FACULTY OF ECONOMICS TUL

Master Thesis

Application of lean management tools in a selected company

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Thesis Supervisors: Ing. Natalie Pelloneová, Ph.D.
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Master Thesis Assignment Form

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- CZIFRA, György; Peter SZABÓ; Miroslava MÍKVA and Jaromíra VAŇOVÁ, 2019**.** Lean Principles Application in the Automotive Industry. *Acta Polytechnica Hungarica*, vol. 16, no. 5, pp. 43–62. ISSN 2064-2687.
- LIKER, Jeffrey K., 2020. *The Toyota Way, Second Edition: 14 Management Principles from the World's Greatest Manufacturer*. 2^{nd} ed. New York: McGraw-Hill Education. ISBN: 978-1260468519.
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Application of lean management tools in a selected company

Annotation

The thesis explores the implementation of Lean Management principles, specifically focusing on the application of the 5S method and Total Productive Maintenance (TPM) in Café Coffee Day (CCD). Beginning with a theoretical framework of Lean Management, it delves into concepts such as waste reduction, process optimization, and the significance of Lean tools in improving organizational efficiency. The characteristics of CCD are outlined, followed by an analysis of the current condition of the company, emphasizing the need for structured approaches to enhance operational efficiency. The proposal for implementing 5S in CCD's kitchen is detailed, highlighting the problem, evaluation of the current condition, and the implementation plan. Additionally, the thesis presents a comprehensive exploration of TPM for the OTG machine, detailing the problem, current status, and proposed implementation plan. Economic evaluations of both the 5S method and TPM are conducted to assess their impact on the organization. Through this structured approach, the thesis aims to provide actionable insights for enhancing operational efficiency and productivity in the café setting.

Key Words

Lean management, 5S method, Total Productive Maintenance, Café Coffee Day, Operational efficiency, Waste reduction

Aplikace nástrojů lean managementu ve vybrané společnosti

Anotace

Předkládaná diplomová práce se zabývá implementací nástrojů lean managementu. Konkrétně se zaměřuje na aplikaci metody 5S a metody TPM (čes. totálně produktivní údržba) ve společnosti Café Coffee Day (dále CCD). Úvodem předkládá teoretický rámec lean managementu a diskutuje pojmy, jako je snižování plýtvání, optimalizace procesů a význam nástrojů lean managementu pro zvyšování efektivity společnosti. Dále jsou nastíněny charakteristiky analyzované společnosti CCD, následuje analýza současného stavu společnosti s důrazem na potřebu strukturovaných přístupů ke zvýšení provozní efektivity. Podrobně je popsán návrh na zavedení metody 5S v kuchyni společnosti CCD, přičemž je zdůrazněn problém, zhodnocení současného stavu a plán implementace. Kromě toho předložená práce předkládá využití metody TPM pro stroj OTG. Podrobně popisuje problém, současný stav a navrhovaný plán implementace daného nástroje. Závěrem je provedeno ekonomické vyhodnocení metody 5S i TPM s cílem posoudit jejich dopad na zkoumanou organizaci. Cílem diplomové práce je prostřednictvím tohoto strukturovaného přístupu poskytnout využitelné poznatky pro zvýšení provozní efektivity a produktivity v prostředí kavárny.

Klíčová slova

Lean management, metoda 5S, totálně produktivní údržba, Café Coffee Day, provozní efektivita, redukce plýtvání

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Content

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5S	Sort, Set in order, Shine, Standardize, Sustain
CCD	Cafe Coffee Day
CZK	Czeh Koruna
GDP	Gross Domestic Product
IIT	Indian Institute of Technology
JIT	Just in time
KPI	Key Perfomance Indicator
OTG	Oven Toater Grill
PDCA	Plan Do Check Act
QSR	Quick Selliing Restaurant
SOP	Standard Operating Procedures
TPM	Total Productive Maintenance
TPS	Toyota Production System
TUL	Technical University of Liberec
VSM	Value Stream Mapping
WIP	Work In Progress

Introduction

In this thesis, the primary focus is on implementing lean management principles and total productive maintenance (TPM) techniques in Café Coffee Day (CCD), a prominent café. The aim is to enhance operational efficiency, improve equipment reliability, and optimize resource utilization within CCD's kitchen operations chain using AI driven analysis to give strategies for enhancing. The methodology involves a comprehensive examination of lean management concepts, including waste reduction, process optimization, and employee engagement, along with the practical application of TPM specifically tailored to the maintenance challenges of the Oven Toaster Grill (OTG) machine. Through a detailed analysis of CCD's organizational structure, product mix, and current operational condition, the thesis proposes structured interventions such as the 5S method and TPM to address identified areas for improvement. Economic evaluations will be conducted to assess the cost-effectiveness and benefits of implementing these methodologies. Through this study, insights will be provided into the potential impact of lean management and TPM on CCD's operations, highlighting the importance of proactive maintenance and continuous improvement in the food service industry.

This thesis is structured to provide a comprehensive understanding of the methodologies and their application in CCD's operations. The theoretical part of the thesis dives into the fundamental concepts of lean management, including waste reduction, process optimization, and employee engagement. This section also explores the principles and techniques of TPM, with a specific focus on addressing maintenance challenges related to the Oven Toaster Grill (OTG) machine. The practical part of the thesis outlines structured interventions such as the 5S method and TPM tailored to CCD's kitchen operations, along with a detailed analysis of the organization's structure, product mix, and current operational condition. Economic evaluations will be conducted to assess the cost-effectiveness and benefits of these methodologies. Finally, the thesis concludes with insights into the potential impact of lean management and TPM on CCD's operations, emphasizing the significance of proactive maintenance and continuous improvement in the food service industry. In the preparation of this thesis, the author used an artificial intelligence program, in accordance with the Rector's Directive No. 4/2023The

author explores the implementation of lean management principles and total productive maintenance (TPM) techniques in Café Coffee Day (CCD), leveraging AI-driven data analysis to inform the strategies for enhancing operational efficiency.

1 Theoretical framework: Lean Management

The theoretical framework chapter explores the foundational concepts and principles of Lean Management, aiming to provide a comprehensive understanding of its significance in enhancing organizational efficiency. It begins with defining Lean Management and elucidates its importance in waste reduction, process optimization, employee engagement, customer focus, quality improvement, resource optimization, and lead time reduction. The chapter further delves into various Lean tools such as TPS, 5S methodology, Kaizen, Kanban, JIT, Andon, Value Stream Mapping, and Standardized Work, detailing their applications and benefits. Additionally, it examines different types of wastes and Lean principles like value, value stream, flow, pull, and perfection. Moreover, the economic benefits of applying Lean tools in organizations are discussed, covering aspects like cost reduction, improved efficiency, quality enhancement, optimized resource utilization, flexibility, and cost of poor quality. The chapter concludes by exploring Lean tools implementation techniques and the cultural benefits of Lean management, emphasizing aspects such as leadership commitment, training, pilot projects, Gemba walks, visual management, feedback mechanisms, key performance indicators, continuous improvement culture, employee empowerment, learning culture, collaboration, respect for people, and customer focus.

Lean management is a comprehensive organizational approach that originated from the Toyota production system (further TPS) and has evolved into a widely adopted methodology across various industries. At its core, lean management focuses on the pursuit of efficiency, waste reduction, and continuous improvement throughout the entire value stream. This philosophy is defined by a set of principles, tools, and techniques aimed at enhancing organizational processes, employee engagement, and overall performance. In this chapter we will be deeply diving into the key elements of lean management which includes the (TPS), which introduced foundational concepts like Sort, Kaizen, Just in time (JIT), Kanban, Andon, and Value Stream Mapping. The ultimate goal is to eliminate waste, optimize resources, and follow a culture of continuous improvement, all of which contribute to improved organizational efficiency and effectiveness. (Liker, 2020)

The core principles of Lean management revolve around creating value for the customer, streamlining the flow of work, embracing a pull-based production system,

and striving for perfection through continuous improvement. The significance of lean management extends beyond operational excellence to achieve waste reduction, process optimization, enhanced employee engagement, customer focus, and the continuous pursuit of high-quality outcomes. By adopting lean principles and tools, organizations can achieve cost reduction, improved efficiency, and optimized resource utilization. The concepts of lead time reduction and flexibility become crucial in responding to dynamic market demands. This theoretical framework establishes the groundwork for a thorough exploration of lean management's impact on organization and its instrumental role in driving economic benefits and implementation techniques through the application of lean tools and methodologies. (Liker, 2020)

1.1 Definition of Lean Management

Lean Management is an approach to work organization and management that focuses on increasing the profitability and quality of a company's output. The word “lean” in lean manufacturing stands for “using less of everything”. The main goal of lean manufacturing as a production approach is to shorten reaction times for suppliers and customers as well as inside the production system. A methodical approach to business operations, lean management concentrates on providing consumers with the most value while utilizing the fewest resources possible. Lean concepts were first created by Toyota as the (TPS) in the 1950s, and they have since grown to be essential to successful and efficient management in a variety of sectors. (Liker, 2020)

Fundamentally, lean management aims to reduce waste, strengthen internal procedures, and raise overall performance levels within the company. It places a strong emphasis on offering goods and services that closely match the needs of customers, responding to change, and engaging in a never-ending cycle of improvement. Lean management is based on three main principles: maximizing work flow, identifying and removing non-value-adding activities, and involving staff

members at all levels in the goal of continuous improvement. Through encouraging a climate of cooperation, problem-solving, and with innovation, lean management aims to build long-term value for businesses and clients. (Liker, 2020)

Lean management is essentially about maximizing value through process optimization, lead time reduction, and overall efficiency enhancement. It goes beyond simply cutting costs. Because the lean concepts have been effectively implemented in the manufacturing, service, and other sectors, it has become a popular and adaptable framework for achieving operational excellence. The concepts of lean management continue to be crucial in influencing contemporary business practices as firms work to maintain their flexibility and responsiveness in a changing business environment. (Mann, 2014)

1.2 Significance of Lean Management in Improving Organizational Efficiency

It is important to note that the lean approach reduces waste in all forms, including unnecessarily lengthy processes and underutilized resources, which can result in cost savings and resource optimization as a result. There are many ways to reduce waste through a lean approach, including eliminating unnecessary steps in processes and maximizing resources, both of which can lead to cost savings and a more efficient use of resources as a result. The lean paradigm practices the reduction of waste in all its forms, such as unnecessary steps in processes and the underutilization of resources, which in turn can lead to a reduction of costs and a better utilization of resources. (Mann, 2014)

As stated by Mann (2014) lean management seeks to eliminate waste in all forms, such as unnecessary steps in processes and underutilized resources, in order to reduce waste and optimize resources in the process of lowering costs and streamlining operations. The lean approach reduces waste in all forms, including unnecessary steps in processes and underutilized resources, and that can result in cost reductions as well as resource optimization in the future.

1.2.1 Waste reduction

The goal of lean management is to get rid of waste in any way possible, including extra production, inventory that isn't needed, defects, long wait times, and wasteful transportation. Organizations can increase overall efficiency through cost reduction, process streamlining, and resource allocation through waste minimization. (Liker, 2020)

By eliminating waste, people make incremental daily improvements in lean, people are constantly seeking perfection by eliminating waste on a daily basis. Getting rid of waste is the key to Lean, which is a continuous search for perfection. Continuous improvement by eliminating waste is the main purpose of lean. (Spear, 2010)

1.2.2 Process optimization

A key component of lean concepts is the improvement of workflows and processes. This entails locating and removing bottlenecks, streamlining intricate processes, and guaranteeing an efficient and uninterrupted work flow. Organizations can increase production and provide goods and services more quickly and accurately by optimizing their processes. (Liker, 2020)

Rother and Shook (2003), explains that how eliminating waste and optimizing processes directly improve financial performance. It goes beyond the shop floor, showing how Lean principles can be applied across all departments and functions. Understand the eight wastes (Muda) in Lean and prioritize their elimination.

1.2.3 Employee engagement

A culture of employee empowerment and involvement is fostered by lean management. Every level of the team actively participates in initiatives for continuous improvement, decision-making, and problem-solving. This improves teamwork and draws on the workforce's pooled knowledge, which promotes higher productivity and creativity. (Liker, 2020)

Hirano (1996) says that there are 9 key drivers which explains that to make employees to truly thrive, they need more than just a pay check. They seek Meaningful Work, feeling their efforts contribute to something greater. This sense of purpose is amplified when employees feel a strong safety net and psychological security, knowing that mistakes are tolerated, and risks are encouraged, following an environment where experimentation and learning can thrive without fear. Choice and autonomy in work tasks provide a sense of ownership and engagement, as employees have the freedom and control to shape their responsibilities. Contributing to an inclusive environment where employees feel heard and valued empowers individuals, emphasizing the unique perspectives and abilities they bring to the collective success of the organization.

1.2.4 Customer focus

A key component of lean management is comprehending and providing value to customers. Organizations can produce goods and services that more effectively satisfy consumer requests by coordinating internal operations with customer preferences and needs. This customer-focused strategy makes sure that resources are used effectively to produce excellent results that appeal to the intended audience. (Liker, 2020)

Kouzes and Posner (2017) says that customer-centricity lies at the heart of value identification, emphasizing a perspective that transcends internal efficiency to focus on meeting customer needs and enhancing their experience. To achieve this, waste elimination becomes paramount, targeting and eliminating inefficiencies, such as prolonged wait times, unclear communication, or redundant procedures, which might contribute to customer effort or frustration.

1.2.5 Quality Improvement

Lean management places a strong emphasis on reducing flaws and pursuing perfection. By emphasizing quality across the whole production or service delivery process, businesses can reduce mistakes, rework, and client complaints.

Improvements in quality are closely related to gains in productivity and client happiness. (Liker, 2020)

As explained by George (2003) has powerful methodologies, offering a comprehensive approach to quality improvement which explains that in the quest for quality, the focus is on what customers really want and making sure we prioritize getting rid of anything that doesn't meet those expectations. This involves reducing waste by eliminating unnecessary activities that don't add value, like fixing mistakes or dealing with delays and to prioritize quality. By employing data-driven methods, we pinpoint the root causes of quality issues and measure our efforts to improve, ensuring lasting results.

1.2.6 Resource Optimization

As stated by Kenney (2010) lean emphasizes a crucial distinction in the Flow vs. Efficiency Paradox, contending that an exclusive focus on maximizing individual resource efficiency may counterintuitively impede overall workflow and increase wasteful practices. Lean principles prioritize the optimization of flow by mitigating bottlenecks and ensuring a seamless, uninterrupted work process. Modig suggests three essential pillars for resource optimization: Variability Management aims to minimize process and demand variations, preventing both under- and over-utilization of resources. Pull Systems, utilizing approaches like Kanban, are advocated to prevent overproduction and unnecessary resource allocation.

1.2.7 Lead Time Reduction

Wireman (2004) distinguishes between process time (the actual value-adding work) and lead time (the total duration from order to delivery), the focus is on minimizing non-value-adding elements within the overall lead time. This involves identifying and addressing sources of waste that contribute to extended lead times, such as waiting, unnecessary transportation, overproduction, and defects. Employing tools like Value Stream Mapping helps visualize the entire process, highlighting

bottlenecks and opportunities for reducing lead time. Flow optimization is achieved through the implementation of Lean principles like Kanban and pull systems, following a smooth, continuous flow and eliminating wait times and excess inventory. Standardizing work practices and promoting continuous improvement through initiatives like Kaizen events and data-driven analysis further contribute to reducing lead time and enhancing overall efficiency.

1.3 Lean tools

A collection of ideas, methods, and procedures known as "lean tools" are employed by businesses to increase productivity, reduce waste, and optimize workflows in order to provide greater value to their clients. These techniques are frequently linked to the (TPS) derived management philosophy known as Lean Thinking. (Liker, 2020)

Myerson (2012) explains that in adopting a holistic approach, it is essential not to implement improvement tools in isolation; instead, carefully select and combine them based on the unique challenges and objectives of your specific processes. Utilize a data-driven improvement methodology by measuring the impact of these tools and using data to refine your approach, demonstrating tangible improvements. Furthermore, employee engagement plays a pivotal role actively involve your workforce in understanding and utilizing these tools to instil a sense of ownership and foster a culture of continuous improvement. By combining a thoughtful selection of tools, data-driven insights, and active employee participation, organizations can achieve a comprehensive and sustainable approach to process enhancement.

