Universidade do Minho

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Schedule and responsibilities definition for the Value Stream Manager

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DECLARAÇÃO DE INTEGRIDADE

Declaro ter atuado com integridade na elaboração do presente trabalho académico e confirmo que não recorri à prática de plágio nem a qualquer forma de utilização indevida ou falsificação de informações ou resultados em nenhuma das etapas conducente à sua elaboração.

Mais declaro que conheço e que respeitei o Código de Conduta Ética da Universidade do Minho.

Definição da agenda e responsabilidades do Value Stream Manager

RESUMO

Um Value Stream Manager (VSM) é a pessoa responsável por aumentar o rácio entre o valor acrescentado e o não valor acrescentado, por eliminar os desperdícios ao longo da cadeia de valor para uma família de produtos definida e por garantir que a cadeia de valor cumpre ou excede os requisitos do cliente (Lean Enterprise Institute, 2006).

Na Bosch Car Multimedia, apesar de ser uma organização departamental e não uma Value Stream Organization, existe a função de Value Stream Manager, que coincide com a função de chefe de secção de uma área de produção. Como o VSM é a figura responsável por aumentar o rácio de valor acrescentado no Value Stream pelo qual é responsável, é necessário que possa fazer uma análise frequente (diária) dos KPIs do VS, para que possa perceber os desvios e a estabilidade dos standards. É também necessário que dedique tempo à melhoria contínua, tudo com vista a atingir os objetivos de negócio e de mercado. Este projeto surge porque foram apresentadas dificuldades neste sentido, quer na coordenação das responsabilidades do VSM com os chefes de secção, quer pela falta de dados necessários à tomada de decisão.

Embora existam algumas responsabilidades e tarefas definidas a serem desempenhadas pelo VSM, estas não são padronizadas e cada VSM desempenha o seu papel de forma diferente.

Depois de conhecer os processos internos da empresa e acompanhar o trabalho dos Value Stream Managers, foram listadas todas as tarefas por eles desempenhadas. Foi feita uma análise aprofundada para mapear a situação atual de cada tarefa, depois foi definida a condição alvo tendo em conta a literatura e os princípios do Bosch Production System, e posteriormente foi feita uma análise dos desvios.

Para concluir, foram feitas várias propostas de melhoria, que incluíram diretrizes de sistemática de reuniões, listas de verificação para as atividades realizadas, standards e uma agenda do Microsoft Outlook.

PALAVRAS-CHAVE

Agenda; Bosch Production System, Cadeia de valor; Value Stream Manager

Schedule and responsibilities definition for the Value Stream Manager

ABSTRACT

A Value Stream Manager (VSM) is the person responsible for increasing the ratio of value added to non-value added, for eliminating waste throughout the value chain for a defined product family, and for ensuring that the value chain meets or exceeds customer requirements (Lean Enterprise Institute, 2006). At Bosch Car Multimedia, despite being a departmental organization and not a Value Stream Organization, there is the role of Value Stream Manager, which coincides with the role of section head of a production area. As the VSM is the figure responsible for increasing the ratio of value added in the Value Stream for which he is responsible, it is necessary that he can make a frequent (daily) analysis of the KPIs of the VS, so that he can understand the deviations and stability of the standards. It is also necessary that he allocates time to continuous improvement, all with a view to achieving business and market goals. This project arises because difficulties were presented in this regard, either in coordinating the responsibilities of VSM with section heads, or by the lack of data necessary for decision making.

Although there are some defined responsibilities and tasks to be performed by the VSM, these are not standardized and each VSM performs its role differently.

After getting to know the company´s internal processes and following the Value Stream Managers work, all the tasks performed by them were listed. An in-depth analysis was made to map the current situation for each task, then the target condition was defined considering the literature and Bosch Production System principles, and afterwards a deviation analysis was made. To conclude, there were several improvement proposals done, which included meeting systematics guidelines, checklists for the activities performed, standards and a Microsoft Outlook agenda.

KEYWORDS

Agenda; Bosch Production System; Tasks; Value Stream; Value Stream Manager

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LIST OF ABREVIATIONS AND ACRONYMS

VSM – Value Stream Manager

VS – Value Stream

KPI – Key Performance Indicator

KPR – Key Performance Result

TPS – Toyota Production System

BPS – Bosch Production System

JIT – Just-In-Time

SMED – Sing-Minute Exchange of Dies

PDCA – Plan-Do-Check-Act

CD – Compact Disk

MOE2 –Manufacturing Operations and Engineering 2

CIP – Continuous Improvement Process

DLR – Daily Leadership Routines

IPN – International Production Network

PPC – Planned Production Costs

IT – Information Technology

FMEA – Failure Mode & Effects Analysis

SQCD – Safety Quality Cost Delivery performance

MTS – Make to Stock

MTO – Make to Order

RB – Robert Bosch

ETO – Engineer to Order

LPC – Layered Process Control

DMM – Daily Morning Meeting

OPL – Open Point List

LMS – Learning Management System

OEE – Overall Equipment Efficiency

IRR – Internal Rejection Rate

PSS – Problem Solving Sheet

SMC – Shopfloor Management Cycle

DIO – Days Inventory on Hand

TPT – Throughput Time

AE – Automotive Electronics

MOC – Machine Operating Costs

NUrel – Relative Utilization

1. INTRODUCTION

1.1 Background and motivation

Value Stream Management is a strategic and operational approach to gathering data, analyzing, planning, and implementing effective change with the key cross-functional processes needed to achieve a truly lean enterprise (Hines et al., 1998). Lean management is a business philosophy that focuses on eliminating waste and maximizing customer value. At the heart of lean management is the concept of value stream, which refers to the sequence of activities required to design, produce, and deliver a product or service to a customer (Womack & Jones, 1996).

Many companies have difficulties after converting to lean production. Why? Because they have established lean processes but have maintained their mass production management systems. Lean management is crucial to the success of lean production; it "sustains and extends the gains" of establishing lean procedures (Mann, 2005).

A Value Stream Manager (VSM) is the person responsible for increasing the ratio of value added to non-value added, for eliminating waste throughout the value chain for a defined product family, and for ensuring that the value chain meets or exceeds customer requirements (Lean Enterprise Institute, 2006).

At Bosch Car Multimedia, despite being a departmental organization and not a Value Stream Organization, there is the role of Value Stream Manager, which coincides with the role of section head of a production area. As the VSM is the figure responsible for increasing the ratio of value added in the Value Stream for which he is responsible, it is necessary that he can make a frequent (daily) analysis of the KPIs of the VS, so that he can understand the deviations and stability of the standards. It is also necessary that he allocates time to continuous improvement, all with a view to achieving business and market goals. This project arises because difficulties were presented in this regard, either in coordinating the responsibilities of VSM with section heads, or by the lack of data necessary for decision making.

Although there are some defined responsibilities and tasks to be performed by the VSM, these are not standardized and each VSM performs its role differently. Suggestions were made in order to define the agenda and responsibilities of the VSMs. Having a defined agenda is crucial to the success of any function, including that of a Value Stream Manager because it promotes clarity of objectives, consistency, facilitates communication and enables continuous improvement (Martínez-Jurado & Moyano-Fuentes, 2014).

1.2 Objectives

This project seeks to facilitate the integration of new VSMs in the company and to optimize and improve their performance, by reducing the time needed for their adaptation, and by defining their agenda and field of responsibilities. It is intended to create a detailed agenda with each moment, including established meeting systematics, the chosen analysis tools, the defined data structuring needed for each task, and the preparatory prerequisites and tasks resulting from them. That said, the following research questions arise "What are the key responsibilities of a Value Stream Manager, and how can their role be defined to ensure effective implementation of lean principles and continuous improvement in an automotive component manufacturing environment?"; "What are the benefits of effective scheduling and defining responsibilities for Value Stream Managers, and how can these benefits be measured?".

1.3 Dissertation structure

The dissertation is divided into six main chapters, namely introduction, literature review, company presentation, research methodology, case study and conclusions.

The introduction chapter seeks to present, in a general way, the concepts and topics under study, through a brief description of the background and the motivation. Also, in this chapter, the planned objectives are presented, as well as the dissertation structure.

The second chapter, regarding the literature review, clarifies concepts of lean manufacturing and lean management, their origins and applications, as well as the role of the value stream manager.

The third chapter includes a brief description of the company where the study was undergone and Bosch´s Production System principles which are fundamental to define the value stream manger´s agenda.

The fourth chapter refers to the research methodology which was an action research approach, with a brief description of the method, as well as the steps involved in applying it to the project in question.

The fifth chapter refers to the case study which includes all the tasks to be performed by the VSM and describes the current and target situation, the deviation analysis between them, and at last the improvement proposals.

The chapter number six, the last one, aims to highlight and synthesize the aspects achieved with the project, as well as the opportunities for future research.

2. Literature Review

In order to understand the role of a Value Stream Manager, it is mandatory to understand the Lean philosophy and its concepts, that are the structure for a Lean Leadership System. Furthermore, knowledge about Value Stream Management is also of extreme relevance for the implementation of the agenda and responsibilities of a Value Stream Manager, since he is the one responsible for managing all the value chain, from the supplier to the client. It is necessary to study the connection between Lean practices and Leadership and Value Stream Management as an approach for the standardization of the Value Stream Manager role.

2.1 Lean Manufacturing

In this section, there is a brief introduction to production paradigms and personalities that are pertinent to the development of Lean Production.

2.1.1 Origins

Manufacturing, being one of the primary driving forces of major economies, plays a crucial role. In Europe alone, the industrial sector employs around 74 million people, either directly or indirectly. This makes it a vital economic domain that generates value by converting materials into finished products. (Westkämper & Walter, 2014)

The concept of manufacturing is relatively new, spanning only two centuries, but has already undergone multiple paradigms of evolution. The most prominent among these are Craftsmanship, Mass Production, Lean Production, Mass Customization, and Global (Yáñez et al., 2019). The impetus for this evolution was often triggered by crises, where companies failed to adapt to new environmental factors or failed to innovate. Consequently, organizations that failed to overcome such crises through transformation were susceptible to failure. (Doll & Vonderembse, 1991)

Initially, manufacturing began with craft production, which relied on skilled craftsmanship to deliver high-quality products to meet customer demands. Typically, skilled workers manually created products using hand tools in small machine shops. Since the products were made individually, the workers not only had to do the bodywork but also assemble the final product. Consequently, the products had low reliability, low production volume, and high costs. (Yáñez et al., 2019)

The transformation of craft production began with the advent of interchangeable parts. Parts started being created in batches so that any part could be assembled into a finished product, marking the beginning of the era of mechanization and division of labor.

2.1.2 Mass Production

Henry Ford, a famous figure in mass production and modern management, founded the Ford Motor Company in 1903 after starting as a mechanic (Nicholas, 2018). His initial goal was to address the limitations of parts supplied by creating interchangeable parts, which allowed for the production of nearly identical cars. He also insisted on in-house production of components, which improved product quality and reduced production costs (Doll & Vonderembse, 1991).

The assembly process was changed with the introduction of the Model T, and workers were assigned one task and moved from car to car. This followed Taylor's Scientific Management principles but resulted in the production rate being determined by the slowest worker (Watt, 2020). To overcome this issue, Ford drew inspiration from slaughterhouses, where the meat is moved between workstations. He introduced the moving assembly line, forcing workers to keep pace with the production rhythm defined by the line. This combination of interchangeable parts and a moving production line gave rise to Ford's mass production system (Nicholas, 2018).

While the new system led to lower production costs and enabled unskilled workers to perform specific tasks efficiently, it also resulted in a new cultural paradigm known as Fordism, characterized by mechanization and the simplification of operations. However, the company environment hindered information sharing, and workers felt disconnected from their work due to the monotonous and repetitive tasks. To address this issue, Ford increased the minimum wage and established an eight-hour work shift to retain employees. These measures not only improved employee satisfaction but also increased productivity and have since been implemented worldwide, resulting in the current practice of a five-day working week. (Valli, 2018)

2.1.3 Toyota Production System

It is necessary to first trace the origins of the Toyota Company in order to comprehend the origins of the Toyota Production System. In the nineteenth century, the Toyoda family first entered the textile business. After Sakichi Toyoda founded the Toyoda Automatic Loom Works, the group's parent company, in 1926 after developing the automatic loom. The first step for one of the cornerstones of TPS, jidoka, was achieved when the looms became so advanced that they had a mechanism to automatically stop the machine when a thread broke (humanized automation) (Ortiz & Liker, 2004). He was able to persuade

and provide the funding for his son, Kiichiro Toyoda, to invest in the automotive industry thanks to the patents from this company and his knowledge of emerging technologies. Toyoda established a new division within the business and began building vehicle prototypes. Simple trucks were the first vehicles made, but they were of poor quality and had antiquated technology. Later in 1937, the Toyota Motor Corporation was founded in accordance with Sakichi's management philosophies. (Holweg, 2007)

After World War II, Toyota struggled with debt, therefore they began to employ cost-saving measures like salary reduction in order to stay out of bankruptcy. Kiichiro assumed responsibility for the financial crisis and made the decision to quit. Eiji Toyoda, his cousin, took over as president of Toyota Motor Manufacturing and led the organization during its most crucial years. So, Eiji made the decision to study American factories in order to enhance Toyota's production methods. He and his managers studied other plants, notably Ford's River Rouge complex, for three months in 1950. It surprised them to learn that the production system had numerous problems and couldn't be implemented in Japan despite their great expectations. Toyota was unable to afford the expensive machinery and technologies needed for mass production because of financial constraints. Toyota intended to amend this policy so that a larger variety of vehicles may be produced at the same facility rather than only being able to make one type of car in each location in the United States (Mann, 2005; Nicholas, 2018).

After arriving home, Eiji contacted Taiichi Ohno, the plant manager, and gave him the assignment of enhancing Toyota's production process. Ohno investigated and even paid additional visits to American factories before coming to the conclusion that in order to satisfy customer needs, they required a flexible and effective approach as opposed to conventional mass manufacturing. He created the Toyota Production System (TPS), the first version of Lean Manufacturing, along with others through a succession of learning-by-doing iterations (Ortiz & Liker, 2004).

The basis of the TPS is the absolute elimination of waste. The two pillars of the TPS are:

- Just-in-Time (JIT), which synchronizes and connects every link in the supply chain to ensure that each process receives the precise item required, when necessary, and in the required quantity, preventing excessive stock accumulations and moving toward zero inventory.
- Jidoka, or "automation with a human touch," is the development of a process that includes inspection, stops the mass manufacturing of inferior goods, lowers the number of operators, and boosts production effectiveness. When an anomaly is found, production is halted and does not resume until the issue is fixed.

Those pillars can be represented in the diagram of “TPS house” as shown in Figure 1.

Figure 1- TPS House (Liker & Morgan, 2006)

The TPS house is characterized by various representations, but the primary elements are outlined above. The two pillars that distinguish TPS are just-in-time and jidoka. Just-in-time is attributed to Kiichiro, who believed that manufacturing would be more efficient if all the necessary production components were located nearby and utilized just in time by the user. This requires the proper flow of materials at the correct pace, achieved by eliminating inventory buffers in operations. The ultimate goal is to produce one piece at a time (one-piece flow) based on customer demand (takt time). Consequently, smaller lot sizes are required, and changeover times must be reduced, which is considered an indispensable approach for achieving JIT.

Shiego Shingo developed the Single-Minute Exchange of Dies (SMED) that consists in techniques to perform the changeover in a significantly lower amount of time (Dillon & Shingo, 1985).

In systems that involve interruptions, such as in batch processing, the supermarket concept is employed to ensure that the subsequent process receives the necessary quantity of parts when required. The earlier process must replenish the same amount of parts that were taken after they have been removed. The operations are coordinated using instructions, which are typically recorded on a piece of paper called Kanban. This document carries information about the pickup, transfer, or production of parts. Over time, this methodology has also been extended to include suppliers. (Ohno, 1988)

The second pillar of TPS, jidoka, involves automatically stopping a machine when a potential defect or deviation from the standard is detected. An andon is then activated through the use of lights or sound to alert the team leader for assistance.

The foundational elements of TPS include stable and standardized processes, as well as levelled production (heijunka). The objective is to achieve stability in the processes by balancing orders and workload. This promotes standardization and ensures that there is sufficient inventory to compensate for

the inherent instability of the system. Various variations of these foundational elements exist. (Liker & Morgan, 2006)

At the top of the TPS house, the objectives of the system can be observed, including achieving the best quality, lowest cost, shortest lead-time, best safety, and high morale.

The center of the TPS house represents the importance of people and teamwork as they are the primary drivers of continuous improvement (kaizen). Ohno believed that assembly workers could perform certain tasks better than so-called specialists because they were more familiar with the workstations. As a result, he organized employees into teams with specific responsibilities and encouraged them to collaborate to discuss problems and identify areas for improvement. To facilitate problem-solving, Toyota introduced the practice of asking "why" five times. All of these efforts culminate in a less recognized lean principle: respect for people. This involves respecting individuals' abilities and promoting training, coaching, and personal development. (Mann, 2005; Nicholas, 2018)

The TPS relies on the elimination of waste. Completely eliminating these wastes can improve efficiency of the operations by a substantial margin. Seven key forms of waste are usually identified:

- Overproduction of unnecessary products.
- Unnecessary waiting time to begin the next task.
- Unnecessary transportation of material.
- Over-processing the product with extra steps.
- Inventory of material to be completed or finished products to be shipped.
- Unnecessary movement of people.
- Defects in the product. (Ohno, 1988; Ortiz & Liker, 2004)

Other fundamental ideas of the TPS include leveling production to reduce costs, establishing a continuous production flow, maintaining a constant supply of raw materials, creating standard work procedures to identify areas for process improvements, and promoting a culture of teamwork.

2.1.4 Lean Thinking

Eiji Toyoda and Taiichi Ohno were the pioneers of the Toyota Production System at the Toyota Motor Company (J. P. Womack et al., 1992) conducted a detailed study of the Japanese techniques, which they later named Lean Production. Stone (2012) notes that the Toyota Way embodies the principles of the TPS and serves as a foundation for Lean Production. Lean Production combines the advantages of artisanal production with the benefits of mass production while avoiding its high costs. Additionally, Lean

Production increases the flexibility of mass production, making it more adaptable to changing market demands.

The Lean philosophy aims to increase efficiency by eliminating waste, optimizing the use of material, human, and capital resources, and responding to customer needs with the least amount of effort required (J. Womack & Jones, 1996). Greater flexibility can be achieved through automation and versatility, promoting continuous improvement towards the goal of continually declining costs, zero defects, zero inventories, and endless product variety (J. Womack & Jones, 1996).

J. Womack & Jones (1996) added an eighth form of waste in Lean, which refers to goods and services that do not meet customer needs. However, other authors such as Brito et al. (2019) have identified underutilization of intellect and skills as the eighth waste in Lean (Skhmot, 2017).

