responsibilities to those who depend on my role	16.06	51.693	.330	.133	.966

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
WS1-I have too much work and too little time to do it.	24.19	111.085	.937	.910	.964
WS2-I must work very fast	23.90	107.364	.724	.607	.983
WS3-My job negatively affects my family life	23.96	108.968	.932	.923	.964
WS4-My job gets to me more than it should	24.13	108.458	.897	.823	.966
WS5-I find it hard to relax after work	24.13	107.347	.951	.955	.963
WS6-I feel that I have little control over what I am doing	24.25	107.321	.937	.915	.964
WS7-Working here is usually quite stressful for me	24.22	105.345	.959	.956	.962

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
LP11-Our company regularly conducts Kaizen events/workshops	100	1	7	5.10	1.720
LP12-Employees are encouraged to suggest improvements	100	1	7	5.34	1.908
LP13-Small, incremental improvements are continuously made	100	1	7	4.81	1.926
LP14-Visual controls help guide work processes	100	1	7	5.19	1.846
LP15-Systems are in place to prevent errors from occurring	100	1	7	5.16	1.895
LP16-Processes are designed to make mistakes impossible	100	1	7	5.07	1.908
LP17-Error-proofing methods are used in our operations	100	1	7	5.01	1.910
LP18-Waste in processes is identified and eliminated	100	1	7	5.21	1.800
Valid N (listwise)	100				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EWB1-When I am at work, I feel enthusiastic	100	1	7	4.84	1.529
EWB2-At work, I feel joyful	100	1	7	4.04	1.984
EWB3-I feel excited and interested in my work	100	1	7	4.43	2.031
EWB4-I feel a sense of belonging at work	100	1	7	4.35	1.992
EWB5-The work I do serves a greater purpose	100	1	7	4.52	1.795
Valid N (listwise)	100				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
IM1-Because I have fun doing my job	100	1	7	3.85	1.850
IM2-Because this job fits my personal values	100	1	7	4.35	1.872
IM3-Because what I do in my work is exciting	100	1	7	3.75	1.882
EM1-Because I engage in my work to achieve financial stability	100	1	7	4.11	1.938
EM2-Because I engage in my work to fulfill responsibilities to those who depend on my role	100	1	7	4.33	2.132
Valid N (listwise)	100				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
WS1-I have too much work and too little time to do it.	300	1	7	4.82	1.914
WS2-I must work very fast	300	1	7	4.96	1.818
WS3-My job negatively affects my family life	300	1	7	4.88	1.912
WS4-My job gets to me more than it should	300	1	7	4.49	1.880
WS5-I find it hard to relax after work	300	1	7	4.44	1.976
WS6-I feel that I have little control over what I am doing	300	1	7	4.53	1.869
WS7-Working here is usually quite stressful for me	300	1	7	4.38	2.021
Valid N (listwise)	300				