1.3.1 TPS

Nicholas (2018) explains that beyond the realm of tools and techniques, Toyota Kata underscores the philosophical underpinning of the (TPS), placing a premium on continuous learning and improvement. The Improvement Kata serves as a structured routine for problem-solving, concentrating on articulating challenges, experimenting with incremental changes, and extracting valuable insights from the outcomes.

Complementing this, the Coaching Kata empowers leaders to coach and develop their teams, nurturing a culture of inquiry and experimentation. By prioritizing these routines, Toyota Kata emphasizes not just the application of specific tools but a comprehensive approach rooted in continual learning and adaptive improvement within the organizational fabric. The Improvement Kata, a central routine, offers a structured approach to problem-solving by systematically defining challenges, experimenting with incremental changes, and learning from the outcomes. Complementing this, the Coaching Kata empowers leaders to guide and develop their teams, cultivating a culture centred around inquiry and experimentation.

1.3.2 5'S (sort, set in order, shine, standardize, sustain)

Jones and Womack (2010) explains that as a valuable tool for process improvement within the broader context of lean principles. he benefits outlined include reduced waste, improved flow, enhanced safety, greater quality standards, and boosted morale, emphasizing the practical advantages of implementing 5S in following efficiency, safety, and overall workplace well-being. It is a technique for arranging the workplace that focuses on standardizing and structuring the workspace to increase productivity and security. This gradual approach allows for a more manageable and effective integration of the principles. Active involvement from everyone in the organization is crucial, following lasting impact and creating a sense of collective ownership. Visualization of improvement through tools like boards and labels aids in maintaining organization and awareness. This inclusive approach ensures sustained success and long-term benefits from the application of 5S principles. The individual principles will be discussed below.

Sort

Liker (2020) explains that this step entails sorting workplace supplies into those that are necessary and those that are not. The work space is cleared of extraneous tools, supplies, and equipment, leaving only the necessities. The objective is to get rid of clutter and make the workspace more efficient and well-organized.

Set in order

Liker (2020) explains that this is the next stage is to logically and efficiently arrange the remaining items once unwanted ones have been eliminated. The arrangement of the tools and materials is designed to cut down on the amount of time needed to find and use them. Making a workstation that is orderly and visually appealing is the main focus.

Shine

Liker (2020) states that workspace is well cleaned, and continual efforts are taken to maintain its cleanliness. Frequent cleaning contributes to a safer and more effective environment by assisting in the early detection and resolution of problems like leaks, flaws, or wear and tear.

Standardize

Liker (2020) states by ensuring that everyone adheres to the same procedures, standardization fosters consistency and the durability of the advancements made.

Sustain

Liker (2020) explains that it entails developing the discipline to uphold the set standards as well as following a culture of constant development. To guarantee that the 5S principles are constantly implemented, regular audits and reviews are conducted.

1.3.3 Kaizen

A Japanese word meaning “change for the better” or “continuous improvement.” It is both a philosophy of striving for excellence and a method of iterative improvement

following PDCA. It is a passionate focus that engages the entire organization. Kaizen aims to produce small, continuous changes in every area of a business, from management techniques to manufacturing procedures. (Poppendieck and Poppendieck, 2013)

Plan-Do-Check-Act, or PDCA, is a four-step management technique used to continuously improve products, services, and processes. Because of its founders, Walter A. Shewhart and W. Edwards Deming, PDCA is also referred to as the Deming Cycle or the Shewhart Cycle. A key idea in lean manufacturing, comprehensive quality control, and quality management is the PDCA cycle. Figure 1 explains the cycle of PDCA in detail, by step by step. (Bell and Orzen, 2016)

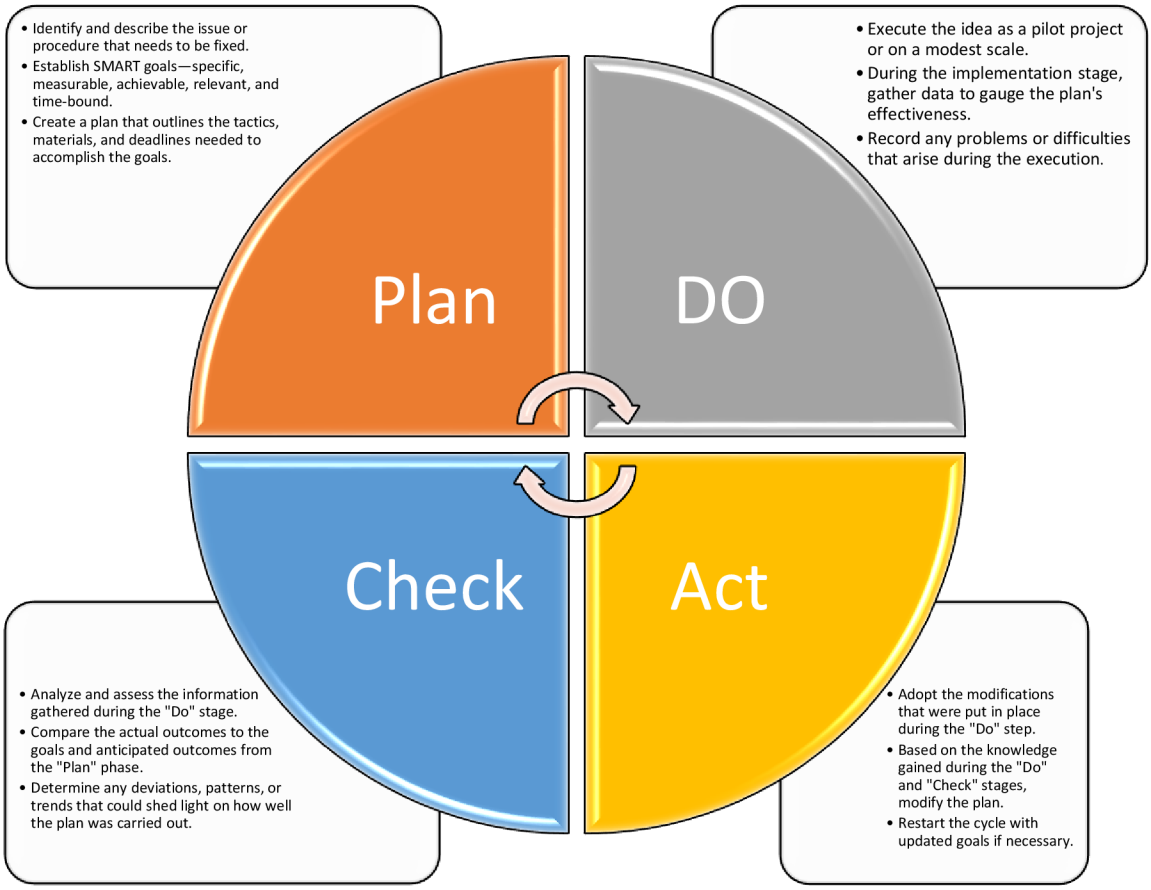

Figure 1: PDCA Cycle
Source (Own processing)

1.3.4 Kanban

Emiliani (2007) explains that the Pull-Based System of Kanban aligns seamlessly with Lean principles by emphasizing production based on actual demand, avoiding the push of tasks through the system, and thereby minimizing waste and overburdening. In line with Lean's commitment to transparency and shared understanding of process flow, the Kanban board serves as a visual tool. The implementation of Work-in-Progress (WIP) limits, a core tenet of Kanban, resonates with Lean's principle of waste elimination, preventing multitasking and mitigating bottlenecks for a more efficient workflow. Enhancing overall work flow, cutting waste, and increasing efficiency are the main objectives of the Kanban method.

1.3.5 Just-in-time (JIT)

Graban (2018) states that the approach of producing and delivering only what is needed, when needed, and in the desired quantity serves to eliminate unnecessary inventory and mitigate waste associated with overproduction. To further enhance efficiency, reducing lead times through process optimization and flow improvement becomes paramount, streamlining production and delivery processes. Adopting a pull-based production strategy, exemplified by tools like Kanban systems, ensures that goods are produced based on actual customer demand, preventing the unnecessary accumulation of excess inventory. Implementing small lot sizes, producing smaller batches more frequently, not only reduces inventory holding costs but also enhances flexibility to swiftly respond to changes in demand.

1.3.6 Andon

Imai (1997) says that it holds significance in Lean manufacturing as a visual and auditory signalling system. It plays a pivotal role in highlighting abnormal conditions or quality issues on the production line, functioning as a communication and problem-solving tool. The Andon Board, typically located centrally, utilizes lights, alarms, and sometimes digital displays to signal various types of problems, enabling swift identification. Stop Cords serve as mechanisms for operators to halt the production line immediately upon encountering an issue. Clear Standard Operating

Procedures (SOPs) provide instructions on how to respond to different Andon signals, ensuring a standardized and effective approach.

1.3.7 Value stream mapping

One method that aids in understanding the current situation and creating a high-level vision of the material and information flow required to meet company objectives is value stream mapping. With constant PDCA, this goal gives you something to work toward. Value Stream Mapping is a potent instrument utilized by enterprises to optimize workflows, minimize lead times, and improve the overall value provided to clients. It is frequently used to increase operational effectiveness and customer happiness in the manufacturing, service, and healthcare sectors. (Liker, 2020)

Stoller (2015) states that Value Stream Mapping (VSM) stands as a powerful visual tool within Lean methodology, meticulously charting the entirety of material and information flow from suppliers to customers to pinpoint and eliminate waste. This tool not only visualizes the current state of a process but also illuminates non-value-adding activities and bottlenecks, serving as a foundation for improvement. It is a Processes that enhance industrial, service, and administrative structures are all described under VSM. Creating a physical map is the foundation of this system, which involves every team member in the process directly. VSM enhances communication, following collaboration and shared understanding among team members. Informed by data-driven insights from the mapped visual, the tool contributes to better decision-making in the context of improvement initiatives. Lastly, by laying the groundwork for ongoing process optimization, VSM becomes an integral driver of continuous improvement within an organization.

1.3.8 Standardized work

Standardized work is essential to a smooth workflow since it enables a repeatable procedure at the rate of consumer demand. Standardized work establishes the foundation for kaizen, or continuous improvement, by recording the presently

accepted best practice for doing the task. As the standard is enhanced, the updated standard serves as the foundation for other enhancements, and so forth. (Rother, 2009)

Akers (2011) says that standardized work involves documented procedures, offering clear, step-by-step instructions for task completion, encompassing required tools, materials, and timings. Visual Management enhances clarity through charts, diagrams, and videos, facilitating adherence to workflows. Achieving a balanced workload involves distributing tasks based on skills and capacities to ensure smooth flow and prevent overburdening. Recognizing Standardized Work as a living document, it remains open to updates and refinements driven by data and experience for continual improvement. It can benefit in improved quality results from consistent processes, reducing defects and errors; increased efficiency eliminates wasted time and effort through streamlined and optimized tasks. Standardized Work also contributes to enhanced training, providing new employees with a clear roadmap for effective task completion, following empowerment, and a sense of control. Ultimately, it serves as a baseline for continuous improvement, enabling the identification and implementation of better ways of working overtime.

1.4 Wastes

Wastes in companies are referred to unnecessary activities, or resources that do not add value to the final product or service. All kinds of wastes occur when we try to produce the same product in large, homogeneous quantities. In the end, costs rise. It is much more economical to make each item one at a time. (Martin and Osterling, 2013)

Imai (1986) explains that Eliminating waste through Lean principles yields multifaceted benefits for organizations. Primarily, it results in reduced costs by addressing excess inventory, minimizing rework, and optimizing inefficient processes. The elimination of waste also boosts flexibility, making organizations more responsive to changing demands by reducing inventory levels and streamlining processes. Beyond the tangible improvements, empowering employees by involving them in waste identification and elimination fosters a sense of ownership and

commitment to continuous improvement. The systematic removal of waste not only enhances financial metrics but also drives operational efficiency, product quality, adaptability, and employee engagement.

To recognize waste, we must understand its nature. Waste can be divided into the following categories. Categories are given in the following subsection 1.4.1.

1.4.1 Types of wastes

Ballé and Ballé (2010) states that waste in various forms hampers efficiency and adds unnecessary costs. Overproduction, exemplified by producing more than customers need, results in excess inventory and wasted resources. In a service context, scheduling more staff than necessary for anticipated demand leads to idle time and increased payroll costs.

1.4.2 Overproduction

Mann (2005) explains that common causes of overproduction in services include batch processing, where services are produced or delivered in large batches instead of smaller, more frequent quantities based on actual demand. Inaccurate forecasting, overestimating customer demand, can lead to production exceeding actual needs. Fear of stockouts drives the production of extra services to avoid shortages, often resulting in unnecessary inventory. Push systems, where services are pushed through processes regardless of actual demand, can lead to overproduction and potential rework. The impacts of overproduction in services are significant. It results in increased costs, encompassing inventory holding costs, storage space, and the potential for product obsolescence. The consequence is reduced efficiency, with time and resources spent managing and handling excess inventory.

1.4.3 Waiting

Black (2016) states that waiting for a machine to operate, awaiting important inputs, or having time to spare when there are no pressing deadlines. Waiting for supplies, knowledge, or tools can lead to inefficiencies and lower output. Developing preventative maintenance plans to reduce equipment downtime, strengthening communication channels for speedier information flow, and optimizing supply chain management to guarantee timely material deliveries are some strategies to alleviate waiting.

George (2010) says that Inefficiencies in scheduling, such as poor appointment scheduling, can result in customer wait times or staff idle time between appointments. Information delays, characterized by waiting for information from other departments, colleagues, or external sources, hinder overall progress. A lack of resources, be it insufficient equipment, supplies, or staff, leads to bottlenecks and increased wait times. Unclear processes, which are ambiguous or complex, require clarification and contribute to delays.

1.4.4 Unnecessary transportation

Womack and Jones (2015) says that carrying work in process (WIP) long distances, causing inefficient transport, or moving items or information into or out of storage or between operations. This movement can lead to additional costs and the potential for damage. Process simplification in transportation can result in lower costs, more productivity, and an operation that is more ecologically friendly. By tackling transportation waste, businesses can save expenses, increase overall operational effectiveness, and lower the chance of material or product damage—all of which support a more competitive and sustainable business model.

Rother and Shook (2003) explains that common causes of unnecessary transportation across various industries include a poor layout, characterized by an inefficient physical workspace layout requiring excessive movement. Inadequate communication, batch processing, redundant processes, and unclear storage systems also contribute to unnecessary movement. The impacts of unnecessary transportation are significant, encompassing reduced productivity due to wasted time and resources, increased costs from additional wear and tear on equipment,

potential product damage, and higher fuel or transportation costs. There is a risk of decreased safety due to excessive movement, and lower quality may result from delays and damage caused by transportation, impacting the overall product or service quality. Identifying and addressing these causes and impacts is essential for organizations aiming to streamline processes and eliminate waste.

1.4.5 Overprocessing

Liker (2020) explains that taking unneeded processes to process the pieces. Inefficiently processing due to inadequate tool and product design, causing unnecessary motion and resulting flaws. Additionally, waste is produced when better goods or services are offered than are required.

Rother and Shook (2003) says that Overprocessing in services, characterized by performing unnecessary steps or using excessive complexity, can be rooted in several common causes. A lack of understanding of true customer needs and expectations may lead to the inclusion of unnecessary features or steps in the service process. An internal focus, where processes are designed for internal convenience or control rather than optimizing the customer experience, can contribute to overprocessing. Redundant procedures may arise due to unclear roles, responsibilities, or communication gaps, resulting in the duplication of effort. Excessive documentation, involving the creation and maintenance of unnecessary paperwork or reports that don't contribute to value, adds to the complexity.

1.4.6 Excess inventory

Liker (2020) states that overproduction of finished items, work-in-progress, or raw materials results in longer lead times, damaged commodities, higher transportation and storage expenses, and delays. Furthermore, excess inventory serves as a cover for issues including uneven output, supplier delivery delays, malfunctions, equipment outages, and long setup periods.

Anderson (2010) explains that excess inventory occurs when an organization holds more stock of materials, products, or information than is immediately needed or

demanded. This practice ties up capital, incurs storage costs, and can potentially lead to obsolescence or deterioration. Various industries commonly face excess inventory, and the causes are identifiable. Inaccurate forecasting, involving overestimating customer demand, can result in production exceeding actual needs. Batch processing, producing or purchasing large quantities at once regardless of immediate demand, contributes to excess inventory. The fear of stockouts may lead to holding safety stock, but often levels exceed optimal thresholds. Excessive inventory levels result in increased costs, as capital becomes tied up in the surplus stock, and additional expenses arise from storage space requirements. The risk of potential waste looms due to obsolescence or damage to excess items. Reduced agility is a consequence, as organizations find it challenging to respond promptly to changes in demand when burdened with inflexible and high inventory levels. Lower quality becomes a concern, particularly when older inventory deteriorates, impacting product quality and potentially necessitating rework. Hidden costs emerge in the form of increased handling, transportation, and administrative expenses associated with managing large inventories. This excess inventory can have various negative impacts on a company. Through the optimization of inventory levels, businesses can enhance their overall operational efficiency and competitiveness by improving cash flow, lowering storage costs, and mitigating the risks associated with storing excess stock.