J. Womack & Jones (1996) identified 5 Lean Principles, presented in Figure 2:

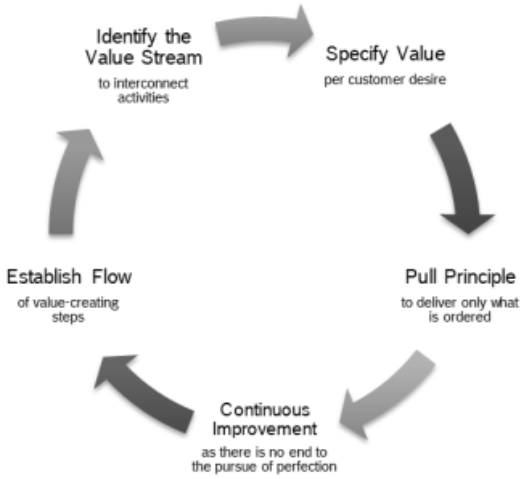

Figure 2- The 5 Lean Principles.
Adapted from Womack & Jones (1996)

During the 1990s, Lean underwent a transformation and expanded beyond its application in the automobile industry to include the wider supply chain, as any concept that offers customer value can align with a Lean strategy. This shift was noted by Samuel et al. (2015) and supported by Hines et al. (2004) who stated that any idea that provides customer value can be integrated into a Lean strategy. Additionally, Stone (2012) reviewed how Lean concepts were utilized in various areas of the enterprise, including product development, marketing, accounting, sales, and services. The review emphasized the importance of aligning these applications throughout the enterprise for successful Lean transformations. According to Samuel et al. (2015) the Lean movement has undergone a shift in mindset, moving away from a sole focus on cost and waste reduction to instead emphasize the creation of value and the

exploration of alternative approaches, such as concepts related to quality or process improvements that enhance overall performance. More recently, Danese et al. (2018) have highlighted the importance of integrating Lean practices with the increased use of automation and information systems, particularly in the service sector. These authors suggest that the benefits of Lean can be further enhanced through improved information flows, appropriate use of Information and Communication Technologies (ICT), and the application of information systems like Enterprise Resource Planning (ERP) and decision support tools for Lean process development and supply management.

There has been a debate among scholars such as Hines et al. (2004) and Stone (2012) regarding the challenges of using Lean in different contexts of process improvement methodologies and the confusion surrounding its application due to the diverse range of definitions. According to Hines et al. (2004), understanding the distinction between Lean thinking at the strategic level and Lean production at the operational level is crucial in comprehending Lean as a whole and utilizing the right tools and strategies to provide value to customers. While Lean production is typically associated with the application of "shop-floor tools" based on Toyota's example, Lean thinking is a broader philosophy that can be applied to all systems and processes of the supply chain to identify critical areas for improvement and ultimately bring about such improvements (Hicks, 2007).

2.1.5 Lean Management

The Lean approach has been adopted by numerous manufacturing companies across various industry sectors, with the aim of emulating Toyota's success. However, as noted by Spear & Bowen (1999), only a few of these companies have achieved success. For instance, in the UK, a mere 10% have managed to implement a successful Lean system, according to Alnajem & Dhakal (2012). It is worth noting that researchers have different perspectives on Lean, highlighting the fact that this systematic approach cannot be easily replicated. In addition to this, there are other crucial factors that contribute to the success of a Lean journey. Effective leadership is essential in preparing and maintaining the change, as noted by Aij & Teunissen, 2017. The Lean leader must encourage personal development, inspire, and support employees in overcoming obstacles, as emphasized by Trenkner (2016).

Mann (2014) states that the most prescriptions for lean production are missing a critical ingredient: a lean management system to sustain it. Lean management practices are like many other aspects of lean: easy to grasp, but difficult to execute consistently. The lean management system comprises the discipline, daily practices, and tools necessary to establish and uphold an unwavering, concentrated focus on the process. It is this process-oriented mindset that maintains and extends lean implementations. Over time,

as these practices become routine, a lean culture gradually takes root, almost imperceptibly. A lean culture is cultivated when leaders supplant the conventional mindset acquired from careers in batch-and-queue manufacturing.

The term "Lean Management" refers to a methodical approach to implementing Lean principles in a sustainable manner, through collaboration between leaders and employees, with the aim of achieving perfection (Aij & Teunissen, 2017). This approach is widely considered a form of transformational leadership (Aij & Teunissen, 2017).

Due to the lack of a consistent definition or structure for Lean Leadership, Dombrowski & Mielke (2013) compiled its principles from various studies. The five principles of Lean Leadership are as follows in Figure 3:

Figure 3 - Principles of Lean Leadership

Adapted from (Dombrowski & Mielke, 2013)

The principle of improvement culture is a fundamental aspect of Lean Leadership. Often misunderstood, this principle acknowledges that shop floor workers alone may not be able to address failures, and the support of management is necessary to ensure sustained improvement activities throughout the organization. As Lean Leadership demands new leadership skills, self-development becomes crucial, as some of these skills may need to be learned. To achieve self-development, approaches such as learning cycles, such as PDCA (Plan-Do-Check-Act) and having a mentor can be utilized. By adopting these methods, individuals can develop and enhance their skills and knowledge, thus improving their ability to lead and implement Lean principles effectively. Enabling individuals to engage in continuous improvement through education and training is crucial. As this process is ongoing, organizations employ coaching techniques to ensure continuous development.

The fourth principle of Lean manufacturing is Gemba, which entails leaders going to the shop floor to observe processes and make informed decisions based on facts. The final principle, Hoshin Kanri, is also known as target management. As previously mentioned, it ensures that improvement activities align with the strategic objectives of the organization (Dombrowski & Mielke, 2013).

Drawing from these principles and the necessity of collaboration between leaders and workers, the author has identified 15 guidelines to assist leaders in successfully implementing Lean methodologies in a sustainable manner (Dombrowski & Mielke, 2014).

Mann (2014) argues that the missing link in lean is the management system. The implementation of lean management practices shares similarities with various other facets of lean methodology: they may be straightforward to comprehend, but maintaining consistent execution poses challenges. The publication titled "Creating a Lean Culture - Tools to Sustain Lean Conversions" effectively elucidates the differentiation between an organization's culture and its management system. It offers a comprehensive framework for discerning the disparities between lean and batch cultures, while also providing a thorough examination of the practices, tools, and mindset necessary for establishing effective lean management. By adopting a lean management system, an organization can perpetuate and expand upon the benefits derived from implementing lean production techniques. He also summarizes the four principal elements of Lean Management as the following:

1. Leader standard work.
2. Visual controls.
3. Daily accountability process.
4. Leadership discipline.

Leader standard work

Standard work for leaders, the engine of lean management, is the highest leverage tool in the lean management system. Leader standard work establishes a structured framework and regular routine that facilitates leaders in transitioning from a singular emphasis on outcomes to a dual focus on both the process and outcomes. This shift in focus plays a pivotal role in the triumph of a lean operation and is, arguably, the most challenging aspect to accomplish in a leader's personal evolution from batch and queue to lean thinking. By providing a means to convert the abstract notion of process focus into tangible expectations for the leader's specific job performance, leader standard work aids in this transformation. Similar to how standard work elements in a production workstation offer clear and unambiguous guidelines, the same principle applies to standard work for leaders (albeit with a few differences). While

nearly all of an operator's time at work adheres to standardized work, team leaders follow it for approximately 80 percent of their work time. The proportion decreases to about half for supervisors and about a quarter for value stream leaders. (Mann, 2014)

Visual Controls

The status of virtually every process should be visible in lean management. If takt time is the heart of lean production, visual controls and the processes surrounding them represent the nervous system in lean management. The objective is not to provide an all-encompassing examination of visual controls; rather, it aims to demonstrate the extensive range and types of visuals available, which are as diverse as the production processes themselves. The design and format of these visuals are only limited by one's imagination, guided solely by the purpose of facilitating the easy and widespread comparison of actual performance with expected standards. This explains why the book does not include a CD of pre-made visual control forms. The most effective forms are those that you create and modify yourself, tailored to display the specific information you require for a quick assessment of your processes' status. (Mann, 2014)

Daily Accountability Process

The daily accountability process represents the third essential component of the lean management system. It serves as the steering wheel, with the meeting leader assigning tasks related to improvement initiatives. Additionally, it functions as the throttle by specifying the deadline and allocating the necessary resources for the improvement task. Upon initial examination, this aspect of lean management may appear to primarily serve the purpose of ensuring the proper follow-up on task assignments resulting from addressing previous day's problems or improvement opportunities. However, a more substantial, albeit less apparent, objective of the daily accountability process is to reinforce the lean management system's emphasis on process and, consequently, to identify and execute opportunities for enhancement.

The daily accountability process takes place as an interlocking set of three brief, structured, daily meetings, one of which is the familiar, but often misunderstood, team start-up meeting. Each of these meetings is an explicit example of lean management’s focus on comparison of expected and actual. As the name suggests, there are three tiers of meetings:

1. The first tier (first, because it typically happens at the start of the shift) is the production team leader meeting briefly with the team members.

2. The second is the supervisor meeting with his or her team leaders and any dedicated support group representatives.

3. The third-tier meeting is the value stream manager or equivalent meeting with his or her supervisors and support group representatives or staff members.

4. A fourth tier is possible where the plant manager meets with his or her production and support staff members.

Each of the meetings shares these characteristics:

- Brevity — rarely if ever longer than 15 minutes.
- Posture — standing up.
- Location — on or immediately adjacent and not physically separated from the production floor.
- Agenda and content — defined by a visual display board.

(Mann, 2014)

Furthermore, (Mann, 2014) remarks eight leadership behaviors to learn. Leaders who achieve success are distinguished by their specific behaviors. In other words, success is derived from one's actions rather than inherent qualities. This is a fortunate circumstance since, for the majority of individuals, it is not possible to be born with innate leadership abilities. Behaviors can be acquired and modified through learning and unlearning processes. This encompasses how you handle interruptions in production, the manner in which you arrive at conclusions, and the aspects you prioritize and direct people's attention towards. Figure 4 and Figure 5 Lists and briefly describes these eight dimensions of leadership (Mann, 2014) has found to be of the most importance.

Leading a lean conversion project differs in significant aspects from leading an ongoing lean operation, one that has already been converted or that started as a greenfield. The differences between them are discussed in turn, contrasting what is needed to successfully lead a conversion project with what is needed to successfully lead an ongoing lean operation.

Attribute	For Project Implementation	For Ongoing Operations
Passion for lean	1. Passionate about the potential for lean to make the enterprise more successful and work more fulfilling for all involved.	1. Same as Project Implementation, plus: 2. Willing to make personal changes in one's own work, including using standardized work for his/her own position.
Disciplined adherence to process—accountability	1. Sets expectations, regularly uses a process to track and follow-up on actual accomplishment of assigned tasks.	1. Same as Project Implementation, plus: 2. Exhibits intense commitment to focus on explicitly defining processes and disciplined adherence to them.
Project management orientation	1. Prior experience in successfully implemented projects. 2. Uses a defined process to track performance and completion of task assignments. 3. Identifies corrective action where necessary and follows up on it.	1. Able to identify needed changes based on daily process data and assign small-bite daily tasks leading to successful implementation of the changes. 2. Uses explicitly defined visual processes to track and follow up assignments and take appropriate corrective action.
Lean thinking	1. Understands lean concepts. 2. Has had experience applying lean concepts. 3. Talks about and promotes a lean future state. 4. Finds ways to apply and illustrate lean concepts in daily project work processes.	1. Serious about ongoing improvement based on a goal of perfection. 2. Sees with "kaizen eyes." 3. Holds and coaches a root-cause orientation to corrective action. 4. Has learned process improvement/problem solving methods; able to personally lead lean process improvement.

Figure 4 - Dimensions of Lean leadership adapted from Mann, 2014

Attribute	For Project Implementation	For Ongoing Operations
Ownership	1. Thinks and talks about the area as his/hers to lead, set direction for, change, and improve.	1. Same as Project Implementation, plus: 2. Eager to empower others in the area through structured ways to elicit and implement their ideas. 3. Acknowledges and celebrates improvements made by others at all levels.
Tension between applied and technical	1. Understands the need to sweat the details, as well as to get things done. 2. Willing to listen to technical experts and consider their advice in planning for the implementation.	1. Understands and respects the details behind elements of lean, such as flow, pull, standardized work, etc. 2. Actively supports steps to upgrade performance and expose previously hidden impediments. 3. Takes a "what can we do today" orientation to making change happen steadily, step-by-step.
Balanced commitment to production and management systems	1. History of effective give and take with people and ideas. 2. Evidence of process focus beyond a "hit the numbers" approach to management. 3. Eager for greater participation by production people as well as others.	1. Personally treats process focus as crucial to the area's success; is able to see waste and opportunity even in leaner processes. 2. Insists on compliance with requirements for visually tracking process performance and execution. 3. Insists on analysis and appropriate, timely action on impediments to normal operation of processes.
Effective relations with support groups	1. History of getting things done with support from operations support groups such as engineering, quality, production control, safety, finance, HR.	1. Understands roles, responsibilities, and expertise of support groups. 2. Incorporates support groups appropriately in plans for improvement and responses to problems. 3. Makes expectations explicit for support group performance in support of production processes.

Figure 5- Dimensions of Lean leadership adapted from Mann, 2014 (continuation)

2.1.6 The role of a value stream manager

"Whenever there is a product for a customer, there is a value stream" (Rother & Shook, 2003), a value stream is the sequence of activities that create and deliver a product or service to a customer. It includes all the steps, both value-adding and non-value-adding, from raw materials to the delivery of the finished product to the customer.

Value Stream Management is a process for planning and linking lean initiatives through systematic data capture and analysis.

The process of Value Stream Management offers a framework for facilitating the transition towards a lean enterprise. This framework ensures the effectiveness of the lean implementation team. The structure is

represented visually through a storyboard format, which incorporates the strengths of well-established problem-solving methods. The attributes of Value Stream Management include the following:

It facilitates clear and concise communication between management and shopfloor teams regarding lean expectations and the actual material and information flow. Proven tools are utilized for effective implementation. Team recognition and ownership are included from the beginning of the process until its conclusion. Management review and reporting are integrated into the process. The storyboard format provides an excellent form of visual communication. The process enables changes and updates to be reflected as they occur (Tapping, 2002).

According to Lean Interprise Institute (2006), a value-stream manager is a person that is responsible for increasing the ratio of value to non-value, and eliminating waste in the overall supply chain from start to finish, for a defined product family; and for ensuring that the value stream meets or exceeds customer requirements. The role of a value-stream manager requires the ability to take a step back and assess the value stream from a holistic perspective. They must have an understanding of the key system constraints and the capacity to identify critical process issues quickly. It is essential that they possess a good level of knowledge about lean thinking, or if not, they should be willing to work closely with a sensei to acquire this knowledge. It is important for the value-stream manager not to focus on sub-optimizing individual components of the supply chain, but instead to concentrate on enhancing the overall value created by the entire system. The ultimate goal is to improve the efficiency and effectiveness of the entire value stream, rather than just specific parts of it.

3. COMPANY PRESENTATION

This section's goal is to provide a description of Bosch, the organization that conducted the research. The company is presented on both a national and international scale, highlighting its primary business sectors. Finally, in this chapter, particular attention is also paid to the department MOE2 in which the study was developed in order to contextualize the relevance of the work developed.

3.1 Bosch Group

In Stuttgart, Germany, Robert Bosch established his "Workshop for Precision Mechanics and Electrical Engineering" in 1886. The business has always been praised for its creative solutions and dedication to social causes. After only a few years, Robert Bosch and Frederic Simms established the first Bosch sales

office outside of Germany in 1898. It was the first of numerous sales offices that would later open in other European nations.

Figure 6 - Bosch Internal Communication 2021

Bosch Group is a well-known provider of technology and services on a global scale. Around 420,000 associates are employed by it globally (as of December 31, 2022). Preliminary data indicates that the company made 88.4 billion euros in sales in 2022. Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology make up its four business segments.

Figure 7 - Bosch internal communication, 2023

Bosch Group has been carbon neutral since the first quarter of 2020, and its innovative strength will be the cornerstone of the 39 company's future expansion. Approximately 73.000 associates are employed by Bosch in research and development at 129 locations around the world. Regarding sales for the year of 2021, the mobility solutions sector presents a greater prominence, reaching about 58% of total sales, followed by the area of consumer goods representing 27%. On the other hand, with less impact, the Industrial Technology sector and the Energy and Building Technology sector represent 7% and 8%, respectively, as shown in Figure 8.

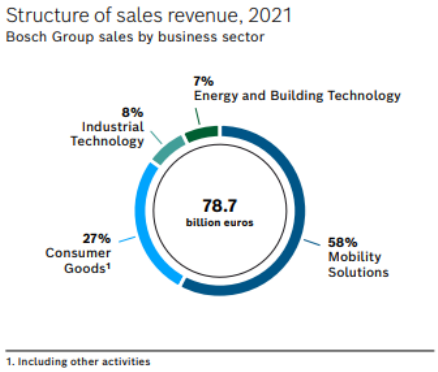

Figure 8 - Structure of sales revenue per business sector, 2021

In what concerns the structure of sales revenue per region, Europe was the most prominent representing 53% of all sales, amounting to 41.3 billion euros; Asia Pacific 31% and lastly Americas with 16%, as shown in Figure 9.

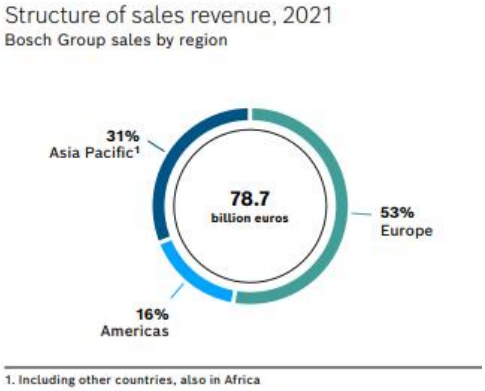

Figure 9 - Structure of sales revenue per region, 2021

3.2 Bosch Portugal

With four locations where it develops and produces a wide range of products, Bosch made its debut on Portuguese soil in 1911 and is currently among the most well-known businesses there. Bosch Thermotecnhology in Aveiro, Bosch Car Multimedia S.A. in Braga, and Bosch Security Systems in Ovar develop and produce hot water solutions, car sensors and multimedia, and security and communication systems, respectively. All three companies are driven by an innovative vision and are focused on technological innovation. Lisbon serves as the location of the Group's national headquarters, where operations in the areas of marketing, accounting, communication, sales, and human resources are conducted. In addition, BSH Appliance, a subsidiary of the business, is located in Lisbon. Bosch, one of Portugal's largest industrial employers with about 5,840 workers (as of 2021), generated €1.7MM in sales in 2021 (*Bosch Internal Communication*, 2021).

3.2.1 Bosch Car Multimédia Portugal, S.A – Braga

With the opening of the Blaupunkt factory in 1990, this unit's history in Braga officially began. The unit at that time assumed a position of significance for the region and the nation by focusing on the manufacturing of car radios and aftermarket accessories. With the changing demands of the automotive market, the brand was sold in 2009, and this division was reorganized to become Bosch Car Multimedia Portugal, S.A., which is focused on the development and manufacture of infotainment systems, instrumentation, and security sensors for the automotive industry. Due to the demand for more complex technologies, Bosch and the University of Minho signed the largest innovation partnership in Portugal in 2012. Currently, the Automotive Electronics division is home to the Braga unit. One of Bosch's centers for the creation of solutions for connected and autonomous mobility is housed in this same unit and has more than 350 engineers. The company, which stands out for having a qualified workforce, employs more than 3500 people in Braga as of 2019.

3.3 Bosch Production System

The Bosch Production System (BPS) utilizes a systematic approach to enhance the material and information flow of value streams, with the goal of achieving comprehensive, sustainable improvements. The system approach is applicable to the entire value stream, from customer to supplier, and necessitates the involvement of all functions involved in the order fulfillment process, such as production, maintenance, quality, logistics, and others.

The BPS System Approach, Figure 10, consists of three steps:

1. System CIP
2. System CIP Projects and Point CIP
3. Daily Leadership Routines

The primary objective of the System Continuous Improvement Process (CIP) is to gain a comprehensive understanding of the needs and opportunities of the value stream, establish a clear focus, and define the desired target state for the upcoming improvement cycle. This involves a comparison of the current situation with the value stream vision, as well as an assessment of the internal and external business requirements. These evaluations are used to identify the focal points for the subsequent improvement cycle. The target situation represents the desired state of the value stream at the conclusion of the improvement cycle. The System CIP projects introduce improved or new standards to achieve the target situation, which are then stabilized through Point CIP. After the new standard has been stabilized, it is

integrated into the Daily Leadership Routines. These routines involve periodic checks to verify that the standards are being maintained in the operational system. Furthermore, factual data and figures are gathered during this process, serving as a vital input for the subsequent improvement cycle.

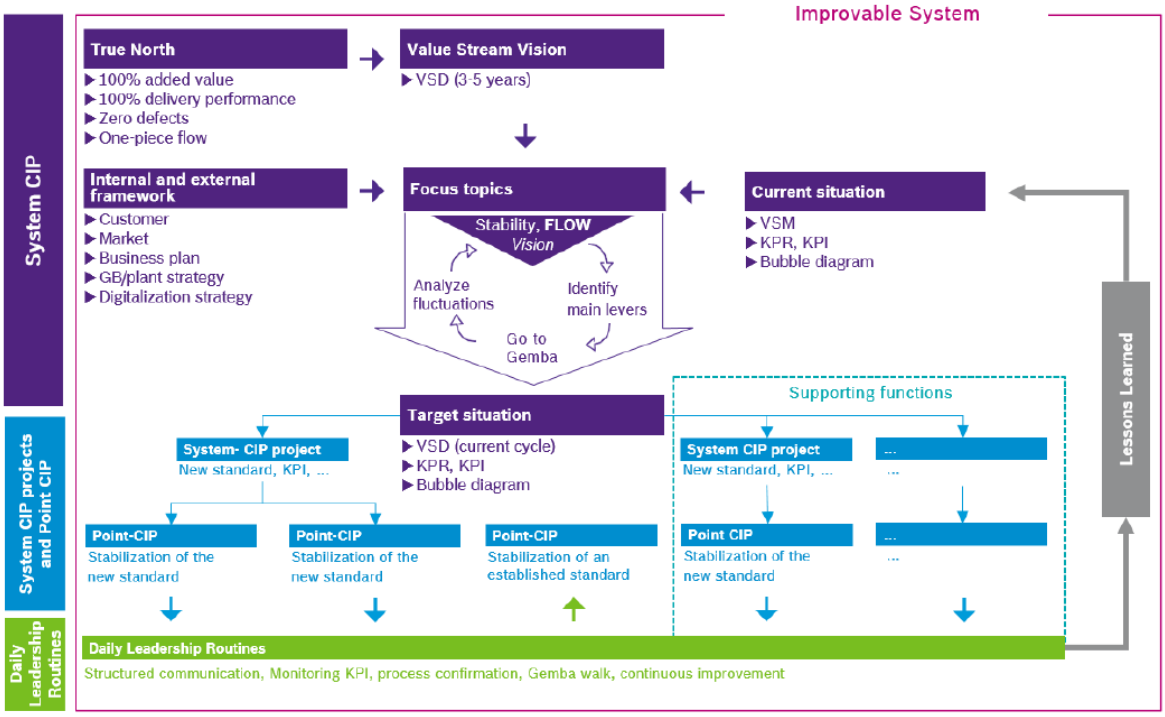

Figure 10 - BPS System Approach

Through the systematic and consistent application of the BPS System Approach, we can establish a continuously improving system while enhancing the clarity of the value stream. Clarity enables the prompt identification of deviations and facilitates a swift understanding of cause-and-effect relationships.

Clarity is present in the value stream when the following characteristics are met:

- Defined data structures, material, and information flows.
- Defined and adhered to standards.
- Processes or stations that are decoupled.
- Transparency.
- Clearly defined roles and responsibilities.

3.3.1 System CIP

The main objective of System CIP is to identify the means to enhance the value stream, promote a stable material and information flow, and achieve competitive costs.

System CIP is a cyclical process that involves recurring improvement cycles. These cycles can be carried out with a frequency ranging from once to six times per year (or every 12 to 2 months). The maturity level of an organization in terms of continuous improvement typically dictates the duration of the improvement cycles, with more experienced organizations opting for shorter cycles.

For every improvement cycle, it is prioritized the most significant challenges faced by the value stream to establish the focus topics. In order to define the focus topics, the following conditions must be met:

- A clear vision for the value stream.
- Understanding of the current situation.
- Understanding of the business requirements.

The three conditions mentioned above, when combined, establish the focus topics for the next improvement cycle. Based on these focus topics, the team then defines the target situation for the upcoming improvement cycle. The target situation should reflect the expected outcome of the defined System CIP projects following their implementation

<u>The True North and the Value Stream Vision</u>

The True North characterizes the waste-free order fulfillment process. It is defined in Figure 11:

Figure 11 - True North

The waste-free order fulfillment process is a value stream that exclusively performs value-added activities with a focus on minimizing waste. This process is designed to deliver all orders to the customer's satisfaction, with the right product, in the correct quantity, at the appropriate time, with the appropriate

quality, and at the right location. In this process, parts move through the value stream without any delays, and all errors are prevented to eliminate the need for detection.

To challenge the setup of the value stream and create its vision, True North is used as a reference point. The value stream vision is an intermediate stage that bridges the gap between the current situation and the ultimate goal of True North. This vision pertains to the ideal arrangement of the value stream over a medium-term horizon (i.e., 3-5 years) with respect to both material and information flow. The fundamental purpose of this vision is multifaceted, aiming to:

(1) translate the lofty ideal of True North into something that is tangible and achievable;
(2) comprehend and internalize the underlying purpose of the value stream;
(3) harness the principles of BPS to enhance the stability of the material and information flow; and
(4) take a proactive stance to lift the value stream to a benchmark standard.

At its core, the value stream vision stimulates the value stream to establish a reliable flow of material by minimizing waiting times and promoting short throughput times.

The value stream vision is a main input to define focus topics for the next improvement cycle and it consists of three elements:

1. Statement for the purpose of the value stream

- One sentence to motivate/drive the value stream towards excellence (considering the business case).
- States the main strategic focus (not copy of true north).
- Can be explained by everybody.
- Clarity on “How to measure” the effectiveness of the purpose statement including target value.

2. Supporting statements for the value stream purpose

- Several sentences/statements supporting the Purpose Statement.
- The statements reflect the True North and “selected” BPS principles.

3. Value Stream Design (3-5 years)

- Value Stream design reflecting the purpose and supporting statements (no contradiction).
- Can be enriched by other documents (e.g., bubble diagram, KPI trees,...).

Current Situation

The analysis of the current situation is the starting point of our cyclical improvement process. In this step, it is intended to understand how the value stream is set up and performing in the moment of the observation.

Therefore, it all the processes required to fulfill a customer order from the supplier to the customer must be mapped. From observations in the shop floor (Gemba) and data collection out of the IT systems, these processes regarding the material and information flow are described. The knowledge gain from these observations regarding the process fluctuations is taken into account as potential for improvement.

During the Gemba observations and IT data analysis must collected and understand the potential reasons for the process fluctuations to later address as point for improvement. The target is to make our processes capable, avoid material to stop, and generate flow.

The goal is to create a continuous flow of material. To achieve this, it is needed to understand the causes of process fluctuations in order to be able to reduce them later.

The minimum requirements for the current situation definition are:

- Value Stream Mapping (with reference to the Throughput Time).
- Actual values of relevant KPRs and KPIs.
- Bubble Diagram.

Internal and external framework (business requirements)

The internal and external framework reflects the current demands on the value stream to operate competitively and profitably. It is used as input to define the focus topics. Examples for external framework: quantities forecast, customer service level agreement (stock, lead time), competitors benchmark, etc.

Examples for internal framework: Business plan (quality costs and delivery), planned production costs (PPC), budget allocation, division and business unit strategy, IPN System CIP, strategy for VS digitalization, etc.

Focus Topics

The process of determining the focus topics for the next improvement cycle involves three key steps. Firstly, identifying the gaps that exist between the current situation of the value stream and the envisioned ideal state as described in the value stream vision. This entails identifying areas where the value stream falls short of the desired state outlined in the vision. Secondly, identifying the gaps in the ability of the value stream to meet the internal and external framework. This includes identifying areas where the value

stream may not be meeting internal performance requirements or external customer expectations, as defined by relevant benchmarks or standards. Finally, summarizing and prioritizing the identified gaps in relation to the value stream vision and the internal and external framework. This involves consolidating the identified gaps and prioritizing them based on their significance and potential impact on the value stream's performance and alignment with the overall improvement goals. This prioritization helps the value stream associates to have a clear understanding of where to focus their efforts in the next improvement cycle.

When there is a contradiction between the internal and external framework and the value stream vision, it is essential to resolve this contradiction. However, considering the limitations of resources and the logical sequence of steps to move towards the value stream vision, prioritization of focus topics is crucial for each improvement cycle. Typically, 2 to 3 focus topics are considered appropriate for one improvement cycle, taking into account the capacity and capabilities of the team. The value stream leader plays a key role in agreeing with the team on the focus topics for the next improvement cycle. These focus topics may vary from cycle to cycle, as they are determined based on the current priorities, challenges, and opportunities identified in relation to the value stream vision and the internal and external framework. Careful consideration of available resources, logical sequencing, and alignment with the value stream vision is necessary to ensure effective prioritization of focus topics for each improvement cycle.

Target Situation

The target situation encompasses the anticipated outcome of the System CIP projects once they are implemented. In order to define the target situation for the next improvement cycle, an iterative process is undertaken to identify actions that will reduce the gap to the focus topics. Throughout this iterative process, the emphasis should be on finding solutions that enhance the stability of the material flow along the entire value stream. In Figure 12 is represented the process to come to the target situation.

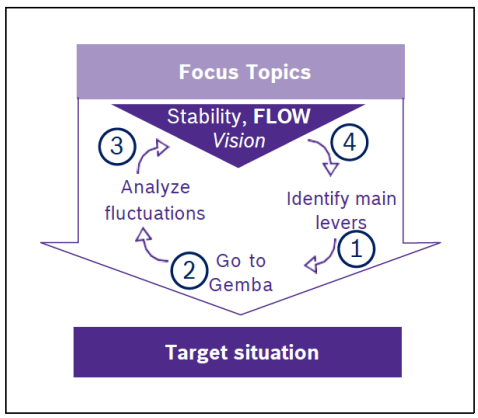

Figure 12 - Process to come to the target situation

1. Identify the main levers/potentials to the related focus topic (e.g., KPI trees, VSM, etc). This step will guide us closer to the area of improvement giving a first indication about which processes are not performing or have higher potential.
2. Know the situation on Gemba. We go to the potential areas of improvement and understand the situation at Gemba by observing, walking around, interviewing people in the shop floor, doing process analysis, etc... While at Gemba, we learn how the process is actually running and get the user experience. The deviations/abnormalities, which lead to fluctuations in the process, as well as observed potential opportunities, are collected.
3. Analyze process fluctuations and potentials. The wide range of observed and collected data at Gemba allows us to see behind average values and have a better understanding on how/where to act. This gained knowledge on a process level allows the team to generate and list down hypotheses, which are the potential System CIP projects. Data out of IT systems can support to improve the quality and speed of the analysis and to understand the historical behavior of the processes.
4. The generated hypotheses are evaluated (effort, benefit) including the potential contribution to the focus topic. The result of this evaluation supports the decision for prioritizing the System CIP projects. The prioritized and defined System CIP projects must improve the stability of the processes to generate flow and bring the value stream closer to the value stream vision.

At the end of this iterative process, the prioritized System CIP projects and their contribution to the focus topics in a project list is summarized. The overall expected result out of the implementation of this project list defines the target situation at the end of the improvement cycle.
The minimum requirements to define the target situation are:

- Value Stream Design at the end of the improvement cycle (with reference to the Throughput Time development).
- Expected relevant KPRs and KPIs.
- Bubble Diagram.

3.3.2 System CIP projects and Point CIP

The result of the system CIP is the target situation of the value stream. The target situation is achieved by implementing new or updated standards into the value stream. Through system CIP projects, we develop standards and implement them. As soon as the standards have been validated and implemented,

we stabilize through Point CIP. Point CIP ensures that the defined target conditions are maintained in a stable manner. As soon as the new standards are stabilized, the projects are closed and the standards are handed over to Daily Leadership Routines.

The aim of the System CIP project is to implement a new standard to improve and stabilize the performance of the value stream. Therefore, after the deep understanding of the current situation, a target condition must be defined for each System CIP project. The target condition is described by:

- Key Performance Indicator (KPI) to measure the initial and target performance of the standard.
- Stability criteria, which defines the allowed fluctuations of the KPIs (intervention limits) during a specified time period.
- New or updated standard.

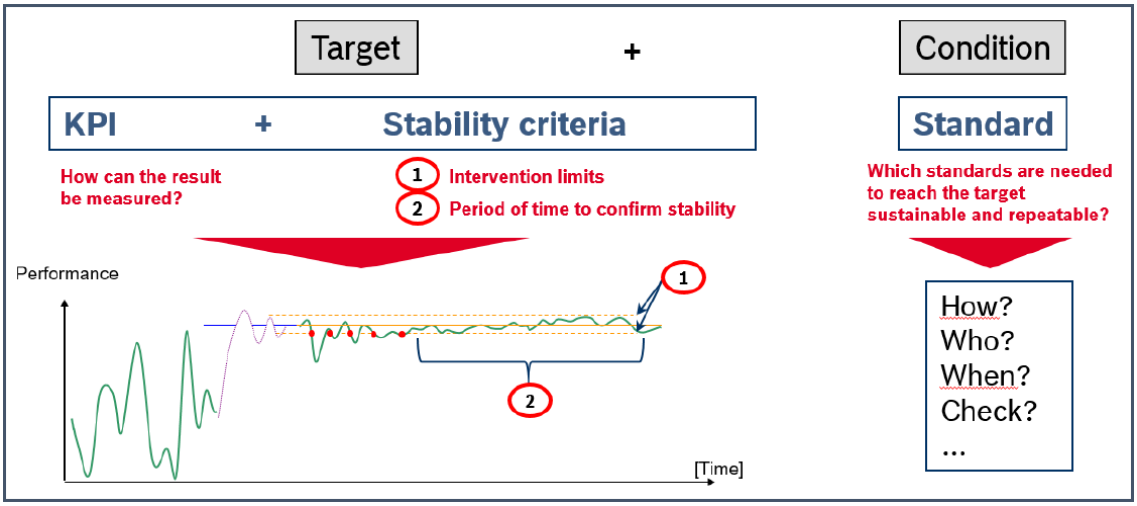

Figure 13 - Stability Criteria

Before the start of each System CIP project, the project leader must collect the information out of the System CIP. Together with the project team, the project leader takes the responsibility for the execution of the System CIP project ensuring the realization of the following steps:

- Project preparation.
- Analysis of the current situation.
- Development of the new standard.
- Validation of the new standard.
- Training on the new standard.
- Implementation of the new standard and handover to Point CIP.

The System CIP Project is finished after the implementation of the new standard. The stabilization phase follows until the target condition of the project is achieved through Point CIP.

Project preparation

As preparation of the System CIP project the project leader must ensure that he has a clear understanding of the expectations of the stakeholders (normally value stream leader), therefore he can understand the project needs in terms of resources and competences.

Analysis of the current situation

The team takes the information collected by the project leader during the project preparation as a starting point. To understand the current situation, the team members go and check the process at the shopfloor (Go to Gemba). They must be able to reproduce the deviation/problem/situation as far as possible to ensure that they have the understanding of the problem/situation at a root cause level. lot of different inputs are collected from the Gemba observations. It is very important that the team is able to communicate in such a way that all the team members can understand and explain it to everybody. Several tools can support in the communication of the data collected/ observed in the shopfloor: machine and process data basis, KPI trees, VSM, Bubble Diagram, Layout, Pareto, Fishbone analysis, process analysis, etc....

Development of the new standard

With the understanding of the root cause of the problem/topic, the team is now able to generate ideas on how to come up with the possible solution (hypothesis). There are often different solutions for the same topic and more than one can be combined to come up with the best possible solution. It is very important at this moment that the team tries out the hypothesis on the shop floor to get the feedback from the system. The expectation is that the team knows and reflects the cause-effect relationships of the tried hypotheses in the development of the new standard. While developing the new standard it is highly recommended to involve the users of the standard and consider their knowledge.

Validation of the new standard

Once the standard is generated, there is the need for validation in the real environment and in an extended time frame. The target is to understand the behavior of the complete system when the new standard becomes part of it. The project team defines and agrees on a validation plan together with the standard

owner. It is recommended to involve the responsible person for the execution of the standard in this step. During the validation phase, the standard is running under special supervision of the project team and standard owner to ensure that there is no negative impact in other areas of the value stream, as well as to collect inputs to revise or fine-tune the new standard.
As part of the validation plan different aspects must be defined:

- Standard for validation.
- Training for validation.
- Responsible persons for the validation.
- Validation criteria (how do we accept the standard as successfully validated, indicators, time fame, which shifts).

Latest while describing the validation plan, the project team must be able to describe the stability criteria of the System CIP project on an improvement KPI level. The standard is considered validated when the validation criteria were successfully achieved. The learnings out of the validation phase must be used to update the description of the final version of the new standard before implementation. The value stream leader and standard owner must take part in the analysis of the results of the validation phase. They will accept and release the standard for implementation.

Training on the new standard

After the validation phase, we define a training plan and agree it with the standard owner and responsible for the execution of the standard. Different aspects must be considered while defining the training plan:

- Standard for training.
- Training method.
- Training participants.
- Training period.
- Criteria to consider the training successful.

Implementation of the new standard and handover to Point CIP

The following prerequisites must be fulfilled for the introduction of the new standard:

- Hardware and/or software changes are completed.
- External validations are concluded: customer approval.
- Internal agreements are concluded: ergonomics, safety, quality check, FMEAs.

- Documentation is available.
- Users of the standard are trained.
- All relevant persons in the value stream are informed.
- Point CIP working documents are produced.

Once the above conditions are fulfilled the handshake from the project team to the Point CIP leader can be done.

The Point CIP leader leads the stabilization of the new standard through Point CIP. It is recommended to document the handshake with the Point CIP leader.

Point CIP

The aim of Point CIP is to achieve the stability of the standard in the new target condition after the handshake from the System CIP Project. During a defined time, the Improvement KPI has to perform within the defined intervention limits.

The 5 elements of Point CIP

Led by the Point CIP Leader, Point CIP requires the project team to frequently meet and quickly react to deviations, sustainably solving the problems aiming to bring the Improvement KPI back within intervention limits. The project team now takes the role of cooperation and supports the Point CIP Team in the stabilization of the new standard within Point CIP.