1.4.7 Unnecessary motion

Liker (2020) says that any unnecessary movements workers make while doing work, like searching for, moving toward, reaching for, or stacking tools, parts, etc. This type of waste can contribute to inefficiencies and result in the squandering of time and resources.

Womack and Jones (2010) explains that unnecessary motion in services and other industries can stem from various causes. Poor layout, marked by inefficient workspace design, may necessitate excessive walking, reaching, or bending to access tools, materials, or information. Unorganized workstations contribute to wasted time as employees search for items in cluttered or poorly organized areas. Inadequate training on efficient work methods and ergonomics results in

unnecessary movements. The use of improper tools or equipment for tasks can require awkward postures or movements. Redundant procedures, stemming from unclear processes or communication gaps, lead to unnecessary steps or checks. There is also a risk of decreased safety, as awkward movements or reaching can increase the likelihood of accidents or injuries. Lower quality may follow, as fatigue or rushed movements can lead to errors and rework, impacting the quality of services or products. Businesses can improve process efficiency, cut expenses related to lost time and resources, and give their workers a more comfortable and productive work environment by avoiding needless motion.

1.4.8 Defect

Liker (2020) explains that Defects refer to errors, rework, or imperfections in products or services that do not meet the required quality standards. Creation of flaws and their fixing.

Mann (2005) says that Defects, in the context of any product, service, or process that doesn't meet its intended specifications or customer expectations, can have significant consequences for various industries. Inadequate training, resulting in a lack of proper skills among employees, contributes to errors in production, service delivery, or information processing. Unclear processes, whether ambiguous or poorly defined, cause confusion and inconsistency, leading to errors and defects. Faulty equipment, improperly maintained or malfunctioning, can contribute to product defects. The impacts of defects are 4profound, encompassing increased costs due to rework, scrap, warranty claims, and customer service expenses associated with resolving defect issues. Reduced productivity results from the time wasted fixing defects instead of producing good quality products or services. Defects lead to decreased customer satisfaction, influencing brand reputation and loyalty negatively. Time, labour, and handling are wasted on repair or rework, scrap, replacement manufacture, and inspection. Businesses can increase their overall competitiveness in the market, decrease production costs, and improve customer happiness by eliminating faults.

1.5 Lean Principles

Mann (2014) says that lean principles boil down to this: Identify and eliminate waste (overproduction, waiting, etc.) to deliver true customer value through continuous improvement. This involves creating smooth flow, responding to pull (actual demand), and following a culture of respect for people who standardize work, use visual tools like Kanban, and embrace incremental Kaizen changes.

1.5.1 Value

Rother and Shook (2003)explains that in adopting lean management principles, organization focuses on identifying and prioritizing customer value, streamlining processes through techniques like value stream mapping and flow optimization, aligning service delivery with actual demand using pull systems, establishing standardized work procedures for consistency, organizing workspaces through the 5S methodology, utilizing Kanban systems for workload management, following a culture of continuous improvement and respect for people, and tracking key performance indicators to measure progress. These principles collectively aim to enhance service quality, reduce waste, and ensure customer satisfaction through efficient and responsive practices.

Additionally, observe customer behaviour during interactions to identify pain points and areas of satisfaction. Utilize customer metrics such as satisfaction levels, churn rates, and complaints to systematically analyse data, revealing opportunities for enhancing value delivery and addressing any identified concerns. (Rother and Levine, 2015).

1.5.2 Value Stream

Rother and Shook (2003) states that a value stream is a journey, which begins with the customer's request or need as the starting point and concludes with the delivery of the desired service or product at its destination. The path encompasses every

step and activity involved in meeting that need. This journey is crucial for several reasons: it allows the identification and elimination of waste by scrutinizing each step's direct contribution to customer value, facilitates the visualization of the entire flow to pinpoint bottlenecks and delays, and guides efforts by prioritizing critical steps for enhanced customer satisfaction.

Value Stream Mapping involves clearly defining the customer and their needs, detailing every step in fulfilling the customer's request, categorizing activities as value-adding or non-value-adding, mapping information and material flows, and incorporating metrics to measure performance in terms of time, cost, and quality at each stage. The benefits of this comprehensive approach include increased efficiency through waste elimination and streamlined processes, resulting in faster delivery and reduced costs. Furthermore, a focus on delivering true value enhances customer satisfaction, following loyalty. (Rother and Levine, 2015)

1.5.3 Flow

Liker and Meier (2005) says that Flow optimization in Lean Management is akin to ensuring a smooth and efficient journey toward delivering a product or service. This involves minimizing lead time to enhance customer satisfaction and responsiveness, identifying and eliminating bottlenecks that impede the flow of work, and strategically reducing work in progress (WIP) to improve resource utilization and overall efficiency. Transparency in workflow is like having a clear picture of how things move from start to finish.

This openness encourages teamwork and makes solving problems easier. For companies aiming to be excellent at delivering what customers want while staying efficient, focusing on this transparent view and optimizing the flow of work is crucial. It's about making sure everything runs smoothly for both the team and the customer. (Liker and Meier 2005).

1.5.4 Pull

Liker and Meier (2005) says that the realm of Lean manufacturing, the core principle of pull systems is succinctly captured by the mantra of "no pushing production." This means refraining from producing items in advance based on speculative forecasts. Instead, the focus is on awaiting a clear "pull" signal, a direct response to genuine customer demand or the requirements of downstream processes needing specific parts. This strategic approach ensures a more efficient, demand-driven production process, minimizing waste and enhancing overall responsiveness to customer needs.

The benefits of implementing a pull system in manufacturing are far-reaching. By eliminating overproduction, waiting times, and unnecessary transportation associated with surplus inventory, pull systems contribute to a significant reduction in waste. This approach also enhances efficiency as resources are deployed precisely when required, resulting in lower costs and shorter lead times. Moreover, the emphasis on quality improvement becomes pronounced, as the reduced urgency in production allows for a dedicated focus on defect prevention, leading to a higher overall quality of output. (Liker and Meier 2005)

1.5.5 Perfection

Liker and Meier (2012) says that rather than an unattainable absolute, perfection in Lean is an ongoing journey marked by continuous improvement, incremental enhancements through Kaizen, and a deep-seated respect for people. The focus is on following a culture of learning and adaptation, empowering employees to contribute to the identification and resolution of issues. Lean's pursuit of perfection translates into tangible actions, such as eliminating waste, standardizing work processes, optimizing flow for timely value delivery, and incorporating measurement and feedback loops for ongoing improvement based on data and feedback.

The principle of respect for people is a cornerstone, emphasizing the empowerment of employees to identify and address issues, cultivating a culture that prioritizes learning, adaptability, and the collective pursuit of excellence. (Liker and Meier 2012)

1.6 Economic benefits by applying lean tools in an organization

Mann (2014) says that implementing Lean management tools offers numerous economic benefits for organizations. By leveraging lean tool businesses can cut costs significantly. Through the elimination of non-value-adding activities, such as excess inventory, Lean contributes to savings in materials, labour, and overhead. On the revenue side, Lean practices result in faster lead times, enhancing customer satisfaction and potentially allowing for higher prices or increased sales. Improved product and service quality, achieved through defect reduction tools like Poka-Yoke, can lead to premium pricing or reduced warranty costs. Additionally, the efficiency gains from waste elimination and resource optimization can increase capacity, enabling organizations to serve more customers or produce more products, ultimately generating additional revenue.

1.6.1 Cost reduction

Liker (2014) says that implementing Lean management tools provides organizations with significant economic benefits. Through tools like value stream mapping and 5S, businesses can achieve cost reduction by eliminating non-value-adding activities, leading to savings in materials, labour, and overhead. Kanban systems optimize inventory, reducing holding costs and freeing up capital. Standardized work and flow optimization ensure efficient resource utilization, minimizing downtime. On the revenue side, Lean practices result in faster lead times, enhancing customer.

1.6.2 Improved efficiency

Liker and Meier (2012) explains that this not only improves customer satisfaction through faster product or service delivery but also enables faster production cycles. The elimination of non-value-adding activities and the optimization of flow lead to improved productivity, allowing resources to be used more effectively and increasing output per unit of input. The emphasis on standardized work and clear procedures enhances resource utilization, minimizing variability and downtime, ultimately translating to improved capacity and reduced idle time. These efficiency gains contribute to lower operating costs, impacting areas such as materials, labour,

and overhead. Moreover, Lean practices foster increased flexibility, creating more adaptable systems that enable organizations to respond swiftly to changes in demand or market conditions. This flexibility enhances customer responsiveness and provides a competitive advantage in dynamic business environments.

1.6.3 Improved quality

Mann (2014) says that implementing Lean tools such as Poka-Yoke (mistake-proofing) and standardized work delivers a cascade of benefits, notably in the realm of defect reduction. By preventing errors at their source, these tools minimize scrap, rework, and warranty claims, directly cutting costs linked to defects. The impact ripples into improved customer satisfaction as higher quality products or services elevate the overall customer experience, potentially following repeat business and positive word-of-mouth. Consistent quality also burnishes the brand's reputation, attracting new customers and potentially allowing for premium pricing.

Maintaining consistent quality not only enhances the brand's image, making it more appealing to new customers, but it can also create opportunities for charging premium prices. Moreover, by reducing problems related to defects, operations run more smoothly, minimizing disruptions and downtime. This efficiency boost enhances overall operational capacity. Furthermore, the lower occurrence of defects means fewer warranty claims, saving the organization money and contributing to increased profitability. (Rothe and Emiliani, 2010)

1.6.4 Optimized resource utilization

Liker and Meier (2005) states that efficient inventory management with Kanban systems helps minimize holding costs and reallocates capital for other purposes. Standardized work and Kanban ensure resources are allocated according to actual demand, preventing idle time and enhancing resource utilization. Quality tools like Poka-Yoke reduce defective outputs, minimizing the need for rework and the associated resource expenditure. Simultaneously, Lean practices lead to increased productivity by streamlining processes, optimizing flow for faster delivery, and improving overall resource availability and capacity.

The reductions in costs, achieved through eliminating waste and optimizing productivity, contribute to enhanced profit margins. Furthermore, the efficient utilization of resources allows organizations to offer competitive advantages such as lower prices, faster delivery, or higher quality. This strategic positioning strengthens competitiveness in the market, leading to sustained profitability and long-term success. (Liker and Meier 2005)

1.6.5 Flexibility and adaptability

Liker and Meier (2005) says that the adoption of Lean practices provides organizations with a competitive edge through faster response to market changes. Tools such as Kanban and standardized work facilitate agility, enabling quick reactions to demand fluctuations and new market opportunities. This responsiveness not only leads to increased sales and market share but also reduces the risk of unexpected events, as Lean practices prepare organizations for potential disruptions through scenario planning and cross-training. Additionally, the flexibility inherent in Lean fosters innovation by encouraging experimentation and learning, potentially resulting in the development of new products, services, or processes that drive revenue growth. Moreover, the emphasis on customer satisfaction is heightened, as Lean tools like Gemba walks and voice of the customer (VOC) enable organizations to understand and respond to customer feedback. The overall impact is a reduction in costs, as flexibility allows organizations to adjust production schedules, resource allocation, and inventory levels based on demand, minimizing waste and associated costs.

1.6.6 Cost of poor quality (COPQ)

Liker and Meier (2005) says that the streamlining of processes and waste elimination also results in improved yield, generating higher quality outputs and reducing waste-related costs. Furthermore, the enhanced quality processes in Lean minimize the need for extensive inspections, subsequently lowering inspection costs. Indirectly, the positive impact of Lean practices extends to enhanced

customer satisfaction, driven by reduced defects and higher quality, potentially decreasing customer service costs and churn. The improved work environment resulting from fewer quality issues contributes to enhanced employee morale, potentially reducing absenteeism and turnover. Additionally, the consistent quality achieved through Lean practices strengthens brand reputation, following trust and allowing for premium pricing, ultimately attracting new customers. This reduction in waste not only enhances the overall quality of the final product but also reduces associated costs related to waste materials and resources.

1.7 Lean tools implementation techniques

Liker and Meier (2005) says that to successfully implement Lean principles, organizations should prioritize customer value, initiate Lean practices on a small scale before expanding, and actively engage employees in the improvement process. Standardizing work procedures ensures consistency, while creating efficient flow and visualizing processes through tools like Value Stream Mapping contribute to waste reduction. Pull production systems, such as Kanban, help minimize inventory and enhance responsiveness. Cultivating a culture of continuous improvement, supported by leadership commitment, fosters innovation through events like Kaizen and Gemba walks. Regularly measuring key performance indicators is crucial to tracking progress and showcasing the positive impact of Lean initiatives on metrics such as lead time, quality, and cost.

1.7.1 Leadership commitment

Rother and Shook (2003) says that leadership commitment in Lean implementation is essential for success. This involves gaining full support from top leadership, ensuring that they understand and endorse Lean principles. With committed leaders, the organization can effectively drive transformative change, following a culture of continuous improvement and waste elimination. Implementing Lean tools

involves key techniques and leadership actions. Value Stream Mapping (VSM) is a visual depiction of current processes led by leaders in workshops, ensuring alignment with the lean vision. Standardized Work requires defining clear procedures, with leadership supporting development and training. Kanban Systems, focusing on pull production, need leaders to ensure understanding and employee involvement. Kaizen Events, for focused improvement, benefit from active leadership participation. Regular Gemba Walks, where leaders observe processes, receive feedback, and foster problem-solving, contribute to a holistic Lean implementation.

1.7.2 Training and education

Rother and Shook (2003) stated that effective Lean training is characterized by hands-on learning, emphasizing practical exercises, simulations, and real-world applications of Lean tools. It should adopt a multi-level approach, tailoring training to different employee levels, offering basic awareness for all and more in-depth training for leaders and change agents. Continuous training is essential, integrating Lean principles into ongoing development programs to reinforce learning and adapt to evolving needs. A cascading approach involves training leaders first, who then disseminate knowledge and skills to their teams.

1.7.3 Pilot projects

Liker and Meier (2005) says that pilot projects offer invaluable benefits in the Lean implementation journey. They provide a controlled environment for testing Lean tools and concepts, allowing organizations to assess their effectiveness before wider adoption. Successful pilot projects play a crucial role in building momentum by creating positive experiences, instilling confidence, and generating buy-in for broader rollout across the organization. Additionally, these projects serve as a platform for identifying and addressing potential challenges, refining approaches, and avoiding costly mistakes in larger implementations.

1.7.4 Gemba walks

Liker and Meier (2012) defines that Gemba is a Japanese word meaning "the actual place." Gemba walks involve leaders and managers directly observing work processes on the "shop floor" or workplace. In the Gemba walk process, meticulous planning is crucial, involving the definition of the specific area or process to be observed, clear objective setting, and the inclusion of relevant team members. During observation, effective communication is key-employ open-ended questions, active listening, and refrain from criticism or interruptions to foster a constructive atmosphere. Data collection should be thorough, encompassing detailed observations, documentation of identified waste, and the use of visual aids such as pictures or videos. Subsequent to the observation phase, engaging in discussions with employees is paramount, facilitating brainstorming sessions for potential solutions, and collaboratively prioritizing improvement actions.

1.7.5 Key performance indicators (KPI)

Liker and Meier (2012) says that linking Key Performance Indicators (KPIs) to Lean goals is crucial for successful implementation, ensuring that chosen KPIs directly align with specific Lean objectives and waste reduction initiatives. To avoid information overload, it is essential to focus on a select few, meaningful measures that have a high impact on overall performance. Tracking trends over time and analysing data helps identify root causes for any deviations in performance, enabling the adaptation of improvement strategies as needed. Visualization and communication of KPIs and progress through charts, graphs, and Gemba boards enhance clarity and understanding. Furthermore, engaging employees in the selection, tracking, and interpretation of KPIs implements a sense of ownership and accountability, promoting a collaborative approach to achieving Lean goals.

2 Characteristics of the selected company

In this section the basic characteristics and information of the company will be provided. Café Coffee Day (further CCD). With its humble beginnings, CCD has evolved into more than just a coffee chain, it's a community hub, known for its innovation, diverse offerings, and impactful initiatives. From its Cafés to its international expansion, CCD's legacy is defined by its commitment to quality, creativity, and customer satisfaction. (Joshi and Bansal, 2011)

2.1 Basic information about Café Coffee Day

CCD is an Indian coffeehouse chain that has become synonymous with the Café culture in India. Founded in 1996 by V. G. Siddhartha in Bangalore, CCD has rapidly grown to become one of the largest and most recognizable coffee chains in the country. With a primary focus on coffee, CCD offers a diverse range of coffee-based beverages, including classics like espresso, cappuccino, and latte, as well as flavoured options to cater to various tastes. Beyond coffee, CCD's menu also features a selection of snacks, sandwiches, pastries, and desserts, providing customers with a complete Café experience. Known for its casual and relaxed atmosphere, CCD outlets serve as popular destinations for socializing, studying, or simply enjoying a cup of coffee.

CCD, a part of Coffee Day Global Limited, is India's favourite hangout for coffee and conversations. The coffees are sourced from thousands of small coffee planters. The first Café was opened in 1996 at Brigade Road in Bangalore – the youth and the young at heart immediately took to the Café, and it continues to be one of the most happening places in the city. CCD to the youth is a "hangout" spot where they meet people, make conversations, and have a whole lot of fun over steaming cups of great coffee. It's been an exciting journey since then to becoming the largest organised retail Café chain in the country. (Joshi and Bansal, 2011) Figure 2 shows the main branch of Café Coffee day located in Bengaluru, India.

Figure 2: Main branch of CCD, Bengaluru

Source (The economic times, 2020)

2.2 History of the company

The history of CCD traces back to 1996 when it was founded by V. G. Siddhartha, an Indian entrepreneur, in Bangalore, Karnataka, India. The establishment of CCD marked the beginning of a new era in India's coffee culture and the Café industry. The history of CCD is a tale of entrepreneurial vision and the transformation of India's coffee culture. Founded in 1996 by V. G. Siddhartha, a visionary Indian entrepreneur, CCD emerged as a pioneering force in Bangalore, Karnataka, India. At the time of its inception, the Indian Café scene was vastly different, with traditional tea stalls dominating the landscape. However, Siddhartha recognized an untapped market and a growing appetite for a modern coffee experience inspired by Western Café culture. With the opening of the first CCD outlet on Brigade Road in Bangalore,

Siddhartha introduced Indians to a novel concept – a vibrant, contemporary Café where patrons could deliver freshly brewed coffee in a relaxed environment. The success of the inaugural outlet laid the foundation for CCD's expansion across the country. Driven by a commitment to quality, innovation, and customer satisfaction, CCD embarked on a rapid expansion spree, opening outlets in major cities and towns across India. Each CCD outlet was meticulously designed to offer a welcoming ambiance, complete with comfortable seating, soothing music, and aesthetically pleasing decor, creating an inviting haven for coffee enthusiasts and casual visitors alike. (Tripathy, 2019)

2.2.1 Diversification of offerings

The diversification of CCD's menu was meticulously planned to encompass a wide array of beverages, snacks, and light meals, each crafted with the same dedication to quality and innovation that defined its coffee offerings. Recognizing that customers sought variety and convenience, CCD introduced an extensive selection of beverages to complement its coffee offerings. The expansion beyond coffee underscored CCD's commitment to creating inclusive and welcoming spaces where patrons could gather, socialize, and indulge in culinary delights. (Tripathy, 2019)

2.2.2 International expansion

CCD, having established itself as a dominant force in India's coffee culture, embarked on a bold journey of international expansion to extend its footprint beyond national borders. This strategic move marked a significant milestone in CCD's growth trajectory and underscored its ambition to become a formidable player in the global Café industry. Expanding into international markets was a natural progression for CCD, given the increasing global demand for coffee and the growing popularity of Café culture worldwide. By leveraging its expertise, brand recognition, and proven business model honed in the competitive Indian market, CCD set its sights on capturing the hearts and palates of coffee enthusiasts across the globe. (Tripathy, 2019)

Figure 3: CCD outlet in Austria

Source (Studios apart, 2014)

2.3 Organizational structure at CCD

CCD operates with a hierarchical organizational structure that facilitates efficient management and coordination across its outlets. At the apex of the hierarchy are the Chairman and Board of Directors, responsible for setting the company's strategic direction and ensuring alignment with its overarching goals and objectives. Directly below them, Executive Management comprises key leaders such as the CEO, COO, CFO, CMO, and CHRO, who oversee various aspects of CCD's operations, including finance, marketing, human resources, and overall business performance.

Regional Managers form the next tier of the hierarchy, overseeing a group of Café Managers responsible for the day-to-day operations of individual outlets within their assigned regions. These Café Managers play a pivotal role in maintaining CCD's standards and ensuring the delivery of exceptional customer experiences. They are

tasked with overseeing staffing, inventory management, customer service, and financial performance, reporting directly to the Regional Managers. Figure 4 shows you the detailed view of the hierarchical structure of CCD.

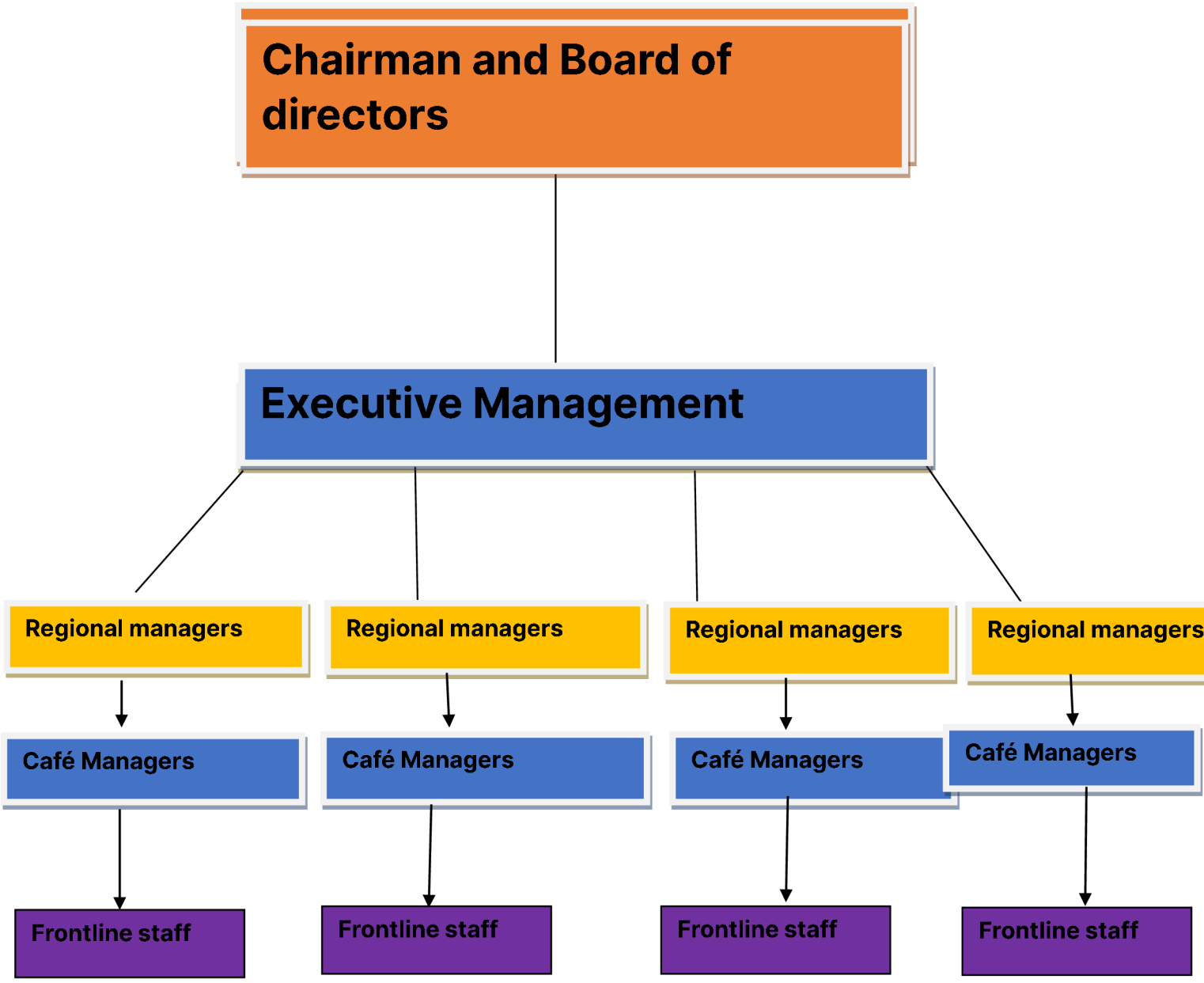

Figure 4: Hierarchical structure of the company

Source (Own processing)

2.4 Product mix

CCD prides itself on its diverse menu, carefully curated to cater to the varying tastes and preferences of its customers. Providing a wide range of beverages, CCD offers classic coffee options such as espresso, cappuccino, and latte, alongside specialty choices like mocha and macchiato. Their tea selection includes an assortment of black, green, and herbal varieties, ensuring there's something for every tea enthusiast. CCD serves up hot chocolate in classic and variant options like dark and white chocolate. When it comes to cold beverages, customers can choose from a refreshing iced coffee, iced tea, frappes, smoothies, cold brew coffee, milkshakes, and carbonated drinks.

3 Current Condition of the company

CCD has 1700 branches all over India, in this topic only one branch is selected which is CCD Chennai, Tamil Nadu which is located inside the Indian institute of technology (IIT) university campus. The 70% of the customers are here are students who are from all over India. This branch is not aware of the lean tools and its methodology. The 90% of the employees are below 25 who are students. So, there is no stable employee in the company, they are in and out. The employees and the management do not think from the lean perspective, and there is also no proper education and training to the employees about the workplace and the procedures, due this there is a lot of chaos in the kitchen and confusion among the employees.

3.1 Description of the branch and its location

As previously explained CCD, Chennai, IIT madras is located inside the university campus, its potential customers are students. This branch consists of seven employees totally, one housekeeping, one manager and five kitchen staff. This particular branch is open for 24 hours as it is located in the hub of the city, and also partnered with food delivery companies like swiggy and Zomato. The employees work on rotational shift basis with one day off. Basically, this a quick selling restaurant (QSR), these are restaurants characterized by fast food cuisine and quick table turnover. They typically offer a limited menu, fast food preparation, and minimal table service. Examples include popular chains like McDonald's, Subway, and KFC. QSRs are known for their efficiency in serving customers quickly, often through drive-thru windows, catering to busy individuals seeking a convenient dining experience. The Indian institute of technology is a very large university, which covers a large area of approximately 2.5 square kilometres (about 620 acres). It is one of the largest IIT campuses in terms of land area and is known for its expansive and green campus environment. Figure 6 shows you the geographical location of the branch which explains how big is the campus and it shows where the branch is located inside the campus.

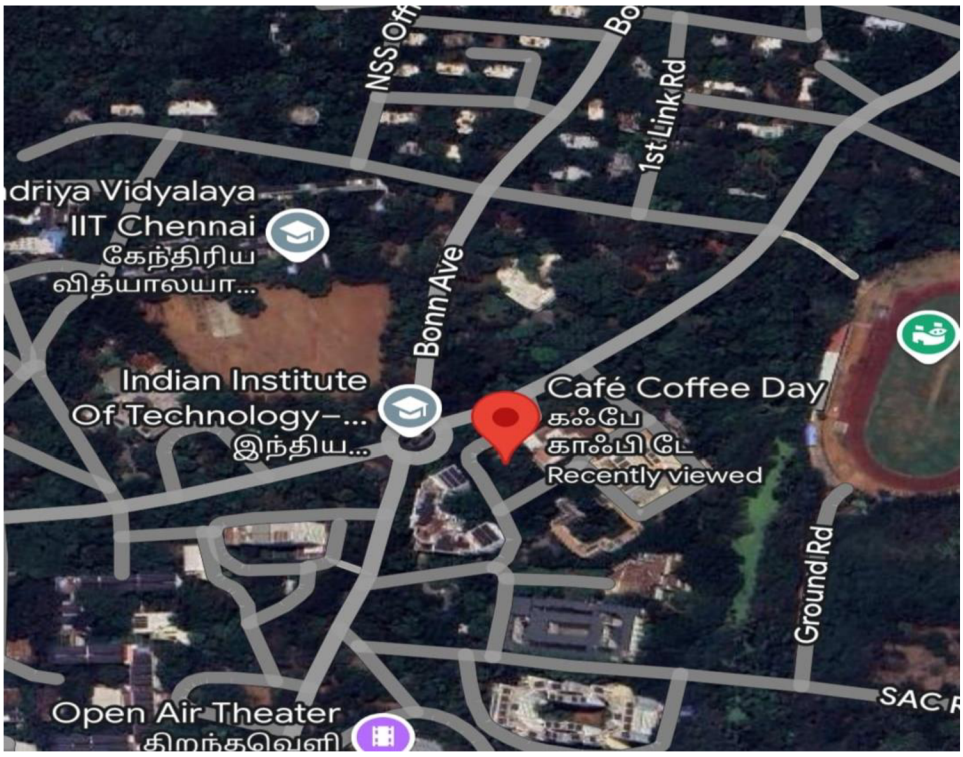

Figure 5: Geographical location of the branch.

Source (Google maps, 2024)

Situated within the bustling campus of one of India's premier institutes, this CCD outlet serves as a popular destination for socializing, studying, and unwinding. With its modern décor, comfortable seating, and friendly ambiance, the Café provides a welcoming atmosphere conducive to both work and leisure. Whether grabbing a quick coffee between classes or settling in for a study session, patrons can expect prompt service, quality beverages, and a diverse menu featuring an array of hot and cold drinks, sandwiches, and quick bites. Additionally, the café's strategic location within the IIT Madras campus makes it a convenient spot for students and staff to recharge and connect amidst their academic pursuits.

3.2 Description of the kitchen in CCD

The kitchen at CCD is an essential operational area where various food and beverage items are prepared and served to customers. Situated within the Café premises, the kitchen serves as the central hub for food preparation, cooking, and

storage. Unlike traditional restaurant kitchens, the CCD kitchen typically has limited space and resources due to the compact nature of Café layouts. Within the CCD kitchen, different stations are designated for specific tasks, such as beverage preparation, food assembly, and plating. The layout of the kitchen is optimized to facilitate smooth workflow and efficient operations, with careful consideration given to the placement of equipment, appliances, and storage areas.

At one end of the kitchen, near the entrance, is the beverage preparation station, where coffee machines, espresso makers, oven toaster grill and other beverage equipment are located. Adjacent to this station is the food assembly area, where sandwiches, pastries, and other food items are prepared and plated for serving.

In the centre of the kitchen, there are workstations for food preparation, including cutting, chopping, and cooking areas. These stations are equipped with essential kitchen tools and utensils, such as knives, cutting boards, and cookware, to facilitate the cooking process.

Storage areas for ingredients, supplies, and equipment are strategically positioned throughout the kitchen to ensure easy access and efficient inventory management. Shelving units, cabinets, and refrigerators are used to store perishable and non-perishable items, while racks and hooks are utilized to hang utensils and kitchen tools for quick retrieval.

Despite efforts to maintain organization and cleanliness, the CCD kitchen may experience challenges related to clutter, inefficient storage, and workspace congestion. These issues can impact productivity, increase the risk of accidents, and compromise food safety standards.

Upon initial observation, several deficiencies were noted in the CCD kitchen, including items located in hard-to-reach places, disorganized storage cabinets, and potential safety hazards. To address these issues and improve overall efficiency, the implementation of the 5S methodology is recommended, focusing on sorting, setting in order, shining, standardizing, and sustaining practices within the kitchen environment.

4 Proposal for implementing 5s in CCD

This section details the implementation of the 5S method in CCD. Unlike traditional approaches where a dedicated team oversees such initiatives, the entrusted this task solely to the thesis.