The following five elements, in Figure 14, must be used within Point CIP:

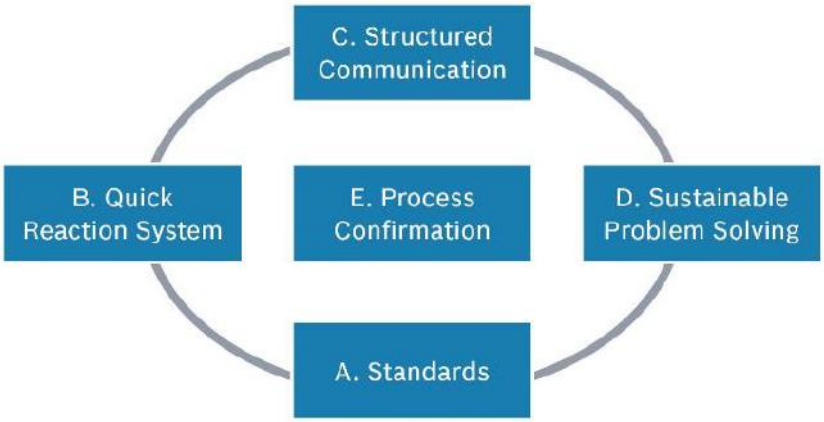

Figure 14- Five Point CIP elements

A - Standards - the standard implemented during the System CIP project is the basis and the focus of the Point CIP. The definition of improvement KPIs is important to measure the performance of the standard and understand deviations to the standard.

B - Quick reaction system - every single deviation to the standard (out of reaction limits) must have a quick reaction. The reaction to deviations may be different from case to case and even different competencies may be required. It is therefore relevant to have a defined systematic to react to the deviations where roles and responsibilities are clearly defined.

C - Structured communication - communication is a crucial factor for success. To share the findings, progress and result of the other Point CIP elements, regular and structured information exchange shall take place. Focus on bringing the KPI into the intervention limits, the relevant functions meet on a defined and short frequency to check the process confirmation and open points status. It is not the target of these meetings to look for problems' root causes and further analysis. The responsible team member for the root cause analysis must be addressed.

D - Sustainable problem solving - as the target is to stabilize the standard, the elimination of the deviations is very important. All the deviations from the standard must be understood at a root cause level and measures to eliminate the cause must be executed immediately.

The usage of problem solving tools (e. g. problem solving sheet, 8D, 5 Whys, fishbone, etc.) can support the root cause analysis of the problem as well as tracking the progress and effectiveness of the defined measures.

E - Process confirmation - the process confirmation of the new implemented standard is the method to check how the standard is performing in reality on Gemba. While doing a process confirmation, we can:

- Recognize deviations/opportunities to the standard.
- Ensure the adherence to the standards by the associates.
- Qualify the management to train and support their associates.
- Ensure that management levels know the standards and train the associates accordingly.

Lead questions are defined within Point CIP to guide on checking if the standard is adhered to. These lead questions are specifically defined for the new standard and referring to its crucial steps. If any of these lead questions are relevant to keep the standard running they must be integrated in the process confirmation of the Daily Leadership Routines.

3.3.4 Daily Leadership Routines (DLR)

The target of all DLR is to maintain existing standards or to go back to the standard as soon as possible. Working according to defined standards leads to expected, stable and sustainable results in Safety (S), Quality (Q), Cost (C), Delivery performance (D). Deviations from standards lead to defined actions to go back to the standard. DLR describe the behavior and interaction of the organization to maintain the standards and to deal with deviations. The leadership functions have to ensure the usage and effectiveness of the DLR.

Scope of Daily Leadership Routines

Daily Leadership Routines:

- Must be applied in all MTS (make to stock) and MTO (make to order) value streams in every plant and every RB operated plant warehouse (integrated in plant organization).
- Are mandatory for all value stream sections: Source, Make and Deliver.
- Are recommended for all ETO (engineer to order) value streams and the remaining RB operated warehouses, e.g., central distribution centers.
- Support dealing with deviations on different leadership levels of a value stream:
    - Station or Operation.
    - Line.
    - Group of lines.
    - Value stream area.
    - Value Stream.

Elements of Daily Leadership Routines

When a target condition has reached stability and sustainability in the Point CIP phase, the new standard is handed over to Daily Leadership Routines. The focus of all DLR is to maintain the implemented standards and react in case of deviations as fast as possible to go back to standard.

Several data sources are used to support the routines. Analogue data sources are sufficient, for the most effective way, a digital database is relied on. Figure 15 shows an overview of the Daily Leadership Routines.

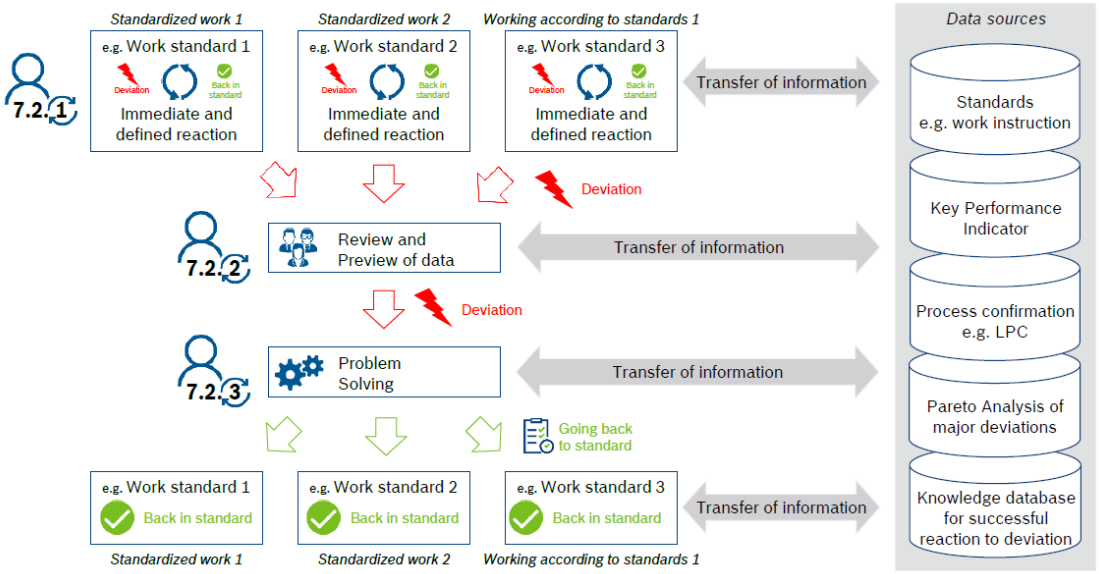

Figure 15 - Overview of Daily Leadership Routines

Standardized work and detection of deviations – DLR1

The first routine builds on the defined standards. In case of a deviation, the responsible person immediate applies the standard reaction. This routine finishes when the standard is back in the defined condition. If this reaction is not quickly possible, perfect within the cycle time, an escalation to the next hierarchy level is in place. The deviation is documented, taken action and results on a Closed PDCA loop. Figure 16 exemplifies the routine.

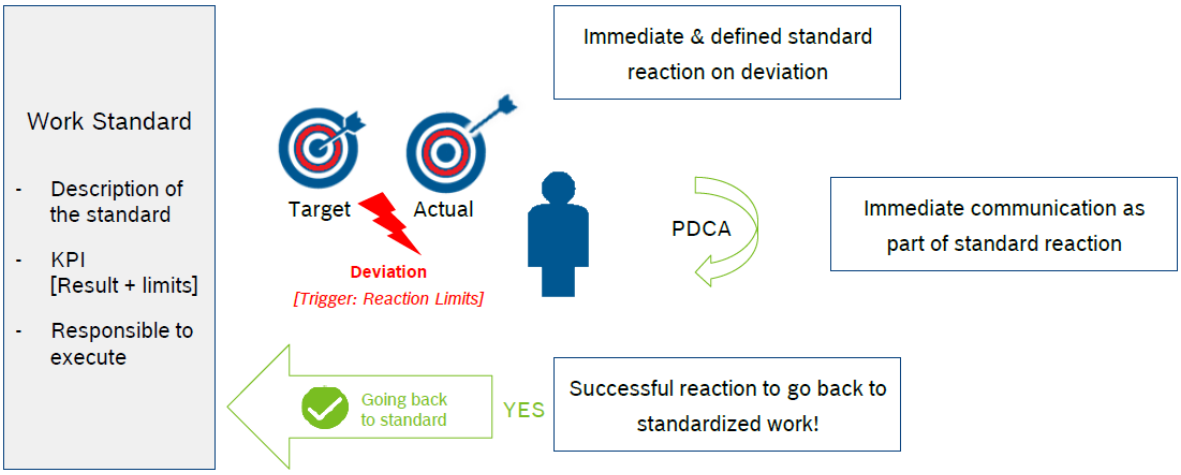

Figure 16 - Execution of a work standard

Possible sources to detect deviations are:

- Self-confirmation of the person who is executing the standard, as part of the work standard

- Self-confirmation of the machine, equipment, sensor as part of work standard e.g. process monitoring
- Process confirmation, e.g. Layered Process Control (LPC)
- KPI deviations at process level, monitoring level, result level

To support the detection of deviations, use visualization at the shop floor. Digital solutions bring additional speed to the reaction to deviations. Following is an example for this procedure:

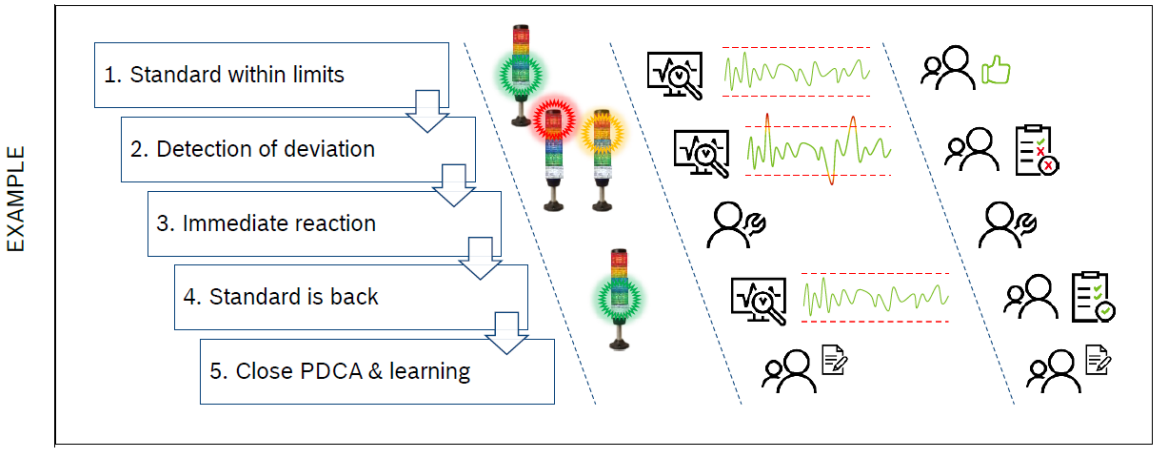

Figure 17 - Visualization of deviations at shop floor

Review and Preview of Data – DLR2

KPI review of SQCD are needed to detect deviations and continuously track the status of the dedicated countermeasures.

The review of collected data of the past production day is collected and a preview for the following production day at all hierarchical levels of the value stream. A daily review/preview meeting is mandatory for each area of the value stream. In case there is no area in the section Source or Deliver, it is mandatory for the section itself. We call this meeting, Daily Morning Meeting (DMM). Figure 18 and Figure 19 show the characteristics of such a daily review / preview meeting of a Make area and a Source / Deliver section:

Characteristics	Definition for Make	Definition for Source / Deliver
Trigger	Fixed routine	Similar to Make
Information input	• Target figure - actual figure e.g., KPI, HC Report, process confirmation • Actions taken incl. result and success • Possible risks	Similar to Make

Figure 18 - Data Review and Preview of Data

Characteristics	Definition for Make	Definition for Source / Deliver
Action	• Structured monitoring of SQCD-KPI. • Prioritization and assignment of deviations to a responsible person • Definition of topics for problem solving activities (e.g., Gemba walk) • Risk evaluation for current day (e.g., availability of components, sustainability of implemented solutions, effects of detected deviation) • Tracking of OPL → Fulfillment of single PDCA-steps (Plan-Do-Check-Act)	Similar to Make
Location	In the value stream area	Similar to Make
Review period Preview period	Last production day Current production day (in case of limited preview period, adjust time accordingly)	Last working day Current working day (in case of limited preview period, adjust time accordingly)
Expected result	• Defined and documented measures and responsibilities • Updated OPL	Similar to Make
Responsible	Value stream area manager (highest leadership level in the value stream area) → Leading the routine	Similar to Make
Functional support	Manufacturing operations and planning, logistics, quality and maintenance → Contribute data, information and status of running activities; clears responsibility for assigned task	Logistic operations and planning on demand: quality, maintenance → Contribute data, information and status of running activities; clears responsibility for assigned task
Management support	Value stream leader, Group Leader → Coaching, prioritization and approvals	Value stream leader, Group Leader, Logistic head of department → Coaching, prioritization and approvals
Information output	OPL: • Documentation of new assigned activities • Documentation of progress/fulfillment of single PDCA-steps for assigned activities	Similar to Make
KPI-Level	Monitoring- and/or Improvement KPI, selection and calculation according description in chapter 7.3	Similar to Make
Name	Daily Morning Meeting (DMM)	Similar to Make

Figure 19- Data Review and Preview of Data (continuation)

Problem Solving – DLR3

While Review/preview meetings prioritize the problems, assign them to responsible persons and track them with an OPL. The Daily Morning Meeting must not be used for problem solving. This routine describes how problem-solving activities should be organized. Problem solving activities aim to go back to standard as fast as possible. Therefore, the problem-solving activities with focus on achieving sustainable solutions should happen within a short time frame (e.g., next 24h). Figure 20 and Figure 21 show the characteristics of any problem-solving activity in Daily Leadership Routines.

Characteristics	Definition for Source / Make / Deliver
Trigger	Defined and assigned task (in OPL)
Information input	• Target figure - actual figure (e.g., KPI, HC Report, process confirmation) • Actions taken so far incl. result and success (all related to assigned task) • Possible risk

Action	• Investigate problem in depth and define measures to go back to standard
	• Leading questions are:
	  ○ Do we understand the standard?
	  ○ Do we understand the deviation?
	  ○ Do we understand the (counter-) measure?
	  ○ Do we understand the result?
	• Choose appropriate problem solving method e.g., Problem Solving Sheet (PSS), A3, Shopfloor Management Cycle (SMC) according to MM-630.17 Shopfloor Management Cycle (SMC) and MM-641.03 8D Problem Solving.
	• Use Point-CIP method for stabilizing the updated standard if necessary

Location	At the point of deviation/problem (e.g, at the station, machine; shipping area)
Expected result	• Standard back in target condition (Problem solved) • Defined and documented measures and responsibilities
Responsible	Defined person of the area (by Daily Morning Meeting) → Leads the activity
Functional support	All required functions e.g., manufacturing operations and planning, logistics, quality, maintenance, controlling →Contributes in the problem solving activity with data, knowledge and experience out of the respective function

Figure 20 - Details Problem Solving within DLR

Characteristics	Definition for Source / Make / Deliver
Management support	All required hierarchy levels → Coaching, prioritization and approvals
Information output	• The result of any problem solving activity must be reported in the DMM. (Feedback to OPL) • The PDCA loop must be closed. • Problem solving documentation through e.g., A3 sheet, PSS • Lessons learned (Input for knowledge database)
Recommendation for performing the activity	Problem solving activity after Daily Morning Meeting with fixed time frame at Gemba E.g., Problem solving at the point of occurrence at 09:30 – 10:30 (see figure 15)

Figure 21 - Details Problem Solving within DLR (continuation)

3.3.5 Overview

Figure 22 shows a general overview of the link between System CIP, from System CIP, passing through System CIP Projects & Point CIP, until the Daily Leadership Routines.

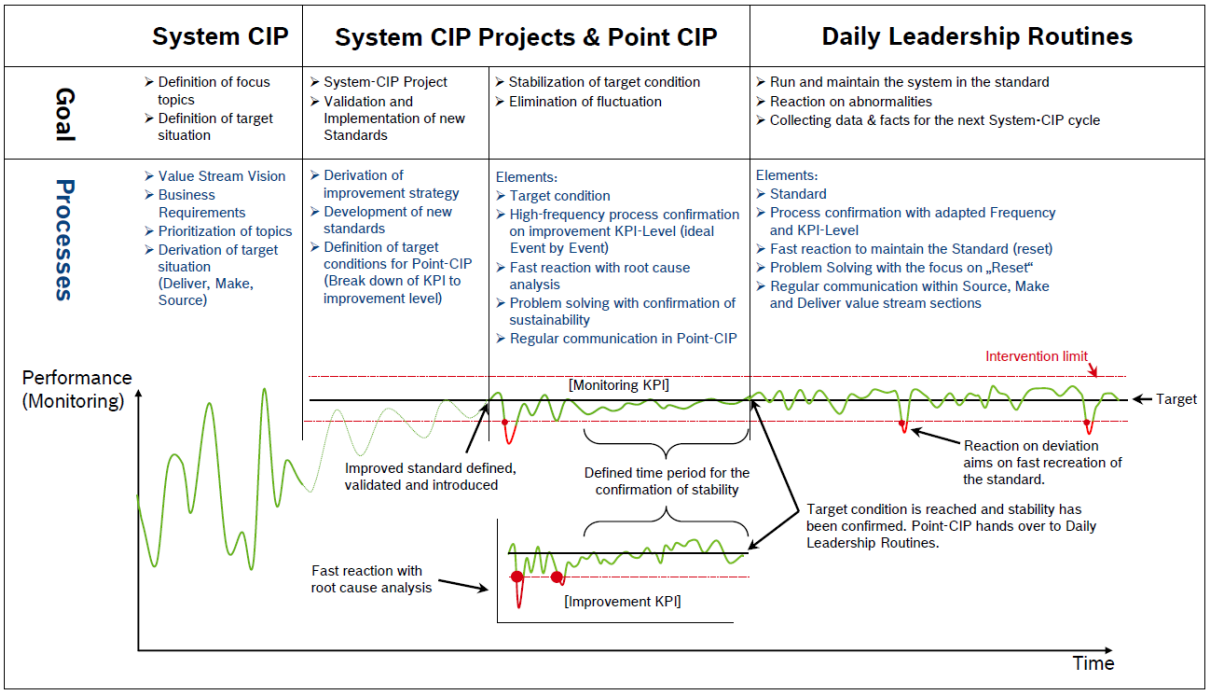

Figure 22 - System Approach overview

3.4 BPS Maturity Assessment

As part of the BPS Assessment, the entire Value Stream from the Customer to the Supplier is evaluated. The structure of the Assessment is based on the Value Stream and is divided into the areas "Source" (Supplier), "Make" (Production) and "Deliver" (Customer), and a higher-level section "Value Stream". The higher-level section deals with the target derivation and methods relating to the overall Value Stream.

In addition to the specific questions on the individual areas, great importance is also attached to the subject of "Continuous Improvement"

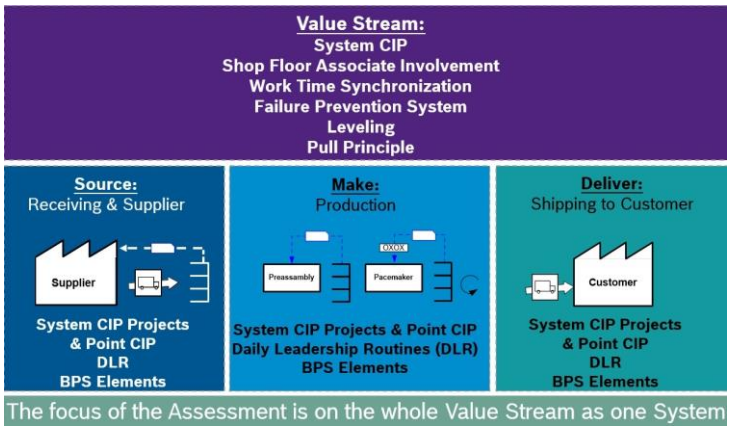

Figure 23 - Structure of the BPS maturity assessment

The BPS Maturity Assessment consists of 20 question classes and covers the content of the core BPS elements.