4.1 Description of the problem

At CCD branch located in IIT Madras, the busy atmosphere of students and staff during break times highlights a critical issue: disorganization and chaos among the staff. This leads to delays in serving customers promptly, as highlighted by the SOP of delivering coffee within 8-10 minutes. Consequently, customers often find themselves waiting longer than expected, resulting in frustration and an increase in order cancellations. Moreover, the chaotic environment in the kitchen exacerbates the problem, leading to misplaced ingredients, cluttered workspaces, and inefficiencies in preparing orders. As a result, the branch experiences a significant amount of food wastage, impacting both customer satisfaction and the company's profitability.

The food which is cancelled by the customer cannot be served to the next customer or it cannot be preserved in the kitchen for the kitchen staffs rather CCD follows a method called dump box. Dump box is where the wasted, cancelled or orders that did not meet the quality will be thrown. Every dumped order should be programmed into the computer, it should be taken into account from the inventory perspective, for example if a coffee is thrown into the dump, in the computer it should be programmed as how many litres of milk has been wasted, how many grams of sugar etc. Figure 7 shows you the dump used in CCD.

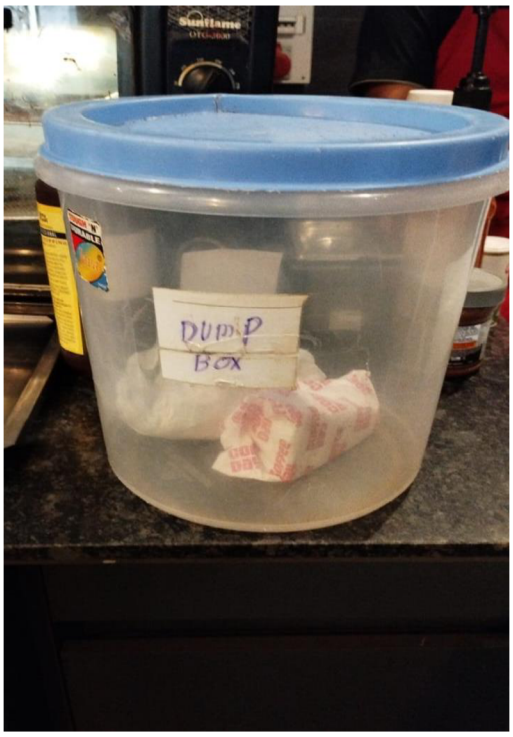

Figure 6: Dump box

Source (Own source)

The inventory stock and dump stock should always match. Usually in cafes or restaurants there can be 5% of dump stock in day. Unfortunately, in this café the dump stock exceeds more than 10%dump stock, which is a major drawback and a concern for a business facing loss financially.

4.2 5S Method in Café Coffee Day (CCD)

Recognizing the significance of organizational efficiency, CCD's management is keenly aware of the need for improvement. As the company has not previously utilized lean tools, this initiative marks a significant shift, aiming to introduce the 5S method to create a clean, organized work environment. Through this approach, we anticipate improvements in safety, productivity, and overall work quality.

Upon analysis, it became evident that employees often face challenges locating work tools during working hours. Additionally, there is a tendency to overlook unnecessary items cluttering the workspace, leading to inefficiencies. To address

these issues, strategic plans have been devised, with a focus on reducing operational costs through the implementation of lean manufacturing principles, starting with the 5S analysis.

To begin the 5S implementation, two departments were considered. While the first department, involved in food preparation, was initially under review, closer examination revealed that it wasn't the ideal candidate. Attention then shifted to the kitchen department, where visible inefficiencies and opportunities for streamlining were identified, prompting immediate action.

After consultation with the management, it was determined that the kitchen urgently requires the 5S method and SMED analysis, particularly for optimizing workflow during peak hours. Key areas of focus include:

Organization and adherence to work processes in the kitchen.

- Maintaining cleanliness and tidiness in the work area.
- Regular maintenance and cleaning of equipment.
- Ensuring clear pathways and removing unnecessary or damaged items.
- Ensuring accessibility of essential work equipment for employees during the work process.
- Proper storage of tools to ensure ease of access and tidiness.

CCD's objectives for implementing the 5S method include achieving financial savings, efficient use of working time, improving health and safety standards, and creating a cleaner and more conducive working environment for employees. Through these efforts, we aim to drive sustainable improvements and foster a culture of continuous improvement within the organization.

4.3 Current Status of Café Coffee Day Kitchen Before the Introduction of the 5S Method

To assess the current state of the CCD kitchen, there was a close look in the daily operations. The observation commenced during the morning shift on a typical weekday, starting at 6:00 a.m. and concluding at 12:00 a.m. A mandatory 30-minutes break is scheduled for each employee, during which cleaning activities,

such as mopping the floor, emptying trash bins, and restroom sanitation, are performed by designated staff. Following the break, production resumes.

On the day of observation, five employees were present, with one operating the coffee machine and four rotating duties at the prep and serving stations. Additionally, periodic quality checks were conducted by a supervisor, ensuring adherence to standards and safety protocols. Notably, the kitchen displays several notable advantages:

Advantages:

- Safety Measures: All electrical outlets and devices are properly labelled for safety, and drinking bottle holders are conveniently placed under workstations.

- Hydration Options: Employees have access to a vending machine offering chilled beverages for hydration.

- Staff Coordination: Employees demonstrate effective teamwork and coordination, rotating tasks regularly to prevent fatigue.

- Hygiene Standards: Handwashing protocols are clearly displayed, emphasizing proper hygiene practices.

While these advantages are commendable, there are evident areas for improvement. Table 1 below outlines key questions guiding the assessment, categorized as "YES," "PARTLY," or "NO" responses, indicating the presence or absence of specific issues in the kitchen environment. These questions serve as a framework for identifying deficiencies and areas requiring attention in preparation for implementing the 5S method.

Tab. 1: Assessment of CCD Kitchen

Questions for kitchen staffs	Responses
Are workstations organized and clutter-free?	Partly
Is there a designated storage system for ingredients and utensils?	No
Are cleaning supplies readily accessible?	Partly
Is there a system for waste disposal?	Yes
Are safety hazards identified and addressed?	Yes
Is equipment regularly maintained and serviced?	Partly
Are staff trained in proper hygiene practices?	Yes
Is there a system for continuous improvement?	No
Are work processes standardized and documented?	No

Source: (Own processing)

Through this assessment, it becomes evident that while certain aspects of the CCD kitchen demonstrate adherence to safety and hygiene standards, there exist notable deficiencies in organization, storage, and documentation of processes. These findings underscore the importance of implementing the 5S method to address these shortcomings and optimize kitchen operations for enhanced efficiency and quality.

Based on an extensive review of the operational processes, it has become evident that the current practices are fraught with inefficiencies and organizational challenges, significantly impacting the productivity and workflow. One notable area of concern pertains to the cleaning procedures. While a standard two-hour cleaning window is allocated, there appears to be a lack of structured protocols, particularly in areas such as cupboards, where essential items are often haphazardly stored, leading to clutter and hindering easy access during critical production phases. This disorganization not only results in time wastage but also compromises the overall cleanliness and safety standards within the facility.

The issue of disorganized storage within the establishment presents a significant impediment to the operational efficiency and customer service standards. Coffee beans, sugar packets, and utensils, vital components of the service, are currently stored in a haphazard manner, scattered across countertops, shelves, and drawers. This lack of systematic organization leads to inefficiencies and delays in fulfilling customer orders, particularly during peak hours of business. Without a clear and structured storage system in place, staff members are often left scrambling to locate essential ingredients and tools amidst the clutter, resulting in precious time being wasted and customer wait times being prolonged. Moreover, the disarray in storage not only affects the ability to deliver orders promptly but also reflects poorly on the overall professionalism and image of café's establishment. To address this pressing issue, to implement a comprehensive organizational strategy for the storage areas. This may involve categorizing items, such as coffee beans, sugar packets, and utensils, and assigning designated storage spaces for each category. Additionally, clear labelling and signage can further facilitate easy identification and retrieval of items, streamlining the workflow and enhancing the ability to deliver prompt and efficient service to the valued customers. Figure 8 shows you the coffee used in CCD.

Figure 7: Coffee machine

Source (Own source)

The presence of cluttered workspaces within the establishment poses significant challenges to the operations and compromises both workflow efficiency and food safety standards. Countertops and prep tables, essential areas for food preparation, are often littered with miscellaneous items such as empty containers, used napkins, and spilled ingredients. This disorganization creates several issues. Firstly, it hampers workflow by limiting the available space for food preparation and assembly, leading to bottlenecks and delays in fulfilling customer orders. Staff members may struggle to find adequate workspace amidst the clutter, resulting in inefficiencies and longer wait times for customers.

Moreover, the accumulation of spilled ingredients on countertops and prep tables poses hygiene concerns, spoiling the commitment to maintaining high food safety standards. The presence of foreign objects and food remnants increases the risk of cross-contamination and bacterial growth, potentially leading to illnesses and health violations. To address this pressing issue, should prioritize regular cleaning and decluttering of the workspaces. Implementing clear protocols for maintaining

cleanliness and organization, such as assigning specific staff members to regularly monitor and clean work areas, can help to rectify these challenges. Additionally, providing adequate storage solutions and waste disposal systems can prevent the buildup of clutter and promote a hygienic working environment conducive to efficient and safe food preparation. Figure 9 shows you the disorganized utensils in CCD.

Figure 8: Disorganized utensils

Source (Own source)

Cleaning practices within the establishment are fundamental for maintaining a sanitary environment, yet there are areas where efforts are inconsistent or neglected, raising concerns about cleanliness and hygiene standards. Documented cleaning routines outline the tasks to be performed, including sweeping, mopping, disinfecting surfaces, and organizing storage areas. However, despite these guidelines, certain areas, such as cupboards and work surfaces, are often neglected. Cupboards, in particular, serve as storage spaces for various items but

are frequently overlooked during cleaning sessions. As a result, they accumulate dust, spills, and debris, posing hygiene risks and potentially contaminating stored items.

Furthermore, inconsistencies in cleaning efforts across shifts exacerbate the problem. While some shifts adhere strictly to cleaning protocols, others may underestimate the importance of thorough cleaning, leading to disparities in cleanliness standards throughout the day. This inconsistency not only affects the overall appearance of the establishment but also compromises food safety and customer satisfaction.

Effective tool management is crucial for streamlining operations and ensuring efficiency in the production process. However, within the establishment, there are notable shortcomings in tool management practices that hinder productivity and contribute to frustration among the staff. Essential tools, including spatulas and cleaning aids, are not readily accessible to staff when needed. Instead of being stored in designated locations for easy retrieval, these tools are often misplaced or scattered throughout the workspace. As a result, staff members waste valuable time searching for the necessary tools, causing delays in food preparation and increasing overall wait times for customers. Furthermore, there is a lack of accountability regarding tool usage and maintenance. Tools are frequently borrowed by staff members but not returned to their rightful place, leading to further disorganization and exacerbating the problem of misplaced items. Without proper tracking or accountability measures in place, it becomes challenging to identify responsible individuals or enforce adherence to established protocols.

This lack of organization and accountability not only impacts operational efficiency but also contributes to frustration and dissatisfaction among the team. Staff members may feel overwhelmed by the constant need to search for tools or deal with the consequences of misplaced items, leading to decreased morale and productivity. As you can see below figure 10 shows you the misplaced blender, this creates confusion to the employees by searching for it.

Figure 9: Misplaced blender

Source (Own source)

Excessive waste of raw materials poses a significant challenge within the production process, leading to both economic losses and environmental concerns. At the heart of this issue are inefficient practices and mishandling during various stages of production. One prominent example is the wastage of dough and flour, essential ingredients in the production of the goods. Spills and mishandling during production contribute to a significant portion of this waste. For instance, workers often stop far from filling hoppers when transporting dough, leading to spillage and loss of material. This inefficiency not only results in immediate material waste but also creates additional cleanup tasks, further consuming resources and time. Moreover, inefficient practices extend beyond the handling of raw materials to encompass broader production processes. For example, inadequate training or supervision may lead to errors during dough processing or filling operations, resulting in avoidable wastage. Additionally, insufficient equipment maintenance or outdated machinery

may exacerbate these issues by increasing the likelihood of product defects or malfunctions, further contributing to waste.

Addressing excessive waste requires a comprehensive approach that addresses both procedural inefficiencies and behavioural factors. Implementing rigorous training programs can enhance employee skills and awareness, reducing errors and minimizing material losses. Regular maintenance and upgrades to equipment and machinery can also improve operational efficiency and reduce the risk of defects or malfunctions. Furthermore, fostering a culture of waste reduction and sustainability within the workplace can encourage employees to take proactive measures to minimize waste generation. This may involve implementing waste tracking systems, setting targets for waste reduction, and incentivizing innovative solutions to minimize material losses.

The presence of unnecessary items within the workspace contributes to clutter and inefficiency, hindering smooth operations and creating an environment prone to disorganization. It is essential to identify and address these items to optimize workspace utilization and enhance overall productivity. One significant issue is the accumulation of redundant items and empty containers throughout the workspace. These items occupy valuable space and serve no functional purpose, contributing to visual clutter and making it challenging to locate essential tools and ingredients. For example, unused containers or packaging materials left strewn across countertops and shelves create unnecessary obstacles for staff, impeding their ability to work efficiently

Additionally, personal belongings left in communal areas further exacerbate the clutter problem. Items such as bags, coats, or personal electronics not only take up space but also detract from the professional appearance of the workspace. Moreover, personal belongings scattered throughout the workspace can pose safety hazards and sanitation concerns, particularly in food preparation areas where cleanliness is paramount.

4.4 Evaluation of the current condition

Prior to the implementation of any improvement methodologies, it is crucial to

assess the existing challenges and inefficiencies within the workspace. Through comprehensive research and interviews with employees, several key issues have been identified that hinder productivity and workplace efficiency.

4.4.1 Divergent Views on Cleaning Practices

There exists a disparity in perspectives regarding cleaning standards among employees and management. With the acknowledgement the importance of uniform cleaning practices to ensure workplace hygiene and organization, it is evident that varying interpretations of cleaning responsibilities lead to inconsistencies in cleanliness levels. This discrepancy not only impacts the overall quality of cleaning but also creates a sense of unfairness among employees.

4.4.2 Disorganization in Equipment Placement

Observations during the research period revealed frequent instances of employees searching for tools and equipment during working hours, indicating a lack of systematic organization in the placement of work aids. The prevalence of the term "search" in employees' daily routines underscores the urgency for a re-evaluation of equipment storage practices to eliminate unnecessary time wastage and streamline workflow processes.

4.4.3 Necessity for Cultural Shift

The successful implementation of the 5S method necessitates a fundamental shift in employee mindset and company culture. It is imperative for employees to recognize the importance of standardized procedures and to take ownership of maintaining a clean and organized workspace. Additionally, fostering a culture of recognition and reward for exemplary performance can incentivize employees to actively participate in improvement initiatives and uphold cleanliness standards.

4.4.4 Rebuilding Company Culture

The research findings also underscore the need for revitalizing the company culture, which may have been compromised under previous management. By instilling a sense of collective responsibility and pride in maintaining a clean and efficient workspace, the company can cultivate a positive work environment conducive to productivity and employee satisfaction.

4.5 Implementation plan

To ensure the sustained implementation of 5S practices, we will first secure support from top management, emphasizing their ongoing commitment to prioritizing these initiatives. A dedicated team comprising representatives from departments will be formed to oversee the sustainability of 5S practices, ensuring accountability and collaboration across the organization. Clear standard operating procedures (SOPs) will be developed, outlining specific tasks, responsibilities, and performance metrics for maintaining 5S standards. Regular training sessions will be conducted for all employees to reinforce 5S principles and educate them on their roles in sustaining these practices. Additionally, a schedule of audits and inspections will be implemented to assess compliance with 5S standards and identify areas for improvement. Continuous feedback mechanisms will be established to solicit input from employees, fostering a culture of engagement and ownership in maintaining 5S standards. Recognition and rewards will be provided to individuals or teams demonstrating exceptional commitment to 5S practices, further incentivizing adherence to these standards. Detailed documentation of 5S activities will be maintained to track progress and facilitate continuous improvement efforts. Finally, 5S principles will be integrated into existing business processes and workflows to ensure alignment with daily operations, thereby embedding a culture of organization and efficiency throughout the organization. Through these concerted efforts, we will establish a solid foundation for sustaining 5S practices and realizing the benefits of improved workplace organization, efficiency, and safety.