The four maturity levels which could be reached can be characterized as follows:

- Level 1: “BPS Implementation” (BPS Essentials) – basic elements are introduced
- Level 2: “Improvement Organization” – specific improvement activities are identified on the basis of existing standards
- Level 3: “Self learning Organization” – closed PDCA cycles are completed at system level
- Level 4: “Lean Enterprise” (True North)

4. Research Methodology

The research methodology employed in this master dissertation was an action research approach, centered around the collection of data through observation and interviews conducted with Value Stream Managers. This approach was chosen to delve into the intricacies of Value Stream Management, its challenges, and potential solutions. By engaging with individuals responsible for the value chain processes, valuable insights were gained regarding their roles, responsibilities, and the dynamics of their work environment. Action Research can be defined as a process of experiential learning, where theory is developed through active engagement with the social system. This occurs through the execution of planned actions, followed by thoughtful reflection on the outcomes and implications of those actions (Susman & Evered, 1978). Hence, the process of Action Research can be broken down into five distinct phases according to Ghodsypour & O’Brien (1998):

1. Diagnostic Phase: This initial stage involves the identification of problems and the collection of relevant data. Various tools such as workshops and surveys are employed to identify and assess the issues faced by the group.
2. Action Planning: In this phase, potential solutions are formulated. It's the Design Phase, during which proposals for improvements are created based on the problems identified in the previous stage.
3. Implementation: This phase involves the execution of planned actions. During the Implementation Phase, the initial measures, usually the simpler ones, are put into action.
4. Evaluation: This phase entails the collection and analysis of results. As the implemented measures take effect, ongoing verification and analysis of the outcomes are carried out.

5. Learning Specification: The final phase involves interpreting the findings. The results are compiled, focusing either on the productivity gains achieved or on the assessment of the maturity of the system, particularly in terms of Learning Management Systems (LMS).

The data collection process involved a two-fold strategy:

1. Observation: Observational data was acquired by closely monitoring the day-to-day activities of Value Stream Managers within Bosch Car Multimedia. This provided a comprehensive understanding of their tasks, decision-making processes, and challenges they encounter while striving for process optimization and waste reduction.
2. Interviews: In-depth interviews were conducted with Value Stream Managers to extract their perspectives, experiences, and insights. These interviews served as a platform for them to share their thoughts on the challenges they face in coordinating responsibilities, data availability, and the need for continuous improvement.

The integration of both observation and interviews enabled a holistic view of the Value Stream Manager role and the challenges faced in real-world manufacturing settings. With the collected data, a comprehensive analysis was carried out. Thematic analysis was employed to identify recurring patterns, challenges, and potential solutions articulated by the Value Stream Managers. By combining insights from both the observed activities and the perspectives shared in interviews, a multifaceted understanding of the issues at hand was developed.

This research methodology proved to be effective in unraveling the intricacies of Value Stream Management within an automotive component manufacturing environment. The integration of observational data and direct input from practitioners provided a well-rounded foundation for addressing the research questions posed:

1. "What are the key responsibilities of a Value Stream Manager, and how can their role be defined to ensure effective implementation of lean principles and continuous improvement in an automotive component manufacturing environment?"
2. "What are the benefits of effective scheduling and defining responsibilities for Value Stream Managers, and how can these benefits be measured?"

The utilization of observation and interviews as primary data collection methods allowed for a thorough exploration of these questions and paved the way for meaningful insights and recommendations to enhance Value Stream Management practices.

5. Case Study

There is a difficulty for VSMs to coordinate and analyze VS KPIs on a Daily/Weekly basis, understand deviations and stability of standards, and allocate time for continuous improvement in order to achieve business and market goals. The Value Stream Managers have some defined tasks but they perform them differently, without a standards/guidelines and agenda. There is a difficulty in coordinating the function of section manager with that of Value Stream Manager due to lack of time. Quite often the data needed for analysis is missing, or not available in time. With this project it is intended to define a detailed agenda with each necessary task to be accomplished, and to define standards and/or guidelines for each task. Ensuring that their tasks are performed in a more optimized manner and that the difficulties encountered no longer exist. A number of tasks performed by at least a large portion of Value Stream Managers have been identified. This chapter is divided by these tasks, and for each of them a description of the current situation, the target condition, the deviations between the current situation and the target condition (analysis), and the improvement proposals are included.

5.1 DLR 2 DMM

5.1.1 Current Situation

DMM (Daily Morning Meeting) are meetings that take place every day, Monday through Friday, with a duration of 30 minutes, in the Gemba, on the first shift, between 8:30 and 9:00 am. These are included in the DLR2 (Daily Leader Ship Routines 2) related to structured communication. According to the general factory calendar, there are two daily DLR2 (DMM) meetings, one per line or line group and one at area level. At the moment only one of these meetings takes place, the one for the line group. The person responsible for this meeting is the Value Stream Manager himself, who should assume the moderation of the meeting, although in some Value Streams it is the Team Leaders of the lines who assume this role. The DMMs, according to the current standard, have as objectives the analysis of deviations from monitoring KPIs, which are

- Accidents (Safety)
- Internal Defect Costs (Quality)
- OEE (Costs)
- Levelling Performance (Delivery)
- Process confirmation

In addition to the analysis of these deviations, it is also intended that an analysis of the definition and planning of corrective actions will be carried out, and feedback will be given on open points. The meeting must be attended by the group section manager/VSM, group team leaders, group quality engineers, maintenance team members and the production planner. Absences from this meeting without justification are frequent, and the planners are rarely present. Figure 24 shows an example of these meetings.

Figure 24 - Multidisciplinar team in a DMM

With the implementation of BCore BETA, which is a production support software, DMM meetings are now supported by the BCore BETA DLR menu. The meeting begins with the registration of the attendance list (Figure 25), marking with a tick the participants present. If someone is present who is not on the defined list, the person must be added manually. In other meetings observed, this attendance list is only filled in at the end.

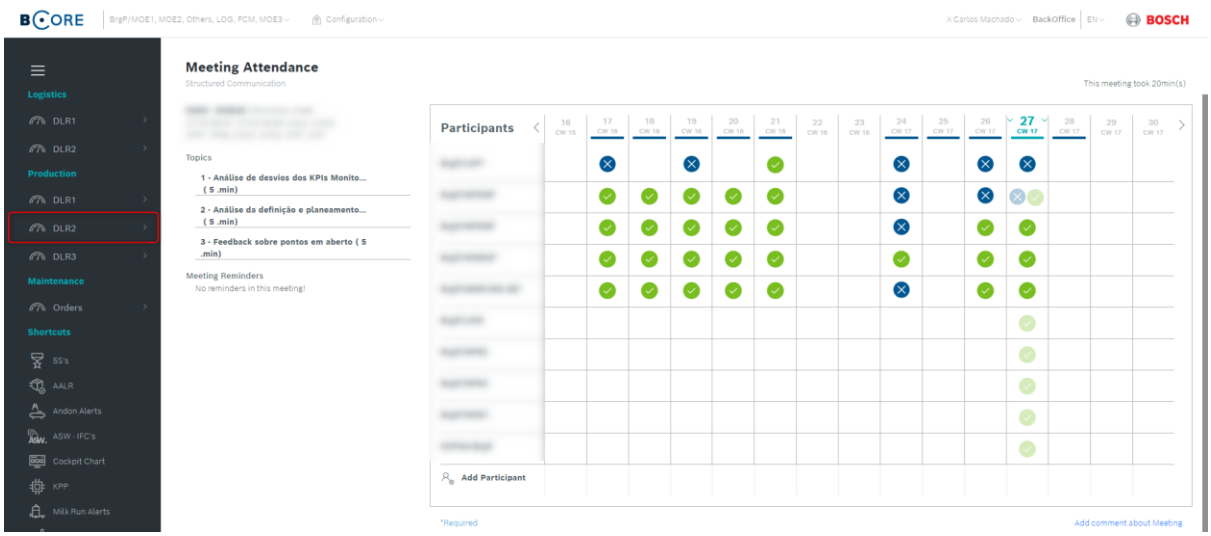

Figure 25 - Meeting attendance BCorebeta

Then we proceed to the analysis of the KPIs as shown in Figure 26. In safety issues, accidents in the area are addressed, and if there are none, this information should be passed on. In the quality factor should be addressed the line scrap, in costs the OEE of the line and in delivery should be evaluated the levelling performance. Since BCore Beta does not yet support the KPI related to delivery, there are few Value Streams in which this indicator is addressed. Finally, area line rejection (IRR) data should be addressed. In case there is any deviation in the previous topics there must be an associated point in the OPL of the BCore Beta. This KPI analysis is fairly quick and only addresses whether the line is outside or inside the defined target. A brief justification is sometimes given for deviations, but the standards that were not met, or the deviations from the standard, are never mentioned.

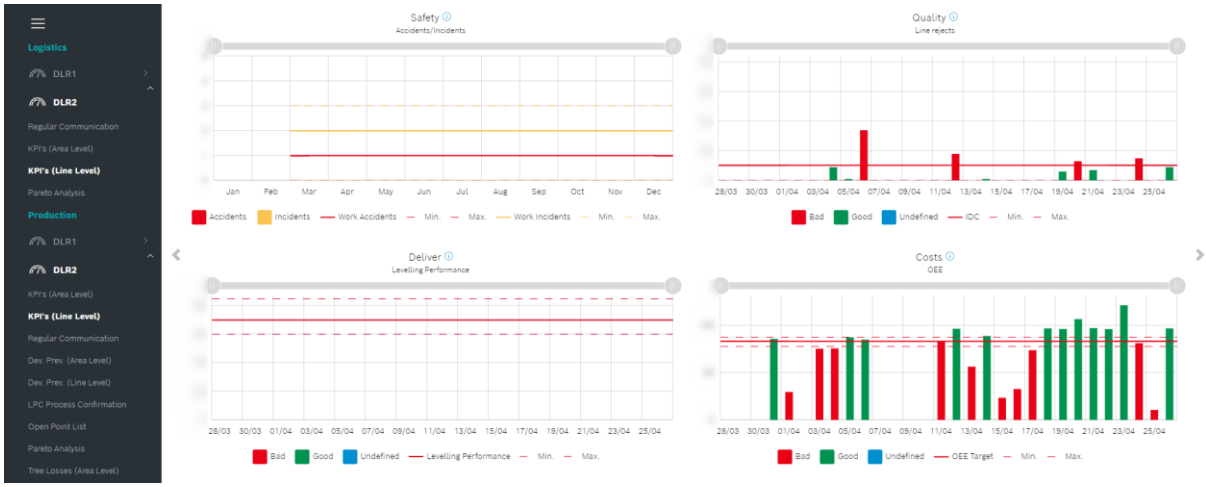

Figure 26 - KPI Analysis BCorebeta

Once the KPIs are addressed, the Dev. Prev. page presented in Figure 27, which contains the problems that occurred in the lines when the reaction limits are exceeded, is opened to expose these problems. The points present on this page are associated with a type of loss, a KPI affected, and where or why this deviation occurred (workstation, maintenance stoppage). Automatically, whenever a defined reaction limit is exceeded, a point is opened on the OPL.

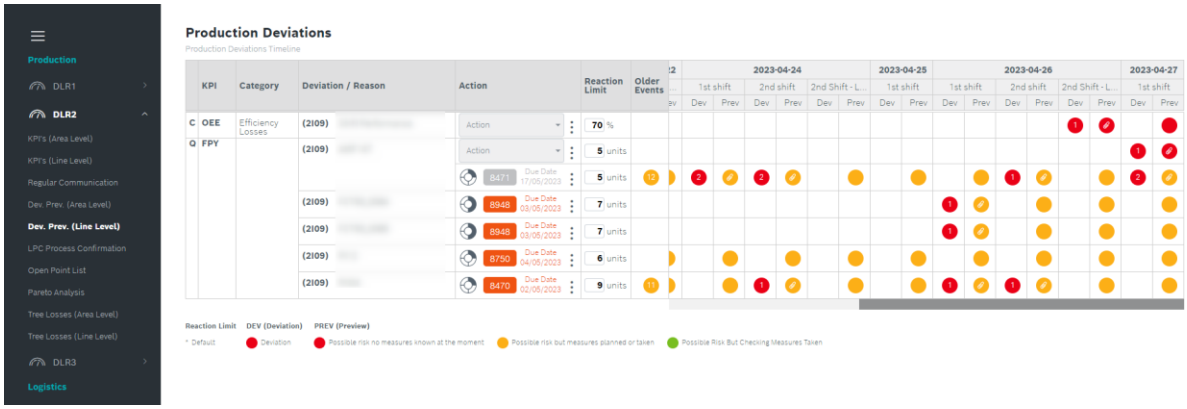

Figure 27 - Dev. Prev. BCorebeta

According to the current standard, after the Dev. Prev. page is displayed, we should proceed, to the page for process confirmation (Figure 28), which rarely happens. This page contains the process confirmations made by the Team Leaders and is displayed to prove that they have been made. When this page is displayed, and there have been deviations in them, they are not addressed or explained. It is usual to find process confirmations that have not been done, or that have been started and not completed.

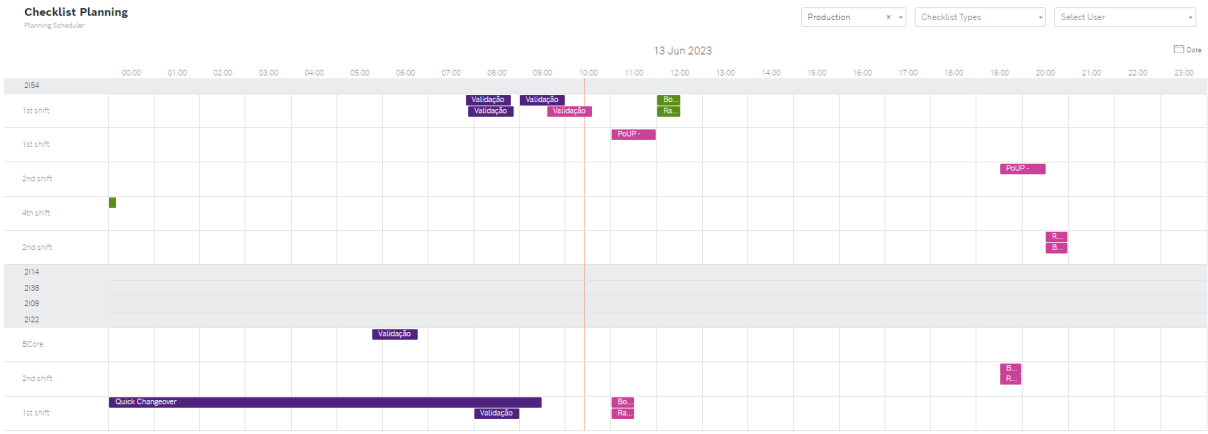

Figure 28 - Process confirmation BCore

Moving on to the Open Point List (OPL), shown in Figure 29, which works with the PDCA cycle for the resolution of the identified problems. Normally after opening the Dev. Prev. the OPL analysis follows, although this is not what is defined in the standard. According to the current standard, the new points of the area must be quickly presented and the responsible people must be asked for the Plan dates. Sometimes this new date is not requested or the responsible person is not at the meeting. In case the responsible person is not on the mandatory attendance list, he/she should be called in advance to the meeting. For items with a Plan date on the day or overdue, the responsible person should be asked about the status of the item and the status of the item should be updated at the time of the meeting for Do. In several DMMs attended there are some points with the date passed and nothing is done at the moment, and this change is only made at the end of the meeting by the Team Leader. This OPL is often forgotten, with numerous open and overdue points. It is evident that there is a lack of prioritization of these actions so that they are effectively taken, with no distinction between short and medium term problems.

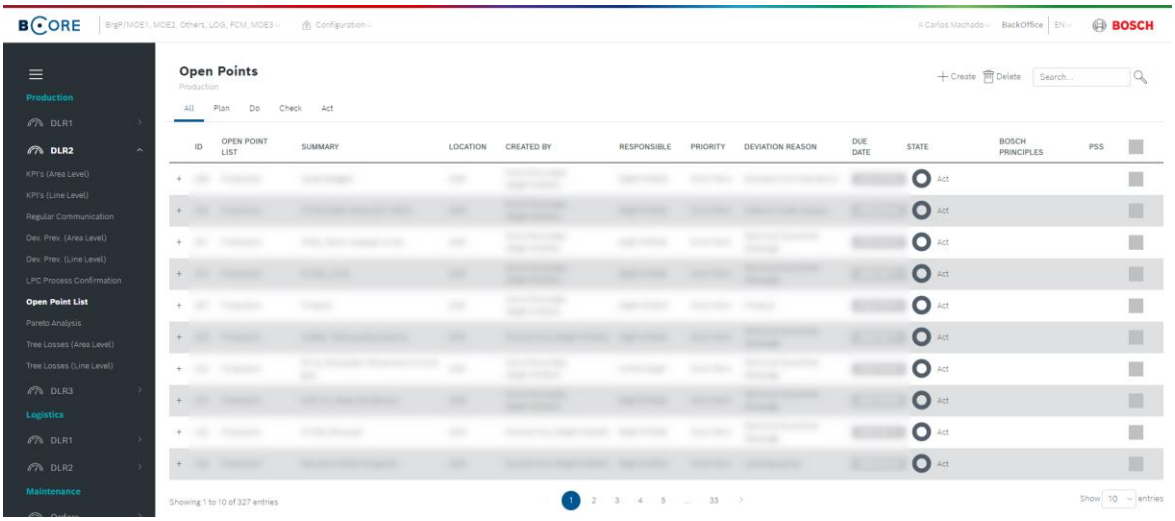

Figure 29 - OPL BCorebeta

The last topic addressed in the meeting, which was evidenced in only two Value Streams, is Pareto analysis to the Top Deviations (Figure 30) of the line and the Tree Losses (Figure 31), used to understand which factors are causing the most deviations in the line.

Figure 30 - Pareto Analysis BCorebeta

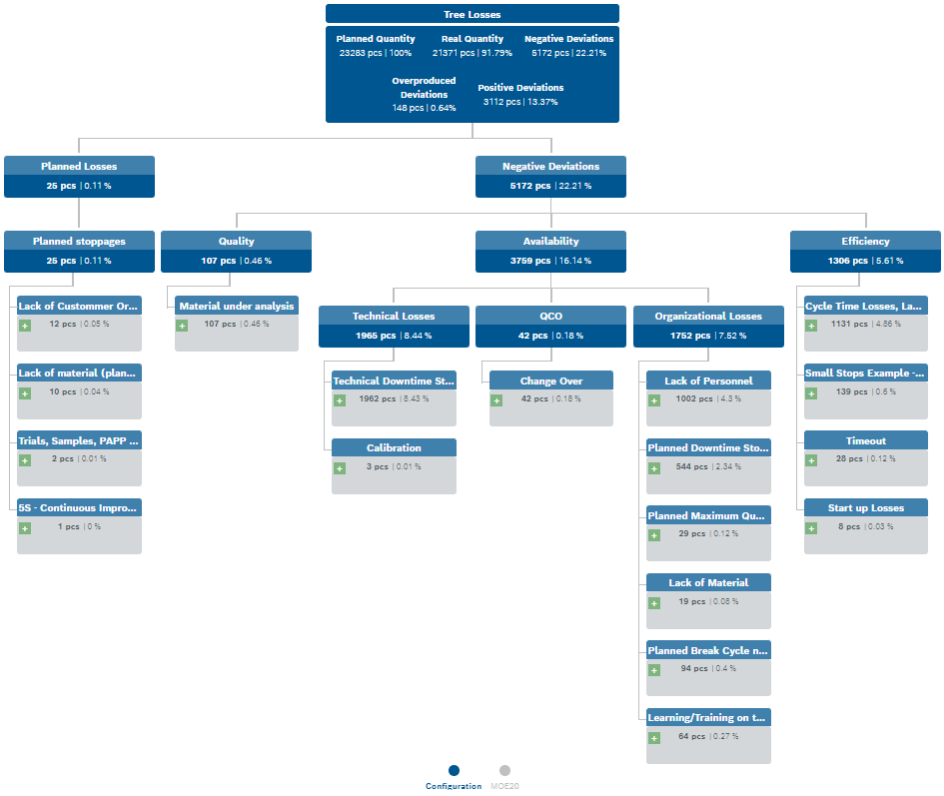

Figure 31 - Tree Losses BCorebeta

Throughout the meeting, as the problems are addressed, the VSM suggests opportunities for improvement and possible approaches to the problems found. Once these topics have been addressed in all the lines of the area, the meeting is concluded. The meeting duration (10 minutes by standard) is almost always exceeded, since it is done at the line group level, but generally it always takes place between the defined period (8:30 - 9:00 AM). At this point in the agenda there are no preparatory activities and no tasks result for the Value Stream Manager. For the others there are only tasks to be performed in order to resolve the open points in the OPL.