4.5.1 Implementation of separation

In the context of implementing the separation phase (Seiri) of the 5S methodology at the CCD branch in IIT Madras, the primary objective is to enhance workspace efficiency by systematically decluttering and organizing storage areas, workspaces, and tools. This phase involves meticulous sorting through the clutter to identify essential items for daily operations while eliminating redundant tools, expired ingredients, and unnecessary items. To initiate this process, we assemble a dedicated team comprising experienced employees who possess an intimate understanding of the workspace intricacies. This team plays a pivotal role in the sorting process, leveraging their firsthand knowledge to make informed decisions about the disposition of each item.

During the initial assessment, conducted with the involvement of both management and frontline employees, we evaluate every corner of the workspace. This assessment helps identify areas with disorganized storage, cluttered workspaces, inefficient cleaning practices, poor tool management, excessive waste, and unnecessary items.

As we progress through the sorting process, the focus extends beyond decluttering to establish a more systematic approach to workspace organization. We prioritize relocating frequently used items to easily accessible areas, while less commonly used tools and materials are stored in designated closets or storage spaces. Like the sugar packets where splattered in different areas in the kitchen, employees where confused all the time that where is the sugar packet placed, it was sorted and placed in the tray where the coffee machine is placed.

Simultaneously, we adhere to responsible waste management practices, ensuring that discarded items are properly disposed of or recycled in accordance with company policies and environmental regulations. Throughout this phase, detailed documentation is maintained to track the progress and record any notable findings or challenges encountered.

To support the successful implementation of the separation phase, we invest in

comprehensive training programs aimed at educating employees on workspace organization principles and the importance of maintaining a clutter-free environment. Interactive workshops and hands-on demonstrations provide practical guidance on proper tool handling, storage techniques, and waste reduction strategies. Educating the employees to remember the standard place where the stock and utensils have been placed, and have been asked to have a standard training for the upcoming employees regarding the knowledge of placing the items in the kitchen.

Furthermore, we establish open channels of communication to get feedback from employees, encouraging them to share their observations, suggestions, and concerns regarding workspace organization. This two-way dialogue fosters a culture of engagement and ownership, ensuring that the 5S efforts are sustained over the long term through continuous collaboration and improvement.

By diligently adhering to the principles of the separation phase and embracing a collaborative approach to workspace organization, we aim to cultivate an environment that provide efficiency, productivity, and employee well-being. Through the collective efforts, we envision a workspace that not only meets the highest standards of cleanliness and organization but also reflects our shared commitment to excellence and continuous improvement. Figure 11 shows you soy milks and sugar sachets which was mixed up and was in an unorganized way. Figure 12 shows you after separating in an organized way.

Figure 10: Unorganized soy milk and sugar sachets

Source (Own source)

Figure 11: Organized soy milk and sugar sachets

Source (Own source)

4.5.2 Implementation of Setting in Order

In addressing the disorganized storage and cluttered workspaces identified in our facility, the implementation of the Setting in Order phase aims to establish a systematic approach to workspace organization, optimize storage systems, and enhance visual management to improve efficiency and productivity. Let's dive deep by step-by-step process.

Optimized Storage Solutions

In designing the layout, my primary focus is to create an environment that promotes seamless workflow and efficiency. I meticulously arrange tools, ingredients, and equipment, considering their frequency of use and proximity to where they're needed. By analysing the dynamics of our daily tasks, I identify the essential items required at each workstation and ensure they're easily accessible. This strategic placement minimizes unnecessary movement, allowing tasks to be completed swiftly and smoothly. Through this approach, I aim to optimize our workspace, empowering to achieve the operational goals with greater ease and effectiveness. Essential cooking utensils such as spatulas, ladles, knives, and tongs were strategically arranged based on their frequency of use and relevance to different cooking tasks. These utensils were placed within easy reach of cooking stations to facilitate seamless meal preparation. Figure 13 shows the blender which was misplaced somewhere else making it hard for the employees search for it when it is needed. Figure 14 shoes the blender placed at the right place making it easy for the employees.

Figure 12: Misplaced blender

Source (Own source)

Figure 13: Blender placed at the right place

Source (Own source)

Standardized storage systems

In implementing standardized storage systems, my objective is to bring uniformity and clarity to the organizational structure. Introducing shelving units, cabinets, and labelled containers establishes a systematic approach to storage that enhances efficiency and accessibility. Coffee beans, sugar packets, and utensils are allocated specific areas marked with clear labels, enabling me and my team to locate and restock items effortlessly. This standardized system not only streamlines our operations but also promotes consistency across the workspace, fostering a more organized and productive environment. Figure 15 shows you the properly placed premix sachets.

Figure 14: Properly arranged premix sachets

Source: (Own source)

Visual management techniques

In embracing visual management techniques, the focus is on enhancing communication and facilitating swift identification of items within the workspace. This approach incorporates various visual cues, including color-coded labels,

signage, and floor markings, to streamline operations and promote efficiency. By employing color-coded labels, each item or category is assigned a distinct colour, making it easy for team members to visually differentiate between them. For instance, coffee beans might be associated with a brown label, while sugar packets could be designated with a white label. This simple yet effective method allows for quick recognition of items, reducing the time spent searching for specific supplies. Additionally, signage is strategically placed throughout the workspace to provide clear instructions and guidelines. Whether indicating the location of certain items or outlining specific procedures, these visual cues serve as constant reminders for staff members, ensuring consistency in workflow and minimizing errors.

Furthermore, floor markings are utilized to delineate designated pathways, work zones, and storage areas. By clearly defining these spaces, employees can navigate the workspace with ease, avoiding congestion and maintaining a safe and organized environment.

Overall, the implementation of visual management techniques enhances operational efficiency by facilitating easy identification of items, reducing confusion, and promoting a more structured and cohesive work environment. Through clear labelling, signage, and floor markings, we aim to optimize productivity and streamline our daily operations.

Documentation and training

Effective documentation and training are integral components of our implementation process, ensuring that progress is tracked methodically and key insights are captured for future reference. Throughout each phase of the implementation, meticulous records are maintained to monitor progress, identify challenges, and document solutions. Detailed documentation serves as a valuable resource, providing a comprehensive overview of the transformation journey and serving as a reference point for stakeholders involved. This documentation includes detailed reports, photographs, and progress updates, allowing for transparent communication and informed decision-making.

Comprehensive training programs are developed and conducted to equip staff members with the knowledge and skills necessary to adapt to the new organizational framework. These training sessions are tailored to address specific roles and responsibilities within the workspace, covering topics such as proper storage procedures, equipment usage, and safety protocols.

Emphasis is placed on the importance of adherence to established protocols and safety guidelines to ensure the well-being of employees and maintain operational efficiency. By empowering staff members with the necessary knowledge and resources, we foster a culture of continuous improvement and collective accountability.

Through effective documentation and training initiatives, we aim to facilitate a smooth transition to the new organizational structure, promote employee engagement, and drive sustained improvements in productivity and efficiency across our operations.

Collective Efforts for Lasting Transformation

With the implementation of the "setting in order" phase of the 5S methodology, the primary goal is to revolutionize the workspace, creating an environment that is not only well-organized but also highly efficient and visually pleasing. By systematically arranging tools, equipment, and materials, aim to optimize productivity and enhance employee satisfaction.

Through collaborative efforts involving all members of the team, endeavour to establish standardized processes and practices that promote consistency and clarity in our workspace organization. By assigning clear responsibilities and roles, we ensure that every individual understands their contribution to the overall objective of achieving a streamlined and orderly workspace.

Central to our approach is the concept of continuous improvement, where we actively seek feedback from employees and stakeholders to identify areas for refinement and enhancement. By fostering a culture of openness and receptiveness to change, we empower our team members to propose innovative solutions and

contribute to the ongoing evolution of our workspace.

Furthermore, we recognize the importance of sustaining the benefits of our organizational enhancements over the long term. To achieve this, we prioritize the development of robust systems and processes that facilitate easy maintenance and adherence to established standards. Regular audits and inspections are conducted to monitor compliance and address any deviations promptly.

In essence, our commitment to implementing the "setting in order" phase of the 5S methodology goes beyond achieving short-term improvements. It is about instilling a mindset of continuous improvement and excellence, where every member of our team plays an active role in creating a workspace that not only meets but exceeds expectations in terms of efficiency, organization, and overall functionality. Figure 16 and 17 shows you the before and after setting the utensils in order.

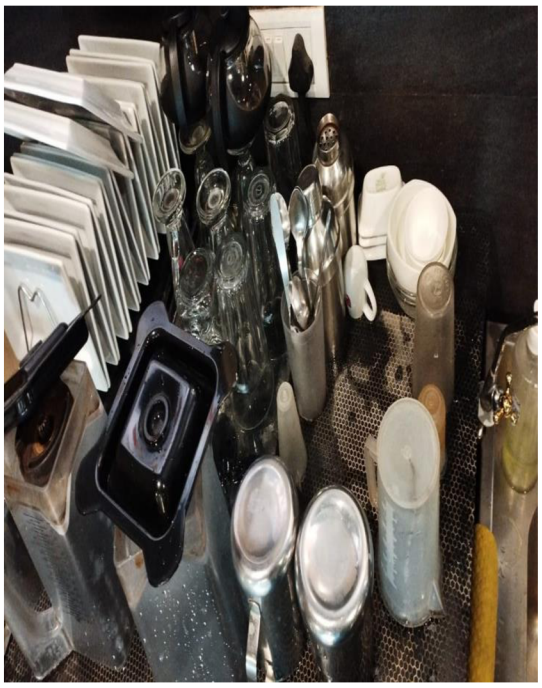

Figure 15: Before setting in order

Source (Own source)

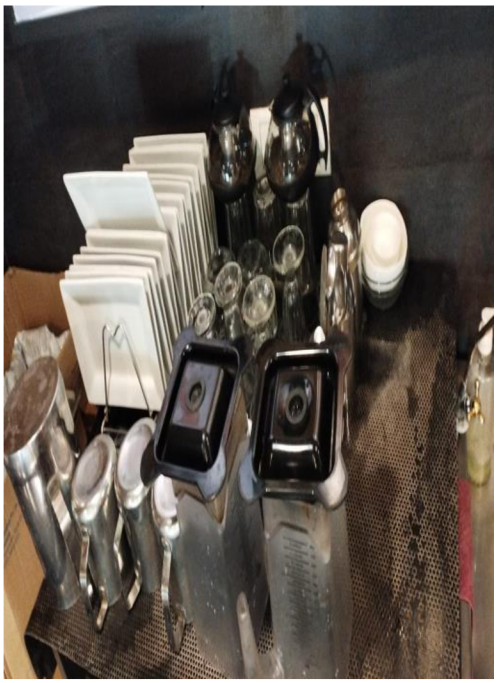

Figure 16: After setting in order

Source (Own source)

4.5.3 Implementation of shine

During the "Shine" phase, our focus is on deep cleaning and sanitizing every aspect of our workspace to ensure a pristine and hygienic environment for our team and customers. We employ a systematic approach to cleaning, addressing each area comprehensively and methodically to achieve optimal results. First and foremost, we prioritize the cleaning of all food contact surfaces to eliminate any potential contamination risks and ensure food safety. This includes countertops, prep tables, cutting boards, and cooking equipment. We use a food-safe disinfectant solution approved by regulatory authorities to thoroughly sanitize these surfaces, following manufacturer instructions for proper dilution and contact time.

In addition to food contact surfaces, we pay special attention to high-touch areas where germs and bacteria are more likely to accumulate. This includes door handles, light switches, faucet handles, and POS terminals. These surfaces are cleaned and sanitized multiple times throughout the day using disinfectant wipes or sprays, with extra emphasis during peak hours to minimize the risk of cross-contamination. Furthermore, we devote significant time and effort to cleaning and sanitizing the

storage areas to prevent the accumulation of dirt, dust, and debris. This includes shelves, cabinets, and storage containers where ingredients and supplies are kept. Before restocking, each storage area is thoroughly cleaned using a combination of vacuuming, wiping, and sanitizing to remove any residues and maintain a hygienic environment.

Another critical aspect of the "Shine" phase is the cleaning of floors and walls to eliminate any dirt, spills, or stains that may pose a slip or trip hazard and compromise cleanliness. We use commercial-grade floor cleaners and disinfectants to mop and sanitize floors, paying close attention to corners, edges, and hard-to-reach areas where dirt tends to accumulate. Additionally, we clean and sanitize walls and baseboards using a mild detergent solution to remove any splashes or spills and maintain a clean and professional appearance throughout the workspace. This includes wiping down walls and baseboards with a damp cloth or sponge and rinsing with clean water to remove any residue.

As part of the commitment to environmental sustainability, we employ eco-friendly cleaning products and practices wherever possible, minimizing the environmental footprint while still ensuring effective cleaning and sanitation. This includes using biodegradable cleaning solutions, reusable microfiber cloths, and low-flow water systems to conserve resources and reduce waste. To ensure accountability and consistency in the cleaning efforts, we implement a comprehensive cleaning schedule that specifies cleaning tasks, frequencies, and responsible individuals. This schedule is prominently displayed in the workspace and adhered to rigorously by all team members, with regular checks and audits to ensure compliance.

Throughout the "Shine" phase, we emphasize the importance of proper cleaning techniques and procedures through ongoing training and education initiatives. Team members receive training on the correct use of cleaning products, equipment, and personal protective gear, as well as best practices for maintaining a clean and hygienic workspace.

4.5.4 Implementing of standardization

First and foremost, we develop a standardized cleaning checklist that outlines the specific tasks to be completed during each cleaning session. This checklist serves as a comprehensive guide for the cleaning staff, detailing the areas to be cleaned, the cleaning methods to be used, and the frequency of cleaning. By standardizing the cleaning procedures, we ensure that all team members follow the same protocols, resulting in a consistently clean and hygienic environment. In addition to cleaning procedures, we also standardize the organization of the workspace by implementing uniform storage systems and labelling practices. This includes assigning designated locations for tools, equipment, and supplies, as well as labelling shelves, cabinets, and containers for easy identification. By standardizing the placement of items in the workspace, we minimize confusion and ensure that everyone knows where to find what they need.

Furthermore, we establish standardized protocols for inventory management to ensure that stock levels are maintained and replenished in a timely manner. This includes establishing minimum and maximum inventory levels for essential items, as well as implementing a system for tracking inventory usage and reordering supplies when necessary. By standardizing the inventory management processes, we prevent stockouts and ensure that our operations run smoothly without any interruptions.

Another important aspect of the "Standardize" phase is the development of standardized operating procedures (SOPs) for key tasks and processes within our organization. These SOPs outline step-by-step instructions for performing specific tasks, such as food preparation, equipment maintenance, and cleaning procedures. By documenting the procedures in SOPs, we ensure consistency in the operations and facilitate training for new team members.

To support the implementation of standardized procedures, we invest in training and development initiatives to ensure that all team members understand and adhere to the established protocols. Training sessions are conducted regularly to educate staff on the importance of standardization and to provide guidance on how to effectively implement standardized procedures in their daily work. Finally, we

establish a system for monitoring and evaluating compliance with standardized procedures to identify any areas for improvement and ensure continuous adherence to established protocols. This includes conducting regular audits and inspections of the workspace to assess cleanliness, organization, and compliance with standardized procedures. Any deviations or non-compliance are addressed promptly through corrective actions to maintain the integrity of the standardized processes.

In summary, the "Standardize" phase of the 5S methodology is essential for establishing consistency and sustainability in the workspace. By standardizing the cleaning procedures, organization practices, inventory management, and operating procedures, we ensure that the operations run smoothly and efficiently, resulting in a clean, organized, and productive work environment for the team and customers.

4.5.5 Implementation of sustain

Now, as we transition into the "Sustain" phase of the 5S methodology, the focus shifts towards ensuring that the improvements we've made are upheld and integrated into the daily operations seamlessly. Here's how we plan to sustain the gains achieved through the 5S efforts.

Firstly, we'll establish a system of Daily Maintenance, where each team member takes ownership of maintaining their workspace. This includes tasks such as tidying up at the end of each shift, restocking supplies as needed, and conducting quick inspections to identify any deviations from the established standards. By embedding these tasks into the daily routines, we can prevent the gradual accumulation of clutter and maintain a clean and organized environment consistently. To complement daily efforts, we'll conduct Regular Audits and Reviews to assess the effectiveness of the 5S practices. These audits will be scheduled at regular intervals and will involve comprehensive inspections of all work areas. During these audits, we'll evaluate factors such as cleanliness, organization, and adherence to standard procedures. Any discrepancies or areas for improvement identified during these audits will be addressed promptly to prevent backsliding and ensure continuous improvement.

Employee Training and Engagement will also remain a top priority during the sustain phase. We'll provide ongoing training sessions to reinforce the importance of 5S principles and procedures, ensuring that all team members are equipped with the knowledge and skills needed to maintain a high standard of organization and cleanliness. Additionally, we'll actively solicit feedback from employees on ways to improve the 5S practices and encourage their participation in problem-solving and decision-making processes. Continuous Improvement Initiatives will be another key aspect of the sustain efforts. We'll establish a formal mechanism for employees to submit suggestions for process improvements or efficiency gains, and we'll regularly review and prioritize these suggestions based on their potential impact. By fostering a culture of continuous improvement, we can harness the collective creativity of the team members to drive ongoing enhancements to the workspace.

Lastly, we'll implement a system of Recognition and Rewards to acknowledge and celebrate the contributions of individuals and teams who demonstrate exceptional commitment to 5S principles. Whether through formal recognition programs, team celebrations, or individual commendations, we'll ensure that efforts to maintain a clean and organized workspace are acknowledged and appreciated. This will not only incentivize continued adherence to 5S practices but also foster a sense of pride and ownership among team members. In essence, the "Sustain" phase of the 5S journey is about embedding the principles of organization and cleanliness into the fabric of the organization's culture. By prioritizing daily maintenance, conducting regular audits, investing in employee training and engagement, fostering a culture of continuous improvement, and recognizing and rewarding exemplary behaviour, we can ensure that the workspace remains clean, organized, and efficient over the long term.

5 Own proposal of Total Productive Maintenance

In addressing the challenge of lengthy cleaning processes affecting the performance of the addressing the challenges of maintenance across various machines in our shop, including the OTG, deep freezer, coffee bean grinder, bill printing machine, and ice cube machine, our objective is to optimize equipment reliability, minimize unplanned downtime, and enhance overall operational efficiency. To achieve this, we'll implement a Total Productive Maintenance (TPM) framework tailored to the unique requirements of each machine.

Beginning with a comprehensive assessment, we'll conduct a detailed review of the maintenance practices associated with each machine. This assessment will involve documenting existing maintenance procedures, analysing historical maintenance records, and identifying areas for improvement or potential sources of equipment failure.

With insights gathered from the assessment, we'll establish cross-functional teams for each machine, comprising maintenance technicians, machine operators, and relevant stakeholders. These teams will be responsible for developing and implementing standardized maintenance protocols specific to each machine, aimed at maximizing equipment reliability and minimizing downtime.

5.1 Reason to choose OTG for TPM

In the café setting, while all machines are vital to daily operations, the Oven Toaster Grill (OTG) emerges as a prime candidate for Total Productive Maintenance (TPM) implementation. Its frequent use, critical role in food preparation, and potential safety concerns elevate its priority. Unlike other appliances, the OTG often requires intricate maintenance due to its design complexity, necessitating proactive measures to prevent breakdowns. Furthermore, downtime with the OTG can lead to substantial revenue loss and compromise food quality, emphasizing the need for regular upkeep. Prioritizing TPM for the OTG aligns with the café's goal of ensuring operational reliability, maintaining consistent service standards, and safeguarding

both staff and customer well-being, thereby contributing to sustained business success. The below table 2 shows you the different types of machines used in CCD and shows you evidently why TPM is used for OTG.

Tab. 2: Machines used in CCD

Machines	Frequency of use	Criticality	Complexity	Potential downtime
Oven toaster grill	High	High	High	Significant
Deep freezer	Moderate	Moderate	Moderate	Moderate
Coffee bean grinder	High	Moderate	Low	Low
Bill printing machine	High	High	Moderate	Moderate
Ice cube machine	Moderate	Moderate	Low	Low
Blender	Moderate	Low	Low	Low

Source: (Own processing)

The table 2 above provides an overview of various machines in the café, considering factors such as frequency of use, criticality to operations, complexity of maintenance, and potential downtime impact. Among these, the Oven Toaster Grill (OTG) stands out as a top candidate for Total Productive Maintenance (TPM) due to its high frequency of use, critical role in food preparation, and complexity of maintenance. With significant potential downtime implications, ensuring the reliability and efficiency of the OTG through proactive maintenance measures is paramount to minimizing disruptions to café operations and maintaining high-quality

service standards. The below pie chart figure 18 gives you the better understanding of the complexity of the machines in CCD.

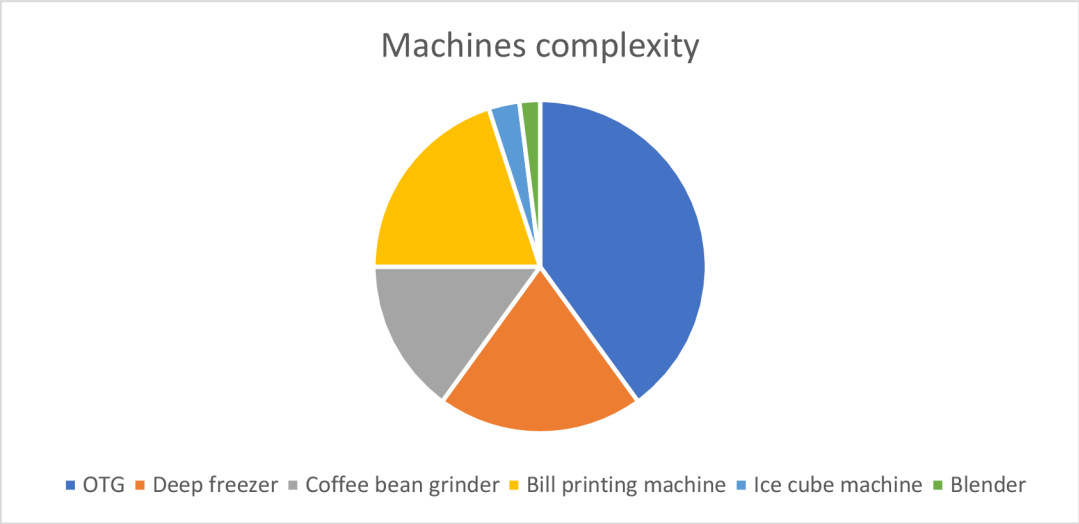

Figure 17: Pie chart of machines complexity

Source (Own source)

The below listed figures shows you the images of the machines used in CCD other than OTG.

Figure 19: Coffee bean grinder

Source (Own source)

Figure 18: Bill printing machine

Source (Own source)

Figure 20: Ice cube machine

Source (Own source)

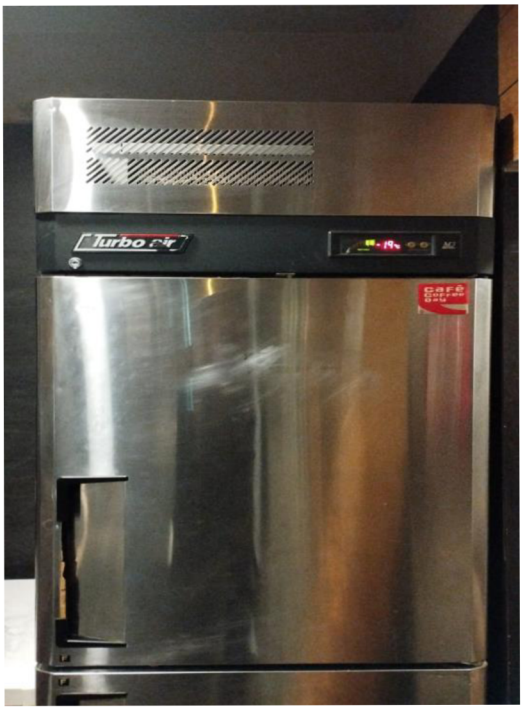

Figure 21: Deep freezer

Source (Own source)

Figure 22: Blender

Source (Own source)

5.2 Description of the problem

The problem we're addressing pertains to the inefficient performance of the Oven Toaster Grill (OTG) machine due to irregular maintenance practices. Currently, there is no defined maintenance schedule for the OTG machine, leading to increased instances of unexpected breakdowns and downtime during production operations. This lack of proactive maintenance not only hampers productivity but also poses risks to product quality and employee safety. Additionally, without a structured approach to maintenance, there's a heightened risk of equipment failure, resulting in potential repair costs and delays in production schedules. Moreover, the lack of a Total Productive Maintenance (TPM) framework exposes us to a myriad of challenges. These challenges manifest in the form of spiralling repair costs, production delays, and compromised quality standards. In essence, the OTG machine, bereft of the protective shield of TPM, stands vulnerable to operational disruptions, threatening to unravel the very fabric of the production process.

Overall, the absence of a TPM framework leaves the OTG machine vulnerable to operational disruptions and undermines the overall efficiency of the production

process. Thus, implementing TPM is crucial to address these challenges and optimize the performance and reliability of the OTG machine.

5.3 Current status of OTG

Currently, we're in the midst of addressing a pressing concern regarding the maintenance of the OTG machine. To tackle this issue effectively, we've commenced by capturing video footage of the entire cleaning process associated with the OTG. This proactive step serves as a vital starting point for the endeavour. It's important to note that the decision to film these procedures was made collaboratively between the manager and the employees. It was carefully scheduled these recordings during regular working hours to ensure that employees remained unaware, allowing for a candid representation of the cleaning process without any external influence. The recorded footage provides us with invaluable insights into the intricacies of the current cleaning procedures. With this visual data in hand, we're now in the process of crafting detailed cleaning process schedules. These schedules comprehensively outline each step of the cleaning process, along with the corresponding time taken for each activity. This meticulous documentation will serve as a guiding light as we navigate through the complexities of the maintenance routines. Through this methodical approach, we're striving to gain a deeper understanding of the time and effort required to maintain the OTG machine. By shining a spotlight on the current state of affairs, we're paving the way for informed decision-making and targeted interventions to enhance the efficiency and effectiveness of the maintenance practices

Typically, a standard OTG machine heats up and toasts food within a specific timeframe, which can vary based on factors like the type of food being cooked and the desired level of doneness. In optimal conditions and with regular maintenance, a standard OTG machine may take around 5-10 minutes to preheat and then approximately 10-15 minutes to toast food evenly.

However, without proper maintenance and upkeep, the performance of the OTG machine can deteriorate. In such cases, it's common for the machine to take longer to preheat, potentially doubling or even tripling the usual preheating time.

Additionally, the toasting process may become uneven or slower, leading to extended cooking times ranging from 20-30 minutes or even more.

This decline in performance not only affects the efficiency of food preparation but also increases energy consumption and operational costs. Therefore, it's crucial to implement regular maintenance practices to ensure that the OTG machine operates at its optimal capacity and delivers consistent results. The below figure 14 shows you the OTG used in CCD.

Figure 23: OTG

Source (OTG)

5.4 Reviewing Maintenance History

Conducting a thorough Root Cause Analysis (RCA) marks the initial step in addressing the maintenance challenges encountered by the OTG machine. This process demands a meticulous examination of the machine's maintenance history, necessitating a deep dive into various documentation sources. Firstly, we will scrutinize the maintenance logs meticulously maintained over time. These logs

serve as a chronological record of all maintenance activities performed on the OTG machine, offering insights into the frequency and nature of interventions carried out. Furthermore, we will meticulously review the repair records associated with the OTG machine. These records provide detailed accounts of past incidents of breakdowns or malfunctions, documenting the specific components or systems that required attention. By analysing these records, we aim to discern any recurring issues or patterns of failure that may have contributed to the prevailing maintenance challenges. This examination is crucial for identifying underlying factors that perpetuate maintenance issues, thereby facilitating targeted interventions to address them effectively.

Additionally, we will delve into past incidents of breakdowns or malfunctions encountered during the operation of the OTG machine. By studying these incidents in detail, we seek to gain a comprehensive understanding of the circumstances leading to machine failures. This analysis will help us identify potential root causes, such as operational errors, environmental factors, or equipment deficiencies, which may have contributed to the maintenance challenges faced by the OTG machine.

The objective in reviewing the maintenance history is to uncover valuable insights that will inform the subsequent investigative steps. By meticulously examining maintenance logs, repair records, and past incidents, we aim to identify causal factors underlying the maintenance challenges encountered by the OTG machine. Armed with this knowledge, we can devise targeted solutions and implement preventive measures to mitigate future maintenance issues effectively. This proactive approach is essential for ensuring the optimal performance and reliability of the OTG machine, thereby enhancing operational efficiency and productivity within the production environment.

5.5 Conducting Failure modes and effective analysis (FMEA)

In this phase of the investigation, we will assemble a cross-functional team comprising maintenance technicians, machine operators, and quality assurance personnel to collaborate on the FMEA process. This diverse team brings together a

wealth of expertise and perspectives, enhancing the depth and breadth of the analysis. The FMEA process begins with the identification of potential failure modes associated with the OTG machine's maintenance challenges. Drawing upon insights gleaned from the review of maintenance history and past incidents, team will brainstorm and catalogue all conceivable failure modes that could compromise machine performance or reliability.

Once the potential failure modes have been identified, we will assess the severity of their potential effects on machine operation, product quality, and overall production efficiency. This involves assigning a severity rating to each failure mode based on its anticipated impact on key performance metrics and operational objectives. Simultaneously, we will evaluate the likelihood of each failure mode occurring and the detectability of its occurrence before it leads to adverse consequences. By assigning corresponding ratings for occurrence and detectability, we can quantitatively assess the risk associated with each failure mode.

Using the severity, occurrence, and detectability ratings, we will calculate a Risk Priority Number (RPN) for each failure mode. The RPN serves as a prioritization tool, highlighting the most critical failure modes that warrant immediate attention and intervention. Based on the findings of the FMEA, the team will collaborate to develop and prioritize targeted mitigation strategies for addressing the identified failure modes. These strategies may include proactive maintenance measures, equipment modifications, process improvements, or operator training initiatives aimed at reducing the likelihood and severity of potential failures.

By systematically conducting Failure Modes and Effects Analysis (FMEA), we aim to gain a comprehensive understanding of the underlying factors contributing to the maintenance challenges faced by the OTG machine. This proactive approach empowers us to implement targeted interventions to enhance machine reliability, optimize maintenance practices, and safeguard operational continuity within the production environment.

5.6 Implementation plan to improve

The next step in the Root Cause Analysis (RCA) process involves implementing corrective actions based on the findings and recommendations generated from the Failure Modes and Effects Analysis (FMEA). This phase focuses on addressing the root causes of the maintenance challenges identified in the investigation and implementing sustainable solutions to prevent recurrence.

5.6.1 Action plan

In the first phase of the implementation plan, we prioritize the development of comprehensive action plans tailored to address the maintenance challenges plaguing the Oven Toaster Grill (OTG) machine at CCD. These action plans are meticulously crafted, outlining specific tasks, responsibilities, timelines, and performance metrics. Each aspect is carefully delineated to provide clarity and guidance for all CCD stakeholders involved in the corrective process.

The action plans serve as invaluable roadmaps, charting the course for the efficient execution of corrective measures within the CCD branch. By clearly defining the steps to be taken, assigning responsibilities to relevant CCD personnel, and establishing realistic timelines, we ensure accountability and facilitate seamless coordination among CCD team members. Furthermore, the action plans are not static documents but dynamic instruments that evolve in response to changing circumstances and feedback within CCD. Flexibility is built into the framework, allowing for adjustments as needed to optimize outcomes and address emerging challenges effectively. Central to the success of the action plans is the incorporation of performance metrics relevant to CCD operations. These metrics serve as quantifiable indicators of progress and success, enabling us to monitor CCD performance, track milestones, and measure the effectiveness of implemented solutions. By setting clear performance targets and regularly assessing the performance against these benchmarks, we maintain focus and drive towards achieving the objectives within CCD.

To conduct a thorough diagnostic assessment of the OTG machine, we utilized a multifaceted approach involving collaboration with skilled maintenance technicians who provided valuable insights and expertise in equipment diagnostics. Additionally, we employed various diagnostic tools such as thermal imaging cameras, vibration analysis devices, and electronic testing equipment to assess performance metrics and diagnose mechanical or electrical issues. Through physical inspection, we examined the machine's components and condition, while data analysis of maintenance records and past incidents helped identify recurring patterns. Observing the machine in operation, conducting tests, and consulting stakeholders including operators and supervisors further enriched the understanding. By integrating these methods, we conducted a comprehensive assessment, identifying areas of concern and informing targeted corrective actions to address maintenance challenges effectively.