After observing different DMMs, it is concluded that although there is a standard for them, it is sometimes not followed. The standard also presents some inconsistencies that need to be corrected and clarified so that the DMMs can occur in the same way regardless of the Value Stream in question, and so that they meet the requirements defined by the BPS Assessment. According to the plant's general schedule, per Value Stream, two DMMs should occur daily, line level/group of lines and area level, which doesn't happen. It should be noted that VSMs only participate in the DMMs of the Make section, but being the VSM responsible for managing the entire value chain it would be important to have an active participation in the remaining areas of the value chain.

5.1.2 Target Situation

DMMs have to cover all areas of the Value Stream. A review of the previous production day and the impact on KPIs (SQCD) is required, as well as a preview of the risks that could lead to the desired performance not being achieved. Measures to counter deviations have to be identified, prioritized, assigned, and the elements of the PDCA cycle have to be visible and the cycle closed. The results of these measures have to be documented and the elements of the PDCA cycle visible. Intervention limits must be reviewed and adjusted regularly.

The shift changeover has to be done in a standard way. The general factory calendar has to be defined for the DLR2, and structured communication done via a digital system. On-site problem solving has to be established with active coaching to team leaders by the top level of the hierarchy.

It is intended to define standards/guidelines for the DMMs, which the VSMs can follow to ensure that all topics defined in the BPS Maturity Assessment (Figure 32) are addressed and thus it is possible to reach level 3, as well as to improve the Value Stream performance, reducing the number of exceeded reaction limits. The topics developed in chapter 3.3.4 Daily Leadership Routines (DLR), based on the BPS norm, should also be taken in consideration, represented in Figure 18 and Figure 19.

Regular communication: - The Daily Morning Meeting (DMM) covers at least the value stream area which includes the pacemaker process - Review of the last working day and impact on KPI - Measures are identified, prioritized, assigned and documented (P and D elements of a PDCA cycle are visible)	Regular communication: as level 1 - Every value stream area has to be covered by a DMM - Preview for current working day for risks to achieve expected performance - Results of measures are documented. C and A elements are visible and PDCA is closed. - Standardized shift hand over is done *Hint: Focus is 2nd level of leadership (e.g. Supervisor for the area)*	Regular communication: as level 2 - Plant calendar for DLR is defined - Structured communication is supported by a digital system (e.g. Active Cockpit) - The on site problem solving is established with active coaching of the shop floor leaders by superior level	Regular communication: as level 3 - No manual data collection (fully automated)

Figure 32 - BPS Maturity Assessment criteria for regular communication

5.1.3 Deviation Analysis

There were some deviations found between the current situation and the target condition regarding DMMs, them being:

- DMMs exist for all lines, but no area-by-area analysis is done in the DMM, and the overall plant schedule is not adhered to.
- When a deviation occurs, people are assigned responsibilities for solving the identified problems, but these responsibilities are usually not prioritized. Often there are dozens of open points in the OPL and with overdue dates. There are even cases where no responsible person is assigned to

it. It is possible to see the status of the PDCA cycle but the results of the applied actions are not documented, nor what was done in each of the steps of the cycle.

- There is not always a preview of the problems that may occur during the day and that may prevent the achievement of the planned goal.
- The VSM only participates in the meetings in the Make section.
- There is opportunity for improvement in coaching by the VSM to the Team Leader.
- There is no evaluation of the result of the DMMs, the evolution of the number of deviations from the target condition is not controlled nor is the stabilization of the indicators evaluated.
- The reaction limits are only reviewed annually, with no regular adjustments.
- Standards are rarely associated with the deviations found. It is not questioned if there is a standard, if it was met or if it is adequate.
- Lack of elements needed for the meeting.
- The delivery performance indicator is not always addressed, because the current indicator display software is still being implemented.

5.1.4 Improvement Proposals

In order to eliminate the deviations found, guidelines/checklist and a standard for the DMMs will be presented to ensure that the target condition is reached.

The checklist (Figure 33) presented is divided into three distinct moments, these being the points to be fulfilled before, during and after the meeting.

Before the DMM

a) Review the previous day's assigned tasks to ask for follow-up

During the DMM

1. Fill out attendance list at BCore.
2. Set the TL who will start the presentation of your line(s).
3. KPIs: ensure that SQCD related KPIs are addressed and a brief explanation is given in case they are off target.
4. DEVPREV: understand the root cause assigned to the problem by the TL, understand if it makes sense, ask questions when something is unclear or a deviation has not been addressed Ensure

that there are already containment measures in place for possible problems that occur throughout the day that might prevent achieving the target.

   a. Associate a standard with the deviation. Question whether a standard exists. Has the standard been met? Is the standard adequate?
   b. Ensure that an action has been assigned at OPL.

5. Process confirmation: verify execution and require explanation if deviations have occurred.
6. Pareto Analysis: absorb information to prioritize tasks at OPL.
7. OPL: check overdue points and question the reason, making sure they are resolved.
   a. Request dates for each of the open points and define priority tasks, ensure that a responsible person is assigned to the defined actions and ensure their commitment
8. Help the TL to ensure that overdue actions are accomplished by being an unblocking agent. Question: What obstacles are preventing you from achieving the desired condition? Which one are you addressing now? What are the next steps?
9. Move on to the next TL - go back to step 2
10. VSM does an analysis by area in order to prioritize the tasks to perform for that area
    a. Make a briefing of the assigned tasks and expected results

<u>After the DMM</u>

1. Record relevant points to follow up the next day
2. Call optional elements that are needed for the next meeting

The VSM should have an active coaching role with the Team Leaders, so during the meeting he/she should keep in mind the 5 coaching questions according to (Rother, 2009), which are:

- What is the target condition?
- What is the actual condition now?
- What obstacles do you think are preventing you from reaching the target condition? Which one are you addressing now?
- What is your next step? What do you expect?
- When can we go and see what we have learnt from taking that step?

Additionally, in order not to continue to have missing participants needed for the DMM, an escalation to the superiors should be done whenever there are continuous missing participants to the DMM. As mentioned, the VSM only participates in the DMM of the Make section, so it would be important that he

starts to participate, even if less frequently, in the DMM of the Source and Delivery sections, once a week (one week on the delivery and the other on the source meeting).

Having in mind the main objective of these meetings, to reduce the number of deviations from the standard (reaction limit exceeded), and to evaluate their results, a monthly analysis of the number of times the reaction limits were exceeded should be done. In parallel, a more frequent review of the defined reaction limits should be done, for example monthly, in the spirit of continuous improvement and in order to achieve better results.

DLR2-DMM

CHECKLIST

DATA:_____

ASSINATURA:_____

№	ACTIVITIES	✓
	Antes da DMM	
1	Rever as tarefas atribuídas no dia anterior para pedir followup	
	Durante a DMM	
1	Preencher lista de presenças no BCore	
2	Definir o TL que irá iniciar a apresentação da(s) sua(s) linha(s)	
3	KPIs -> garantir que são abordados os KPI relacionados com SQCD e que é dada uma breve explicação no caso destes se encontrarem fora do target	
4	DEVPREV -> Entender a root cause atribuida ao problema pelo TL, perceber se faz sentido, fazer questões quando algo não está claro ou algum desvio não foi abordado. Garantir que já há medidas de contenção para possíveis problemas que ocorram ao longo do dia e que possam impedir que se atinja o objetivo Associar um standard ao desvio. Questionar se existe standard. O standard foi cumprido? O standard está adequado? Garantir que foi atribuída uma ação na OPL	
5	Confirmação de processo -> Verificar execução das mesmas e exigir explicação no caso de terem ocorrido desvios	
6	Análise de Pareto -> Absorver informação para priorizar tarefas na OPL	
7	OPL -> Verificar pontos em Overdue e questionar o motivo, garantindo que ficam resolvidos Exigir datas para cada um dos pontos em aberto e definir tarefas prioritárias, garantir que é atribuído um responsável às ações definidas e garantir o compromisso do mesmo	
8	Ajudar o TL a garantir que as ações em atraso são cumpridas, sendo um agente desbloqueador. Questionar: Que obstáculos o estão a impedir de atingir a condição desejada? Qual deles está a resolver agora?	
9	Passar para o próximo TL - passo 2	
10	VSM faz uma análise por área de modo a priorizar as tarefas a desempenhar para a mesma	
	Depois da DMM	
1	Registar pontos relevantes para dar followup no dia seguinte	
2	Convocar elementos opcionais que são necessários para a próxima reunião	

Figure 33 - Checklist for DLR2 - DMM

5.2 DLR 3 Problem Solving

5.2.1 Current Situation

DLR 3 are Problem Solving meetings, called by the Value Stream Manager, whenever necessary (when a problem occurs for which the root cause is unknown), and take place between 9am and 9:30am according to the plant's general schedule. The meeting is attended by the specialists needed for the problem meeting, in addition to the usual DMM elements. The problem-solving method is defined accordingly using the criteria defined in Figure 34.

Type of Deviation		Impact	Frequency	Category		Problem Solving Method	Top Problem
			Occurrences/Day	≤ 3 days *Root cause known*	> 3 days *Root cause not obvious*	OPL, PSS, A3, System CIP	
Safety	Accidents Incidents	> 0	1			OPL(Bcore) + PSS	✓
Costs	OEE	≥ 15%	≤ 3	✓	✗	OPL(Bcore)	✗
				✗	✓	OPL(Bcore) + PSS	✓
		≥ 15%	> 3	✓	✗	OPL(Bcore)	✗
				✗	✓	OPL(Bcore) + PSS	✓
Quality	QIM	≥ 0	1	✓	✗	OPL(Bcore)	✗
				✗	✓	OPL(Bcore) + PSS	✓
	IRR	Top Problems Weekly evaluation		✓	✗	OPL(Bcore)	✗
				✗	✓	OPL(Bcore) + PSS	✓
Delivery	Leveling Performance	Daily Plan not fulfielded		✓	✗	OPL(Bcore)	✗
				✗	✓	OPL(Bcore) + PSS	✓

Figure 34 - Decision matrix for problem-solving method

The meetings observed did not have a fixed moderator, so in about half of the observations the VSM was not the moderator of the meeting, but rather an element with more knowledge about the problem encountered. The meeting consists of filling out a PSS (problem solving sheet), with plenty of discussion about the content to be filled in. There are points that are not completely filled because it is understood that there is no need. In about half of the meetings observed, there are moments when some elements leave the board to look for data on computers, losing the focus of the meeting. The discussion takes up most of the meeting time, which is natural given the nature of the meeting. The 30 minutes allotted to it are scarce, so it takes several meetings to complete the PSS. It is noticeable that there is little preparation for the meeting, in terms of researching the documentation for example, and that the time allocated to

solving the problem is exclusively allocated in DLR3. Sometimes there is difficulty in scheduling meetings on consecutive days, given the scheduling of other DLR3 where the simultaneous presence of some elements is required, taking several weeks before the PSS is filled. Another point to highlight is the little practice in the methodologies used in problem solving, which leads to wasted time in discussing concepts.

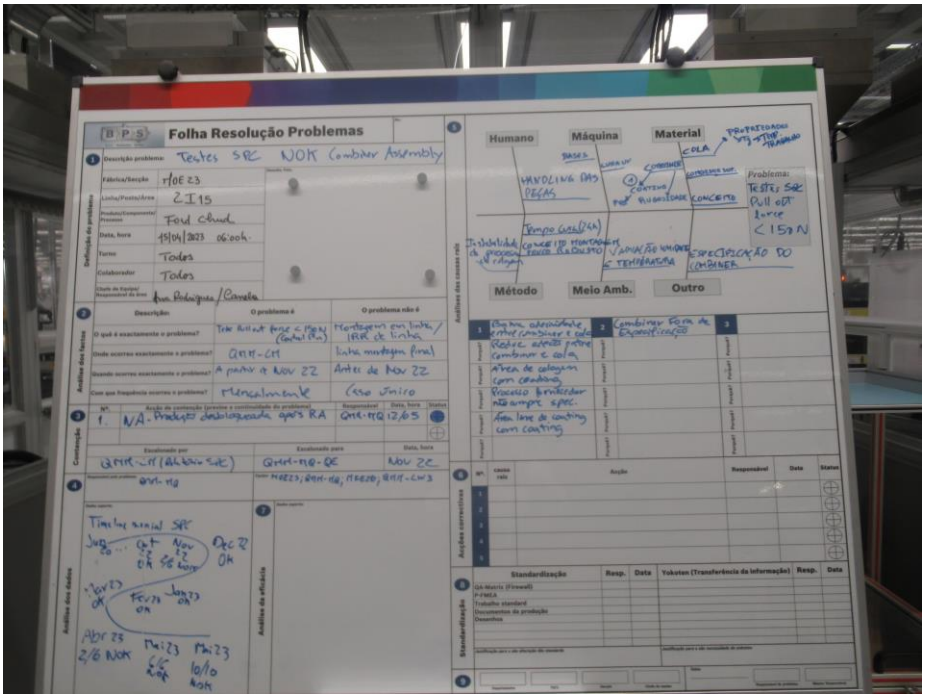

Figure 35 - Problem Solving Sheet (PSS)

5.2.2 Target Condition

While Review/preview meetings prioritize the problems, assign them to the responsible people and track them with OPL, the problem solving activities aim to go back to standard as fast as possible, in a short time frame. DLR 1 and DLR2 give inputs to be used in the problem solving meetings. The problem solving methods to be used can be a: Problem solving sheet (PSS), A3, Shopfloor Management Cycle (SMC), and the Point-CIP method can be used for stabilizing if the updated standard is necessary.

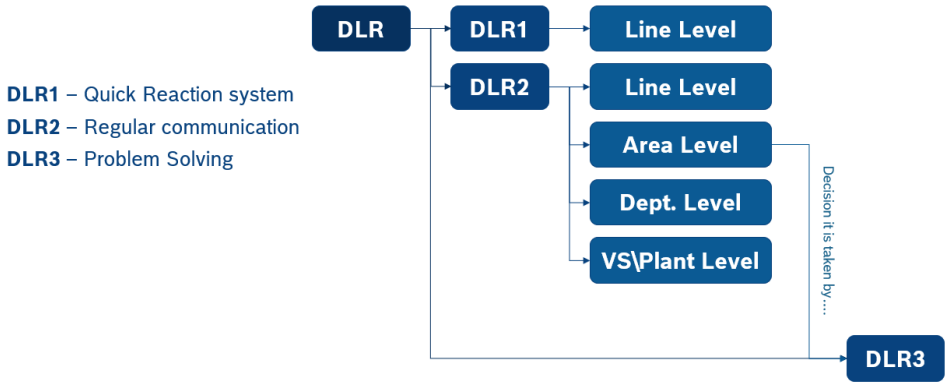

Figure 36 - DLR systematic

For the problem-solving activities there should be a defined process to follow the PDCA (e.g. OPL) and the problems found should be categorized as short or mid-term (and solved accordingly). For mid-term problems, the appropriate problem-solving method should be applied (SMC, PSS, A3, 8D). For short term problems the root cause in known and the solution has to be implemented within 3 days and for midterm, the root cause ins not obvious and the expected time for finding the solution is longer than 3 days. These activities must be supported by automated data collection and analysis. The solutions need to be transferred into a knowledge database and the solutions should be transferred to other areas when appliable, as shown in Figure 37.

Problem solving: - There is a defined process to follow the PDCA (e.g. OPL)	Problem solving: as level 1 - The problems are classified into the categories short term and mid term and solved accordingly - Mid term: problem solving methods are applied (e.g.: SMC, PSS, A3, 8D) *Hint:* *Short term: the root cause is known and the solution has to be implemented within 3 days* *Mid term: the root cause is not obvious and expected time for finding solution longer than 3 days*	Problem solving: as level 2 - Problem solving is supported by automated data collection and analyses - Solutions are documented and transferred into a knowledge database (quick reaction) - Problem solving gets transferred into other areas	Problem solving: as level 3 - Solutions are transferred into the IPN - Process & performance data are available in the whole IPN - Best of best approach is used

Figure 37 - BPS Maturity Assessment criteria for problem solving

5.2.3 Deviation Analysis

The deviations identified from the target condition are related to the time needed to conclude problem-solving activities and the non-use of the IPN (international production network).

Regarding the time allocated to problem solving, both short- and medium-term problems far exceed the defined one. This is due to the lack of training and qualification for moderation and participation in problem-solving activities by the stakeholders. In addition, there is no preparation for the meetings, spending a lot of time searching for information and irrelevant discussions, resulting in long weeks until the root cause of the problem is found.

In order to achieve level 3 of the BPS Assessment it would also be necessary that the solutions found are transferred to the IPN and that the process & performance data are available there, which doesn´t happen.

5.2.4 Improvement Proposals

Given that the largest deviation from the target is related to the time it takes to complete the problem-solving activities, it is proposed that there is greater coordination in scheduling these meetings. Although there is a fixed time for the meetings to take place, they should be staggered to allow the necessary elements to participate in the different meetings. In addition, more participants with knowledge of the problem at hand should be allocated to the different meetings to avoid simultaneous requests for them.

With regard to the effectiveness of the meetings, a lack of preparation for moderation and participation is evident. So, to address the problem-solving efficiency, training and qualification should be given by developing a comprehensive training program to equip stakeholders with effective problem-solving skills, root cause analysis techniques, and meeting facilitation expertise. The process should also be standardized, by implementing a standardized problem-solving process with clear steps, roles, and responsibilities to expedite decision-making and solution identification.

Furthermore, in order to have effective facilitation, designated facilitators should be trained to lead problem-solving meetings, ensuring focused discussions and timely progress.

So as to include the IPN Integration, a process should be established to transfer successful solutions from problem-solving activities to the IPN for broader implementation. Relevant process and performance data should be transferred into the IPN, enabling informed decision-making and fostering cross-plant collaboration.

5.3 Core Team meeting

5.3.1 Current Situation

The DLR2 Core Team meetings are monthly or biweekly meetings with the Core Team with about one hour duration through the Microsoft Teams platform, and have the purpose of analyzing the status of KPR and KPI of the Value Stream, deviations and the OPL, as well as developing focus topics. The person in charge is the Value Stream Manager and the core team is made up of members from the following departments:

- Project office
- Industrialization assembly
- Maintenance
- Quality engineer
- Logistics planning and fulfillment
- Product controlling
- Logistics innovation

It is usual to have several core team members missing without giving any explanation to the VSM, which means that these meetings sometimes are not taken into consideration.