Observation and testing of the OTG machine involved closely monitoring its operation and conducting targeted procedures to evaluate its performance under various conditions. We observed the machine in action, paying attention to its behaviour, sounds, and performance indicators. Additionally, we conducted specific tests to simulate different operating scenarios and assess the machine's response. These tests included adjusting temperature settings, monitoring heating and toasting times, and evaluating the consistency of results. By combining observation with structured testing procedures, we gained valuable insights into the OTG machine's functionality and identified any anomalies or performance issues that required attention.

5.6.2 Proactive maintenance protocols

We establish routine inspection schedules to systematically assess the condition of the OTG machine. These inspections cover various components, such as heating elements, electrical connections, and mechanical parts. By conducting regular inspections, we can detect potential issues early and address them before they escalate into costly breakdowns or malfunctions. Leveraging predictive maintenance techniques, such as thermal imaging and vibration analysis, allows us to anticipate potential failures and take preventive action. By monitoring key performance

indicators and analysing equipment data, we can identify abnormal patterns or trends indicative of impending issues. This proactive approach minimizes unplanned downtime and maximizes equipment reliability. We implement a culture of preventive care among the maintenance team and relevant staff members. This involves promoting awareness of the importance of proactive maintenance and providing training on best practices for equipment upkeep. By empowering the team to take ownership of equipment maintenance and instilling a proactive mindset, we create an environment conducive to minimizing disruptions and optimizing equipment performance.

5.6.3 Equipment Upgrades or Modifications

In the context of addressing maintenance challenges associated with the Grill OTG machine at CCD, we will explore the possibility of implementing equipment upgrades or modifications to enhance its reliability and performance. This initiative involves assessing the feasibility of various upgrades or modifications tailored to address the specific failure modes identified during the diagnostic assessment. One potential approach is to integrate advanced sensors into the OTG machine, allowing for real-time monitoring of key operating parameters such as temperature, pressure, and vibration. These sensors can provide early warning indicators of potential issues, enabling proactive intervention before they escalate into major breakdowns. Additionally, we will consider upgrading critical components of the OTG machine to improve durability, efficiency, and overall performance. This may include replacing outdated or worn-out parts with high-quality alternatives designed to withstand the rigors of continuous operation.

Furthermore, we'll explore opportunities to optimize maintenance access points and serviceability features of the OTG machine. By enhancing accessibility to key components for inspection, maintenance, and repair, we can streamline maintenance workflows and reduce downtime associated with routine servicing tasks. Throughout this process, we will carefully evaluate the cost-effectiveness and practicality of each proposed upgrade or modification, taking into account factors such as upfront investment costs, potential savings in maintenance expenses, and expected improvements in equipment reliability and longevity.

5.6.4 Process optimization

In addressing maintenance challenges specific to the OTG machine at CCD, the focus extends to process optimization as a vital strategy. This involves a comprehensive review and refinement of existing maintenance procedures to streamline workflows and mitigate the risk of human error. Central to the approach is the standardization of maintenance protocols, ensuring consistency and clarity in how tasks are performed across different shifts and personnel. By establishing standardized procedures, we aim to minimize variability and improve the reliability of maintenance outcomes. Furthermore, we recognize the importance of comprehensive training for maintenance technicians and relevant CCD staff. Through targeted training programs, we will equip personnel with the necessary knowledge and skills to execute maintenance tasks effectively and efficiently. This includes training on proper equipment operation, troubleshooting techniques, and adherence to safety protocols. In parallel, we will leverage digital tools and technologies to automate routine maintenance activities where feasible. This may involve implementing maintenance management software systems to schedule, track, and document maintenance tasks.

By optimizing maintenance processes through standardization, training, and digitalization, we aim to enhance the overall efficiency and effectiveness of maintenance operations for the OTG machine at CCD. This proactive approach not only reduces the likelihood of equipment failures and unplanned downtime but also contributes to the long-term sustainability and competitiveness of CCD's operations.

5.6.5 Continuous monitoring

Monitoring will be conducted through a combination of manual observations and automated systems. Maintenance technicians will perform regular inspections of the OTG machine, recording key performance indicators such as temperature levels, power consumption, and any unusual sounds or vibrations. These manual observations will be complemented by the installation of sensor-based monitoring systems that provide real-time data on the machine's operational status.

Additionally, we will leverage predictive maintenance software to analyse historical data and predict potential failures or maintenance needs before they occur. This proactive approach allows us to schedule maintenance activities during planned downtime, minimizing disruptions to CCD's operations.

Furthermore, we will implement a feedback mechanism where maintenance technicians can report any issues or anomalies they encounter during their inspections. This feedback will be collated and analyzed to identify recurring problems or areas for improvement in the maintenance processes.

5.7 Documentation and record keeping system

Establishing a comprehensive documentation and record-keeping system is paramount to the efforts in enhancing maintenance practices for the Oven Toaster Grill (OTG) machine. This system will serve as a centralized hub, meticulously tracking all maintenance activities, equipment performance metrics, and operational incidents encountered during its lifespan.

Firstly, we will maintain detailed maintenance logs to document every task performed on the OTG machine. These logs will capture crucial information such as the date, time, and nature of maintenance activities, as well as the personnel involved in executing them. By meticulously recording routine inspections, repairs, replacements, and upgrades, we ensure a thorough record of the machine's maintenance history.

Secondly, we'll track key performance indicators (KPIs) to assess the OTG machine's operational efficiency, reliability, and overall health. Metrics such as uptime/downtime, mean time between failures (MTBF), mean time to repair (MTTR), energy consumption, and temperature profiles during operation will provide valuable insights into the machine's performance trends over time.

In addition, we'll diligently document any incidents, malfunctions, or anomalies observed during the OTG machine's operation. Incident reports will outline the nature of the incident, its impact on operations, immediate actions taken to address

the issue, and subsequent measures implemented to prevent recurrence. This proactive approach ensures swift resolution of operational challenges and minimizes disruptions to CCD's workflow. Moreover, calibration records for sensors, gauges, and monitoring devices installed on the OTG machine will be meticulously maintained to uphold measurement accuracy and reliability. Regular calibration schedules and procedures, along with records of calibration results, will ensure the integrity of collected data and support informed decision-making.

Lastly, we'll prioritize compliance with relevant regulatory standards and guidelines governing equipment maintenance and operation. Documentation related to safety inspections, environmental compliance, and industry-specific regulations will be meticulously recorded to uphold CCD's commitment to regulatory compliance and best practices.

By implementing this documentation and record-keeping system, we aim to foster transparency, accountability, and traceability in the maintenance practices. This will enable us to proactively identify emerging issues, analyse performance trends, and make data-driven decisions to optimize the OTG machine's performance and reliability.

5.8 Continuous improvement

To ensure the successful implementation of the maintenance strategies for the OTG machine, we recognize the critical importance of providing comprehensive training to the maintenance technicians and CCD staff involved in machine operations. The training program will be meticulously designed to address the specific needs and requirements of the workforce, focusing on key areas essential for effective equipment maintenance and operation. The training curriculum will commence with a thorough understanding of the OTG machine's operation and functionality. Participants will be guided through detailed sessions covering the various components, controls, and operating procedures of the OTG machine, ensuring a solid foundation of knowledge to support maintenance activities. A significant emphasis will be placed on imparting expertise in preventive maintenance tasks, troubleshooting techniques, and corrective maintenance procedures specific to the

OTG machine. Through hands-on training sessions, technicians will gain practical experience in performing routine maintenance tasks, utilizing maintenance tools and equipment effectively, and addressing common issues encountered during operation. Safety is paramount in all maintenance activities, and the training program will underscore the importance of adherence to safety protocols and best practices. Participants will receive comprehensive instruction on the proper use of personal protective equipment (PPE), handling of hazardous materials, and emergency response procedures, ensuring the well-being of personnel throughout maintenance operations.

Proficiency in diagnostic techniques is crucial for identifying and addressing potential faults or malfunctions affecting the OTG machine. The training program will be delivered through a variety of methods to accommodate diverse learning styles and preferences. Classroom-based instruction, hands-on workshops, online modules, and practical demonstrations will be utilized to ensure maximum engagement and knowledge retention among participants. To support ongoing skill development and knowledge acquisition, we will establish avenues for continuous learning and professional development. This may include opportunities for refresher courses, advanced training modules, participation in industry conferences, and access to online resources and learning platforms, enabling the workforce to stay abreast of emerging trends and best practices in equipment maintenance.

Through the implementation of this comprehensive training program, we aim to empower the maintenance technicians and CCD staff with the expertise, confidence, and capabilities needed to maintain the OTG machine effectively. By fostering a culture of excellence, innovation, and continuous learning, we will ensure the long-term reliability, performance, and success of the maintenance initiatives.

6 Economic evaluations

In this chapter, we conduct an economic evaluation of the 5S methodology and the newly designed machine cleaning process. The primary objective is to assess the effectiveness of the 5S method in improving organizational efficiency and to quantify the resulting financial savings and non-financial benefits. Additionally, we aim to evaluate the time saved through the implementation of the new machine cleaning process and its impact on soybean bar production, ultimately contributing to increased profitability for the company. It's important to note that the evaluation of both methods is based on adjusted coefficients, and therefore, the calculated figures serve as estimations rather than precise measurements.

6.1 Economic evaluation of the implementation of the 5S method

Initial Investment

The implementation of the 5S methodology necessitated certain initial costs to procure essential equipment and materials. This included the purchase of hooks for hanging tools (10 units at 5 CZK each), specialized cleaning tools (2 units at 319 CZK each), drawer containers for organized storage (1 unit at 4,742 CZK), and wall-mounted document holders (1 unit at 1,745 CZK). The total cost of these items is outlined in Table 3 below.

Tab. 3: Future costs for CCD in implementing 5S.

Items	Quantity	Unit cost (CZK)	Total cost (CZK)
Hooks for hanging tools	10	5	50
Specialized hanging tools	2	319	638
Drawer container	1	4,742	4,742
Wall mounted document holder	1	1,745	1,745
Total costs			7,175

Source: (Own processing)

Financial Savings:

The introduction of the 5S method has resulted in substantial financial savings for the CCD branch. An analysis was conducted to assess the annual losses incurred from unnecessary tasks prior to the implementation of 5S. The calculated annual losses from unnecessary operations amounted to 30,600 CZK, as detailed in Table 4 below.

Tab. 4: Losses in CCD

Losses from unnecessary actions in CCD	Values in CZK
Daily losses per employee	15
Monthly losses per employee	300
Annual losses per employee	3,600
Total annual losses for all the employees	30,600

Source: (Own processing)

Non-Financial Benefits

In addition to the quantifiable financial savings, the implementation of the 5S methodology has yielded several non-financial benefits for the CCD branch. These include enhanced workplace safety, improved workflow efficiency, increased employee satisfaction and engagement, and standardization of processes and documentation.

This economic evaluation highlights the significant return on investment and overall positive impact of implementing the 5S methodology at the CCD branch in IIT Madras.

6.2 How losses are connected with the employees

Time Wastage

Employees spend valuable time searching for misplaced tools or materials, waiting for equipment to be repaired or replaced, or dealing with avoidable interruptions in workflow. This time wastage directly impacts their productivity and effectiveness in performing their tasks.

Frustration and stress

Dealing with inefficiencies and obstacles in the workplace can lead to frustration and stress among employees. They may feel demotivated or overwhelmed by the constant hurdles they encounter, which can affect their morale and job satisfaction.

Impact on performance

The time and effort spent on unnecessary tasks detract from the time and energy employees could devote to more productive activities. As a result, their overall

performance may suffer, leading to lower quality work and missed opportunities for innovation or improvement.

Financial implications

While the direct financial losses are incurred by the company, the employees indirectly bear the consequences. These losses may translate into reduced bonuses, incentives, or opportunities for career advancement. Additionally, in extreme cases, companies facing financial challenges may resort to cost-cutting measures such as layoffs or salary freezes, further impacting the employees' financial well-being.

Employee engagement

Engaged employees are more likely to contribute positively to the organization's success. However, when faced with inefficiencies and obstacles in the workplace, employees may become disengaged or disinterested in their work. This lack of engagement can have long-term repercussions for employee retention, company culture, and overall performance.

6.3 Economic evaluation of TPM

Financial savings

The introduction of TPM methodology at CCD is expected to yield significant financial savings by mitigating operational inefficiencies and minimizing equipment-related costs. An analysis was conducted to evaluate the annual losses incurred from unplanned downtime and reactive maintenance practices prior to the adoption of TPM. The calculated annual losses from equipment failures and downtime amounted to 45,000 CZK, as depicted in Table 5 below:

Tab. 5: Losses from unplanned downtime

Losses from unplanned downtime	Values (in CZK)
Daily losses due to equipment failures	150
Monthly losses due to unplanned downtime	3,000
Annual losses due to reactive maintenance	36,000
Total annual losses	45,000

Source (Own processing)

Explanation of Losses

Unplanned downtime and reactive maintenance practices have been significant contributors to financial losses at CCD. Daily operational disruptions due to equipment failures result in direct production losses, idle labour costs, and emergency repair expenses. Additionally, reactive maintenance often incurs higher repair costs and leads to prolonged equipment downtime, further exacerbating financial losses for the company.

Anticipated Savings with TPM

Implementation of TPM is expected to lead to substantial cost savings by transitioning from reactive to proactive maintenance strategies. By conducting regular equipment inspections, implementing predictive maintenance techniques, and fostering a culture of preventive care, CCD aims to minimize unplanned downtime, reduce repair costs, and optimize equipment performance. The target is to achieve a 20% reduction in annual losses associated with equipment failures and reactive maintenance within the first year of TPM implementation.

Projected Benefits:

By addressing equipment issues proactively, CCD anticipates a significant reduction in unplanned downtime, resulting in fewer production disruptions and associated financial losses.

Maintenance Cost Reduction: Transitioning to proactive maintenance practices is expected to lower overall maintenance costs by minimizing the need for emergency repairs and optimizing spare parts inventory management.

Improved Equipment Reliability: TPM implementation will enhance equipment reliability and performance, leading to increased productivity, higher output quality, and improved customer satisfaction.

Employee Engagement: Engaging employees in TPM activities fosters a sense of ownership and accountability, leading to higher morale, increased productivity, and reduced turnover rates.

Conclusion

This thesis purpose is to enhance operational efficiency within Café Coffee Day (CCD) through the implementation of lean management principles, particularly focusing on the 5S method and Total Productive Maintenance (TPM). The primary goal was to provide CCD with a roadmap for optimizing its operations while ensuring sustainable growth and customer satisfaction. By exploring into theoretical frameworks, practical proposals, and economic evaluations, the thesis aimed to offer a comprehensive understanding of how CCD could leverage lean management principles to its advantage.

The thesis commenced with an in-depth exploration of lean management, laying the foundation by its core principles, significance, and tools. Concepts such as waste reduction, process optimization, and employee engagement were meticulously examined, setting the stage for a deeper analysis of the methodologies of 5S and TPM. This theoretical groundwork provided valuable insights into the principles that improve lean management and their potential applications within CCD's operations.

Moving on to the results section, the practical implications of implementing the 5S method and TPM within CCD went through thorough analysis and evaluation. It became evident that both methodologies held immense potential for enhancing operational efficiency, reducing costs, and improving customer satisfaction. The proposal for integrating the 5S method in CCD's kitchen highlighted its capacity to revolutionize cleanliness, organization, and employee engagement. Similarly, the focus on TPM for the OTG machine highlighted opportunities for proactive maintenance, process optimization, and cost reduction, thereby contributing to CCD's overall efficiency and profitability. However, it's crucial to acknowledge the inherent limitations of this research. The scope was confined to a specific context and organization, limiting its generalizability to other industries or settings. Additionally, the analysis was constrained by the availability of data and resources, which may have influenced the depth and breadth of the findings. These limitations underscore the need for caution in extrapolating the results to broader contexts and highlight avenues for future research to address these constraints.

In discussing the results, it became evident that the successful implementation of the 5S method and TPM hinges on various factors, including leadership commitment, employee engagement, and organizational culture. Moreover, the economic evaluations underscored the need for a balanced approach that considers both short-term gains and long-term sustainability. By embracing lean management principles, particularly through the 5S method and TPM, CCD can navigate the complexities of the competitive landscape while delivering unparalleled value to its customers.

In conclusion, this thesis serves as a roadmap for CCD's journey towards operational excellence and continuous improvement. While the pursuit of operational excellence is undoubtedly a challenging process, it is also a rewarding one that requires ongoing commitment, adaptation, and innovation. By embracing lean management principles and leveraging the methodologies of 5S and TPM, CCD can position itself for long-term success in an increasingly competitive market landscape.

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