The meeting starts with the VSM displaying the cockpit chart KPR (Figure 38), these being:

- 0km defects – incidents per billion

- Delivery performance (LIWAKS) - %
- DIO (days inventory on hand) – days
- DIO state
- TPT (throughput time) – days
- Direct productivity - %
- Indirect capacity AE – number
- Logistic costs - % of total net sales
- Internal Defect Costs - % of planned product costs
- MOC (machine operating costs) - €/part
- NUrel (relative utilization) - %

Throughout their display, the VSM explains the reason for the deviations to the target and in some cases questions the team member responsible for the indicator in order to understand its deviations. In the same scope of the identification of deviations, the Core Team members identify other problems encountered and report what they have done to solve them. During the meeting the VSM asks the team about possible projects related to the focus topics and the problems found. Finally, the open points in the OPL are addressed and dates for the next steps are set. Throughout the meeting members raise other topics they consider relevant and there is room for discussion.

Figure 38 - Cockpit chart with KPI

As a preparatory moment, the VSM has to ensure that the available data is up to date and it is also necessary to interpret and analyze it to define the intended approach for the meeting. At the end of the meeting the VSM updates the OPL with the tasks for each element.

5.3.2 Target Condition

The target condition for this moment of VSM´s agenda can be divided in four main topics, them being the following:

1. Increased Focus on Key Performance Results (KPR) and Key Performance Indicators (KPI):
    - Ensure that the core team meetings prioritize the analysis and discussion of KPR and KPIs related to the Value Stream.
    - Develop a structured format to review and assess the current status of KPR and KPIs, identifying any deviations from targets.
    - Facilitate open dialogue to address challenges and implement improvement measures to achieve KPR and KPI targets.
2. Effective Status Analysis and Deviation Management:
    - Enable thorough analysis of the status of the Value Stream, identifying areas of improvement and potential bottlenecks.
    - Establish a systematic approach to identify, discuss, and resolve deviations from planned targets, focusing on root cause analysis.
    - Encourage proactive communication and collaboration among core team members to address deviations promptly and implement corrective actions.
3. Development of Focus Topics:
    - Allocate dedicated time in each core team meeting to discuss and develop focus topics relevant to the Value Stream.
    - Engage all core team members in generating ideas, sharing best practices, and exploring innovative solutions for the identified focus topics.
    - Define specific objectives and action plans for each focus topic, assigning responsibilities and monitoring progress in subsequent meetings.
4. Value Stream Manager Leadership and Facilitation:
    - Empower the Value Stream Manager as the leader of the core team meetings, responsible for driving engagement, collaboration, and accountability.
    - Provide the Value Stream Manager with the necessary support, resources, and authority to effectively facilitate discussions, decision-making, and problem-solving during the meetings.
    - Encourage the Value Stream Manager to foster a culture of continuous learning and development among core team members, promoting their growth as lean practitioners and problem solvers.

- By implementing this target condition for DLR2 Core Team Meetings, the aim is to enhance communication, collaboration, and problem-solving capabilities within the core team. It facilitates a structured approach to analyze performance, address deviations, optimize the OPL, and develop focus topics, ultimately driving continuous improvement in the Value Stream.

5.3.3 Deviation Analysis

The current situation of the DLR2 Core Team meetings reveals several areas of deviation from the target condition. These deviations can be identified and addressed to improve the effectiveness and outcomes of the meetings. Here are the key areas of deviation:

Frequency and Attendance of Core Team Meetings:

One significant deviation is the inconsistent attendance of core team members. It has been observed that several members frequently miss the meetings without providing any explanation to the Value Stream Manager (VSM). This lack of attendance undermines the purpose and effectiveness of the meetings, as important stakeholders are not present to contribute and address issues.

Analysis of KPR and KPIs:

While the current situation acknowledges the importance of analyzing Key Performance Results (KPR) and Key Performance Indicators (KPIs) during the core team meetings, there is a deviation in terms of prioritization and structure. The meetings do not have a structured format to review and assess the current status of KPR and KPIs, leading to a potential lack of focus and accountability in addressing deviations from targets.

Thorough Analysis and Deviation Management:

Another deviation is the absence of a systematic approach for thorough analysis and management of deviations. While the current situation mentions discussing deviations during the meetings, there is no specific mention of conducting root cause analysis or implementing prompt corrective actions. This lack of a systematic approach may hinder the team's ability to identify and resolve underlying issues causing deviations.

Development of Focus Topics:

The current situation indicates that focus topics are discussed during the core team meetings. However, there is a deviation in terms of allocating dedicated time for the development of these topics. Without dedicated time and clear objectives, action plans, and progress monitoring, the development of focus topics may lack direction and fail to generate meaningful improvements.

Value Stream Manager's Leadership and Facilitation:

While the current situation designates the Value Stream Manager (VSM) as the person in charge of the core team meetings, there is the lack of empowerment of the VSM and fostering their leadership skills. Empowering the VSM with necessary support, resources, and authority can enhance their ability to drive engagement, collaboration, and problem-solving. Additionally, fostering a culture of continuous learning and development among core team members can contribute to their growth as lean practitioners and problem solvers.

In summary, the deviation analysis highlights the need for improvements in the frequency and attendance of core team meetings, the analysis of KPR and KPIs, thorough deviation management, development of focus topics, and the leadership and facilitation skills of the Value Stream Manager. Addressing these deviations will contribute to more effective and productive core team meetings, leading to better outcomes for the Value Stream and driving continuous improvement.

5.3.4 Improvement Proposals

As an improvement proposal an agenda was developed for this task that includes all the topics needed to reach the target condition.

DLR2 Core Team Meeting Agenda:

Review of Key Performance Results (KPR) and Key Performance Indicators (KPIs) (15 minutes)

- Presentation and discussion of the current status of KPR and KPIs related to the Value Stream.
- Identification of any deviations from targets and reasons for them, and ongoing projects aiming to solve the deviations.
- Assignment of responsibilities, tasks, and their prioritization.
- Brainstorming and collaboration to address challenges and propose improvement measures.

Open Point List (OPL) Review and Management (10 minutes)

- Review of the current OPL, including all open points, issues, and action items.
- Progress updates on previously identified open points.
- Discussion of new open points and their prioritization.
- Assigning responsibilities for each open point and establishing timelines for closure.

Focus Topic Development and Discussion (20 minutes)

- Discuss and develop focus topics relevant to the Value Stream, and possible projects related to them.
- Brainstorming ideas, sharing best practices, and exploring innovative solutions for the defined focus topics.
- Defining specific objectives, action plans, and responsibilities for each focus topic.
- Monitoring progress and discussing updates on previously identified focus topics.

Value Stream Manager Leadership and Feedback (5 minutes)

- Facilitated discussion on the effectiveness of the meeting.
- Feedback from core team members on the Value Stream Manager's leadership and facilitation.
- Identification of areas for improvement in meeting structure, format, or content.
- Actions to foster a culture of continuous learning and development within the core team.

Wrap-up and Next Steps (5 minutes)

- Summary of key takeaways and action items.
- Recap of decisions made and agreements reached during the meeting.
- Confirmation of the date, time, and location for the next DLR2 Core Team Meeting.

5.4 CIP Projects VS track

5.4.1 Current Situation

The CIP Project VS track are weekly follow-up meetings for the projects under development in the Value Stream. The VSM and the Project Leaders are present in the meeting, and sometimes some other element of the project team. The meeting lasts about an hour, and a good practice identified in some VS is to set a timeframe for each project, allowing the Project Leader to enter the meeting only when necessary and to leave when he finishes his part. In the general factory calendar it is defined that this meeting occurs

weekly, on Wednesdays, between 10:30 and 11:00, but each VSM defines the desired time and frequency, differing from what is defined in the general calendar.

At this moment there is no defined systematic, so each VSM conducts the meeting in a different way and depending on the project in question. The VSM asks questions about the current state of the project, developments since the previous meeting, barriers encountered and difficulties experienced. The VSM gives suggestions to the Project Leaders on how to proceed and thus overcome the difficulties encountered and tries to be an unblocking piece. In this project follow-up, the VSM assumes the position of a coach, training for the lean approach to projects and the use of software for documenting projects. It is evident a general lack of knowledge about project systematics on the part of the Project Leaders, which leads the Value Stream Manager to spend a lot of time training, and sometimes even doing the project documentation.

5.4.2 Target Condition

The VSM's project monitoring meetings should be moments to allow him to be updated on the status of the project, being able to contribute with suggestions given his greater experience. The role of the VSM should be that of a coach and unblocking agent, so it must make the Project Owner understand the current situation of the project, what is intended to achieve, what are the barriers / obstacles to achieving the goal and how it can contribute to boost the progress of the project. The time spent in these meetings should be focused on the topics mentioned, and this meeting should have a short duration (15 minutes) and a weekly frequency. In the week of the project presentation, this follow-up may extend up to thirty minutes for the alignment of the topics to be addressed in it.

5.4.3 Deviation Analysis

The main deviation identified is related to the focus of the meeting and the time spent during the meeting. The time allocated to the meeting is much longer than the intended fifteen minutes (often extending up to an hour), and much more is addressed to documentation issues than to the project itself. The frequency is not always weekly, and sometimes the meeting occurs only before the presentation. There are other meetings for the development of the projects in which the VSM participates with the rest of the team, leading to spending even more time than intended. Although there is a mandatory mentor for each Project Owner, this role is rarely played by the mentor, but rather by the VSM.

5.4.4 Improvement Proposals

To ensure that projects are successful, that they are completed as soon as possible, and that the VSM can provide effective follow-up by allocating its time well, a number of conditions must be met.

Initially, in the derivation of the project a Project Owner with experience in the area in question should be chosen, also taking into account the availability of team members. Once the Project Owner is chosen, a mentor should be allocated with knowledge of the A3 project approach, PDCA cycle, and familiar with project documentation software. If the Project Owner does not have training, it should be provided internally by the department concerned. The VSM should ensure that these requirements are met and if this is not the case should contact the mentor to resolve the situation. In the first follow-up meetings the mentor should be present.

The meetings should be allocated 1 hour per week of the agenda, divided by the number of projects under development in the VS.

As for the meeting systematics, the following systematics should be followed:

Before the meeting

1. Review the status of the projects from last week

During the meeting

1. Ask for updates on the project since last week
    a. Have the blockages been solved?
    b. How did the intended action perform?
    c. Were there any other obstacles?
    d. What can I do to make your task easier?
    e. What is the next step? When are you planning to have it done?
    f. Make sure the documentation of the project is being done and the A3 structure is being followed, as well as the measurement of the monitoring KPIs (depending on the phase of the project).
2. Check the presentation and make sure that it is based on the A3 sheet structure (on the week of the presentation)
    a. Do not give a lot of technical details.
    b. Include which focus topic and framework it is related to, and which KPR it will affect as well as monetary gains for the company.
    c. Expose the obstacles faced and how can the administration solve them.

d. Lessons learned for the future and possible Yokoten.

After the meeting

1. Register the current status of each project and ask for updates on the next meeting.
2. Perform the defined actions in the meeting (eliminate the obstacles).

5.5 Value Stream presentation and meeting preparation

5.5.1 Current Situation

This task occurs monthly and consists of preparing the PowerPoint presentation to be presented at VS KPR, S-CIP Projects Review & Recognition. The presentation is divided into two parts by standard, but there is no set structure. The first is the presentation of the KPRs and the second is the presentation of the projects. For the preparation of the first component, the VSM should access the PowerBI prepared for the BPS assessment, and should take a screenshot of the Cockpit chart containing the Value Stream KPR (Figure 39).

Figure 39 - Cockpit chart BPS PowerBI

Quite often this data is not up to date, which means that the VSM has to contact the people responsible for updating it. If the VSM wants to go into detail on the KPR, they will need to access the KPI tree (Figure 40) and put it in the presentation as well.

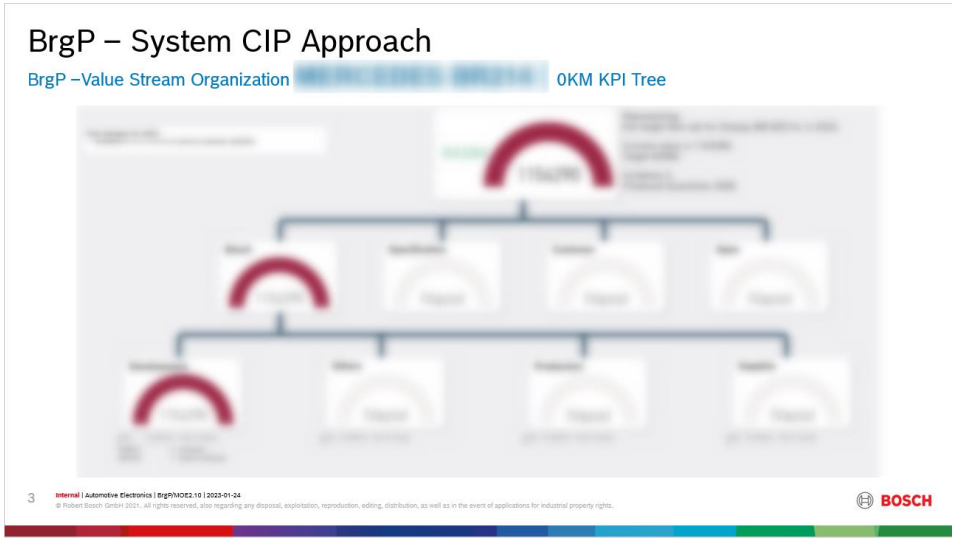

Figure 40 - KPI Tree

Sometimes other details about the status of some line are included, for example OPL status, the focus topics (Figure 41), and details about the start-up of new lines, such as scheduled production volumes and problems encountered (Figure 42). Finally, the list of projects in development and those that have already been completed is included.

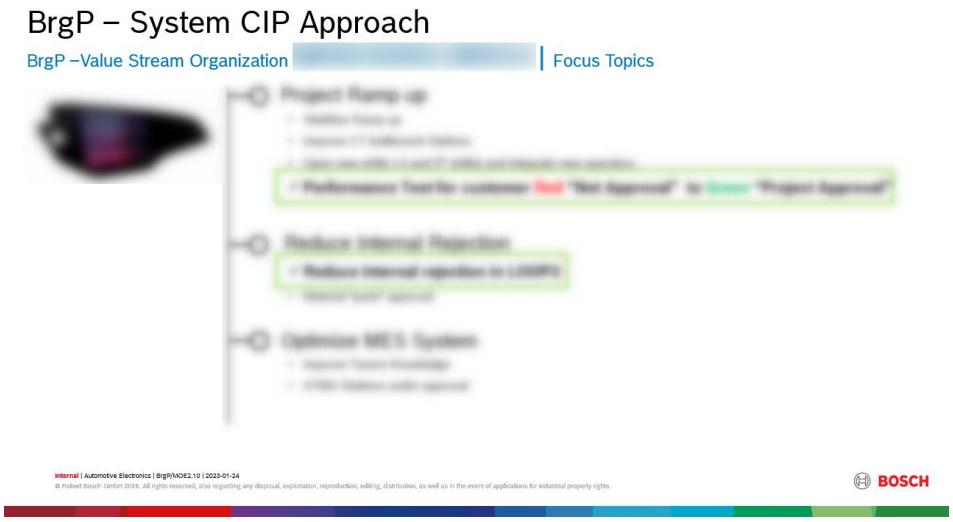

Figure 41 - Focus topics

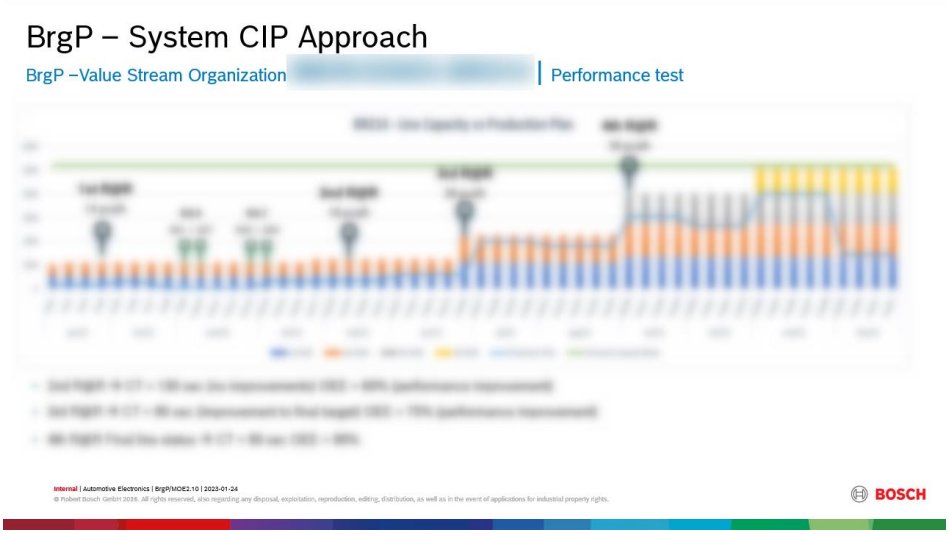

Figure 42 - Other topics included in the presentation

In the week of the presentation, the VSM gives a closer follow-up to the Project Leaders who will present their project. There is the need to train the PL for the dynamics of the presentation, regarding the topics of the A3 sheet format and information to be addressed. This preparation takes about 3 hours, already including the coaching and mentoring given to the PLs, the preparation of the PowerPoint and the request for the necessary data.

5.5.2 Target Situation

The target situation for the Value Stream presentation and meeting preparation is to establish a streamlined and comprehensive approach that enables the Value Stream Manager to gather the necessary information from other departments, structure the presentation effectively, and deliver a clear and impactful update during the System CIP Gemba meeting.

The main topics for the meeting preparation should be the following:

a. Timeline: Establish a timeline for information gathering that ensures sufficient time to collect the required data from relevant departments and stakeholders.

b. Collaboration: Foster collaboration with other departments by proactively engaging them in the information-sharing process.

c. Data Requirements: Clearly communicate the specific data and information needed from each department to ensure accurate and comprehensive reporting.

d. Prioritization: Prioritize critical information and potential challenges to be addressed during the presentation, ensuring focus on key areas that require attention.

5.5.3 Deviation Analysis

One of the critical issues faced in interdepartmental communication and decision-making is the absence of a clear reference to the challenges encountered and the corresponding solutions. This lack of clarity can lead to misunderstandings, conflicts, and ineffective collaboration among departments. To address this, it is essential to identify and document the specific challenges faced by the value stream.

Another significant issue in interdepartmental communication and decision-making is the absence of clear expectations from each department involved. This ambiguity can lead to confusion, inefficiencies, and conflicting priorities. Furthermore, delays in gathering information can hinder effective communication and decision-making within an organization. This challenge can arise due to various reasons such as inadequate information management systems, lack of coordination among departments, or inefficient data collection processes. A common challenge in interdepartmental presentations is the inclusion of excessive technical details, which can lead to discussions without concrete decision-making or prioritization. While technical information is essential for understanding complex concepts, it should be presented in a manner that aligns with the objectives of the communication or decision-making session.

5.5.4 Improvement Proposals

As an improvement proposal a presentation structure was defined, as well as the information sharing process.

<u>Presentation Structure:</u>

a. Introduction: Begin the presentation with a brief overview of the value stream's purpose, objectives, focus topics, and strategic alignment.

b. Current Status: Present a snapshot of the value stream's current performance, highlighting key performance indicators (KPI and KPR) and metrics. Include KPI trees when available to expose a more detailed approach to which lower level KPI are affecting the Value Stream Performance.

c. Achievements: Discuss recent accomplishments, milestones reached, and successful initiatives within the value stream. Include ongoing projects their impact on the VS performance, and which focus topics they are related to (how they were derived).

d. Challenges and Risks: Identify and address challenges, risks, and issues that have impacted or have the potential to impact the value stream's progress or objectives.

e. Improvement Opportunities and Best Practices: Present improvement areas, future plans, and growth opportunities for the value stream. Present some best practices of the value stream that can be transferred to others.

f. Support Requirements: Communicate any resource, budget, or cross-functional support needed to address challenges or pursue improvement initiatives.

g. Conclusion: Summarize the key points of the presentation and invite questions or discussion from the steering committee.

Information Sharing Process:

a. Proactive Communication: Initiate regular communication with relevant departments to request necessary data and updates for the presentation with at least one week in advance.

b. Clear Guidelines: Provide clear guidelines and templates for the information requested, ensuring consistency and easy understanding.

c. Review and Validation: Review the collected information for accuracy and completeness, seeking clarification or additional details if required.

d. Alignment with Strategic Goals: Ensure that the gathered information is aligned with the strategic goals of the value stream and the organization as a whole.

Continuous Improvement:

a. Feedback Loop: Establish a feedback loop with the steering committee and other stakeholders to gather input on the effectiveness and relevance of the presentation content.

b. Learning and Adaptation: Continuously learn from previous presentations, identify areas for improvement, and adapt the presentation structure and information gathering process accordingly.

c. Best Practices Sharing: Share best practices with other Value Stream Managers and continuously refine the presentation preparation systematic based on collective insights and experiences.

By implementing this systematic, the target condition is to enable Value Stream Managers to gather accurate and timely information, structure their presentations effectively, and deliver impactful updates that facilitate informed discussions and decision-making during the System CIP Gemba meeting. Regular assessment and improvement of the presentation preparation process will drive continuous enhancement and ensure alignment with the value stream's objectives and organizational strategies.

As an improvement proposal it was created a checklist for meeting preparation and presentation:

Meeting Preparation:

1. Define Meeting Objectives:
   - Clearly articulate the purpose and desired outcomes of the meeting.
2. Establish Meeting Agenda:
   - Create a detailed agenda that includes topics, presentation durations, and discussion timeframes.
3. Gather Relevant Materials:
   - Collect supporting documents, reports, and data necessary for presentations and discussions.
4. Request Information:
   - Reach out to relevant departments to obtain any necessary updates, data, or insights for the meeting, with sufficient time. Be sure to have the BPS cockpit chart updated, contact all the KPI owners a week before the presentation to ask them to update the file.

Presentation Preparation:

1. Define Presentation Structure:
   - Determine the flow and structure of your presentation, considering the target condition and the key elements to be addressed.
2. Create Visual Aids:
   - Develop clear and concise visual aids, such as slides or charts, to support your presentation and enhance understanding.
3. Organize Content:
   - Arrange your content in a logical and coherent manner, ensuring a smooth transition between topics.
4. Focus on Key Messages:
   - Identify the key messages and main points to convey during your presentation.
5. Practice Delivery
   - Rehearse your presentation to ensure a confident and smooth delivery.
6. Time Management:
   - Allocate appropriate time to each section of your presentation to ensure adherence to the meeting agenda.

7. Anticipate Questions:
    - Prepare for potential questions or clarifications that may arise during or after your presentation.

Meeting Day:

1. Arrive Early:
    - Ensure you arrive well in advance to set up any necessary equipment and materials.
2. Review Meeting Agenda:
    - Revisit the meeting agenda and familiarize yourself with the sequence of presentations and discussions.
3. Engage with Participants:
    - Establish a positive and collaborative atmosphere by engaging with participants and encouraging active participation.
4. Deliver Presentation:
    - Deliver your presentation confidently, adhering to the allocated time and effectively conveying your key messages.
5. Respond to Questions and Feedback:
    - Address questions and feedback from the steering committee members, providing accurate and insightful responses.
6. Document Action Items:
    - Note down any action items resulting from discussions or decisions made during the meeting.

Post-Meeting:

1. Follow-Up on Action Items:
    - Take necessary steps to follow up on assigned action items and communicate progress or completion.
2. Reflect on Meeting Outcomes:
    - Evaluate the meeting outcomes and identify areas for improvement in future meetings.
3. Seek Feedback:

- Request feedback from the steering committee and other participants to gather insights on the effectiveness of the meeting and presentation.

4. Update Meeting Documentation:
    - Update meeting minutes and related documentation with accurate and comprehensive information.

By following this checklist, you can ensure thorough meeting preparation, well-structured presentations, and effective engagement with the steering committee, leading to productive discussions and successful outcomes.

5.6 VS KPR, System CIP projects Review & Recognition

5.6.1 Current Situation

The VS KPR, S-CIP projects Review & Recognition, are meetings that take place every Wednesday between 11am and 12pm at the Gemba, and have as objectives to present to the participants the status of the KPR of the Value Stream in question, as well as the projects currently underway (Figure 43). Each VS is presented once a month, with two VS presented per week, with half an hour dedicated to each. The meeting is attended by the two Plant Managers, from the technical and commercial side, all the VSMs, members of the BPS department moderating the session and doing process confirmation, and the team members of the projects to be presented. Other managers and team leaders are often present. The meeting starts with the Value Stream Manager giving an overview of the value stream, starting by displaying the cockpit chart with the following KPR:

- 0km defects – incidents per billion
- Delivery performance (LIWAKS) - %
- DIO (days inventory on hand) – days
- DIO state
- TPT (throughput time) – days
- Direct productivity - %
- Indirect capacity AE – number
- Logistic costs - % of total net sales
- Internal Defect Costs - % of planned product costs

- MOC (machine operating costs) - €/part
- NUrel (relative utilization) - %

In some KPR a loss tree is entered in detail, mainly in the 0Km defects, to highlight which monitoring or improvement KPI is affecting this KPR the most. Throughout the presentation of the indicators, justifications are given for deviations from the defined target and problems encountered. There are often moments of discussion among the participants in the meeting, pointing out suggestions to solve the problem presented, and some questions are also asked by management and participants about the problems reported or the status of the indicators. Once the indicators are presented, the Value Stream Manager proceeds to present the status of the projects defined in the last System CIP Review Report and projects to be recognized. The duration of this first component is typically between 10 and 15 minutes.

Then follows the presentation of the projects to be developed in the VS in question. The estimated duration for each project is 10 minutes, so as not to exceed the 30 minutes set per VS, a time that is sometimes far exceeded. Since this is a presentation for the Plant Leaders, only the essential information for decision making in view of the business and market goals should be presented. The presentations are made by the Project Leader and start with the presentation of an A3 sheet, but often drift into a PowerPoint presentation with a lot of technical details, causing the presentation to extend beyond the defined 10 minutes. The focus should be kept on the A3 sheet so that a presentation of about 3-5 minutes would be sufficient for the objectives of the presentation. Some Project Leaders bring prototypes of the developed products (if applicable) which makes the presentation more dynamic and easy to understand for everyone. Again, there are moments of discussion during the presentation which leads to losing the focus of the project, the VSM intervenes sometimes to clarify some topic or to answer more technical questions. Suggestions are given for next-steps or recommended changes, barriers that can be encountered, among others. Finally, the BPS moderators who confirm the process to the presentation ask more general questions related to the project approach and A3 sheet constitution. At the end of each presentation recognition is given for the work done so far.

From the VSM's point of view, this moment in its agenda has some related preparatory tasks, such as the preparation of the presentation, the coaching that is given to the Project Leaders who are often not used to this systematic presentation and project documentation, and finally it is necessary to follow-up on the comments, suggestions and feedback given by the Plant Managers, so that they can be taken into account in their development.

Figure 43 - System CIP Gemba Project Presentation

5.6.2 Target Situation

The target condition for the meeting systematic is to establish an effective and efficient meeting framework that enhances communication, collaboration, and decision-making within the System CIP Gemba. The improvements aim to optimize the Value Stream and projects presentations, fostering a more structured and productive exchange of information, resulting in informed decision-making and action-oriented outcomes. The target condition includes the following elements:

1. Streamlined Meeting Structure:

- Develop a standardized meeting agenda that clearly outlines the purpose, sequence of topics, and allocated time for each agenda item.
- Ensure a balanced distribution of time among value stream and project presentations, discussions, and decision-making activities.

2. Engaging Value Stream Presentations:

- Enhance value stream presentations by incorporating visual aids, such as charts, graphs, and performance dashboards, to facilitate understanding and engagement.

- Encourage value stream managers to highlight key achievements, challenges, and improvement opportunities to spark discussion and collaboration.

3. Comprehensive Project Presentations:

- Enrich project presentations by including concise updates on progress, milestones, risks, budget utilization, resource management and stakeholder engagement.
- Promote a proactive approach by project owners, encouraging them to propose solutions or seek guidance for identified challenges.

4. Effective Discussion and Decision-Making:

- Facilitate productive discussions by providing opportunities for all participants to share their insights, concerns, and recommendations.
- Encourage active participation from the administration and value stream managers in addressing cross-functional issues and aligning strategic goals.
- Aim for timely decision-making by documenting key decisions, assigning responsibilities, and setting clear deadlines during the meeting.

5. Action-Oriented Outcomes:

- Ensure that each meeting concludes with clearly defined action items, including responsible individuals, specific tasks, and deadlines.
- Emphasize the importance of accountability and follow-up in executing the assigned action items before the next meeting.

6. Continuous Improvement:

- Establish a feedback loop to gather input from meeting participants regarding the effectiveness of the proposed improvements.
- Regularly assess the meeting process and make adjustments based on the feedback received to drive continuous improvement.

By implementing these improvements, the target condition is to create a meeting systematic that fosters collaboration, promotes data-driven decision-making, and drives tangible outcomes.

5.6.3 Deviation Analysis

At the moment there is no detailed agenda for the meeting, nor a defined time to be allocated to each topic, and there are value streams that far exceed the total defined time. Additionally, the discussion moments occur mixed in with the presentation moments, as well as the decision making moments. Both in the presentation of the value stream status, and in the presentation of projects, too much emphasis is given to technical details, instead of highlighting blockages, risks, stakeholder engagement. Although the participation in the meeting is disorganized, there is an active participation of the several elements in the meeting, the feedback given in the meeting is not registered, nor are deadlines and responsibilities assigned. The meeting systematic is static and no official feedback is ever given on them in the spirit of continuous improvement.

5.6.4 Improvement Proposals

As an improvement proposal, the purpose of the meeting was defined and also an agenda.

Purpose:

The purpose of the System CIP Gemba is to provide a platform for the administration and value stream managers in the automotive company to discuss and assess the status of the value streams and projects within the organization. This meeting serves as a means to track progress, address challenges, and ensure alignment with strategic goals.

Agenda:

1. Value Stream Status Updates (10 minutes)

- Value Stream Manager presents an overview of the current status, KPRs, achievements, challenges, and upcoming plans for Value Stream. (8 minutes)

a) Provide a brief overview of the value stream's purpose, objectives, and its strategic alignment within the automotive company. Highlight the value stream's contribution to overall organizational goals.
b) Present key performance indicators (KPIs) or metrics used to measure the value stream's performance. Discuss the current performance levels compared to targets or benchmarks. Identify any areas of improvement or notable achievements.
c) Highlight any improvements or initiatives implemented to enhance operational efficiency. Discuss any challenges or bottlenecks faced and strategies used to overcome them.

d) Share information on the allocation and utilization of resources within the value stream, such as personnel, equipment, and facilities. Discuss any resource constraints or areas where optimization is needed. Present plans or initiatives to improve resource allocation and utilization.

e) Identify and communicate any challenges or obstacles faced by the value stream. Discuss strategies or actions taken to mitigate these challenges. Seek input or guidance from the steering committee on addressing specific challenges.

f) Present upcoming initiatives, projects, or plans for the value stream. Discuss growth opportunities, and potential improvements. Seek feedback or suggestions from the steering committee on the value stream's future direction.

- Q&A and discussion. (2 minutes)

2. Project presentation (7 minutes each with a maximum of 2 projects)

- Project Owner presents the progress, milestones achieved, risks, and issues related to the project, follow the A3 sheet systematic. (5 minutes)

a) Provide an overview of the project's progress, refer the background, current situation, target situation, root cause analysis, evaluation of countermeasures, action plan, follow up and standardize (A3 sheet)

b) Expose any risks, challenges, or obstacles that have been encountered during the project.

c) Present the upcoming tasks, milestones, or phases planned for the project.

d) Discuss any adjustments or refinements in the project plan based on lessons learned or changing requirements.

e) Seek input or feedback from the steering committee on the proposed next steps.

- Q&A and discussion (2 minutes)

3. Discussion and Decision-Making (5 minutes)

- Open floor for general discussion and decision-making regarding cross-functional issues, resource allocation, and strategic alignment.

- Key decisions made should be documented to be discussed in the VS Plant meeting.

Outcomes:

1. Updated understanding of the status, achievements, and challenges of each value stream within the automotive company.
2. Comprehensive overview of the progress, risks, and issues related to each project.
3. Decisions made regarding cross-functional issues, resource allocation, and strategic alignment.
4. Defined action items to be discussed on the VS Plant meeting.

To note that VS Plant meetings are meetings that take place twice a month with all Value Stream Managers and are moderated by the production department head. The objectives defined for the meeting are the alignment of VS Standards, the calibration of new directives, the strategic alignment of VS and coaching.

5.7 Schedule definition

After making an improvement proposal for each of the VSM tasks, a schedule was defined as show in Figure 45. The tasks were divided by their periodicity: weekly, twice a month, monthly and when necessary, as show in Figure 44.

Peridiocity	
Weekly	
Twice a month	
Monthly	
When necessary	

Figure 44 – Periodicity of the agenda

	Monday	Tuesday	Wedsneday	Thursday	Friday
8h30	**DLR2 (DMM)**	**DLR2 (DMM)**	**DLR2 (DMM)**	**DLR2 (DMM)**	**DLR2 (DMM)**
9h00	**DLR3 (Problem Solving)**	**DLR3 (Problem Solving)**	**DLR3 (Problem Solving)**	**DLR3 (Problem Solving)**	**DLR3 (Problem Solving)**
9h30					
10h00					
10h30					
11h00		**CIP Project VS Track**	**System CIP Projects Review & Recognition**		
11h30					
12h00					
12h30	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch**
13h00					
13h30					
14h00			**VS Plant**		
14h30		**Core Team meeting preparation**			
15h00					
15h30		**System CIP Projects Gemba presentation preparation**	**DLR 2 Core Team**		
16h00					
16h30	**CIP Projects VS Track preparation**				
17h00					

Figure 45 - VSM Agenda

Additionally, a Microsoft Outlook calendar (Figure 46) was created with the defined tasks, and a file was sent to the Value Stream Managers so they could have their schedule.

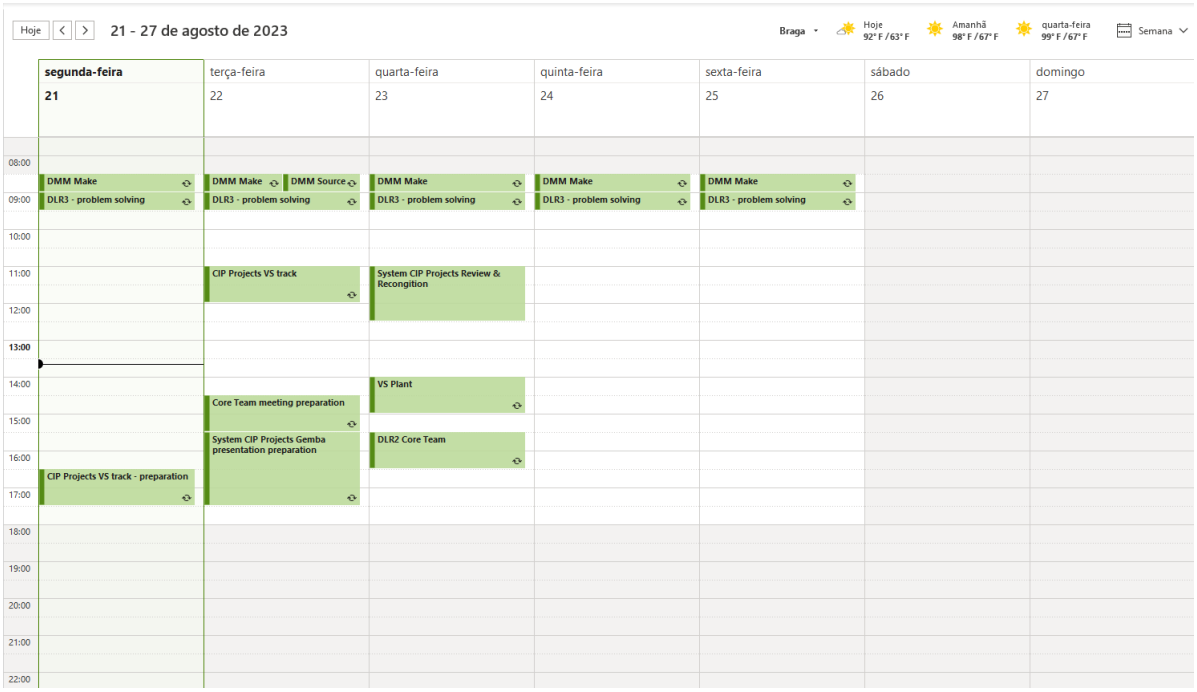

Figure 46 - Microsoft Outlook calendar

6. CONCLUSIONS

The final chapter of this master´s dissertation showcases the primary findings derived from the study. Furthermore, it emphasizes potential avenues for future endeavors.

6.1 Final considerations

Once the improvement proposals had been developed, they were presented to the Value Stream Managers in order to ascertain their level of approval and the possible adjustments required. An 80% approval rate was obtained, meaning that eight of the ten VSMs would start adopting the proposed system. During the internship other activities were performed, such as Value Stream Mapping, standards development, projects follow up with the teams, formations, which complemented the knowledge needed to write this master´s dissertation.

The main objective of this case study was to provide Value Stream Managers with a detailed agenda, with guidelines for the tasks to be carried out as standard, in order to ensure that it was possible to carry out an effective analysis of Value Stream indicators and thus improve their performance, increasing the value-added ratio. To do this, the first step was to understand what the day-to-day life of a VSM consisted of, which is not as obvious as it might seem at first. As Bosch Car Multimédia is a highly developed company, there was an initial period of adaptation and learning how the internal processes worked. Next, it was essential to understand the systematics of the 3.3 Bosch Production System, and the BPS System CIP approach, which is closely linked to the function of the Value Stream Manager. After long hours of monitoring the VSMs, support in some activities, clarifying doubts and interviews, their purpose in the company was clarified. Based on the knowledge acquired in the initial phase, it was possible, using documentation and literature as a basis, to begin to identify deviations in the activities carried out and then propose improvements, with a view to creating standards and guidelines for everyone to follow.

6.2 Opportunities for future work

As possible future work, the implementation of the new system should be monitored, the process confirmation should be done and satisfaction with the efficiency of the new system measured, in what concerns the efficiency in making it easier for the VSMs to monitor the VS's KPIs and KPRs more frequently, and to ensure that activities are carried out that contribute to improving them. Furthermore, since there are other Bosch plants that work as a Value Stream Organization, a visit could be made to those plants and the information shared between them, in order to improve the VSM´s performance.

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