

## SHOPFLOOR MANAGEMENT – A TOOL OF LEAN MANAGEMENT

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### Abstract:

Lean management is an approach to continuous process optimisation. The methodology involves the entire value chain. The individual links are made more efficient and thus leaner. The main goal of lean management is to use various lean methods, procedures and thinking principles to coordinate all processes and activities in such a way that any kind of waste along the value chain is avoided in a holistic production system. This would result in the following main difficulties: Transporting information quickly and purposefully to the right places in the company. This is where the lean tool of shopfloor Management (SFM) comes into its own. The shopfloor board is the communication platform of SFM. Shopfloor takes place very close to the employees in a direct interaction between employees and managers. Staff are directly involved in the process and should and can contribute their own approaches to solutions. The article provides an overview of the structure of shopfloor management (SFM) and proves that the goals set by the introduction itself – namely the optimised flow of information in the company with the involvement of all employees – are achieved through shopfloor Management. The method of a structured interview with 63 respondents is used to obtain data.

**Key words:** *lean management, shopfloor board, shopfloor management*

### INTRODUCTION

At the beginning of the 1990s, a book entitled "The Second Revolution in the Car Industry" [1, 2] was published. In this book, the authors examined the differences in development and production conditions in the automotive industry. In the process, the principles of a development and production system were elaborated that placed particular emphasis on efficiency and quality. This principle has been called Lean Production [3, 4].

However, Lean Production is not a purely technical process plan, but rather the principles of a lean organization. Initially, Lean Production was mainly applied in the automotive industry and its suppliers. The methods of lean management were developed in the mid-20<sup>th</sup> century by the Japanese car manufacturer Toyota [5, 6], which succeeded in creating stable process organizations that are the basis for the quality level of its products. While production was originally the focus of interest, a management philosophy called "Lean Management" had emerged with the subsequent adaptation by managers

and management consultants. Since the principles of "Lean" can and have been transferred in principle to any other industry, it can be said today that Lean Management is a management and organizational concept that is fundamentally oriented towards Lean Production, but in extension aims to avoid any form of waste, errors and unnecessary costs not only in production, but in all areas, while time striving for the best possible quality at the same [7].

### The Core Idea

Lean management means [8, 9] "creating value without waste". The goal is to coordinate optimally all activities that are necessary for value creation and to avoid superfluous activities (waste, Japanese: Muda). This also includes transporting information quickly and presenting results in a clear form. The results are processes with a high degree of customer orientation, as the targeted and flexible fulfilment of the customer's wishes is the basis for

economic work with a high degree of efficiency. Precise process descriptions and descriptions of interfaces, simple organizational methods, clear regulations of responsibilities, early reaction to errors (in the product and in the process) lead to stable processes from which high-quality products emerge [10, 11]. This results in some design approaches for lean management. (The list does not claim to be complete and the position in the list does not indicate the necessary weighting in the application).

1. Concentration on the company's own strengths.
2. Optimization of all company processes.
3. Continuous improvement process (CIP), especially with regard to quality.
4. Orientation of all activities towards the customer (customer orientation).
5. Decentralized customer-oriented structures.
6. Internal customer orientation as a corporate mission statement.
7. Personal responsibility of employees and working in teams.
8. Open information and feedback processes.
9. Attitude and cultural change in the company (Kaikaku: Japanese: reform).

Hypotheses about shop floor management can be derived from points 2, 7, 8 and 9. The aim of the article is to test and prove the following hypotheses in the course of the article:

#### Hypotheses

1. The installation of an SFM will optimize the internal flow of information compared to the situation before the launch.
2. By installing an SFM, the existing potential of the employees will be utilized to a greater extent than before the introduction.
3. By introducing an SFM, employees at all levels are more closely involved in the process.

#### LITERATURE REVIEW

The basis of lean management activities [11, 12, 13], according to Womack and Jones [1], are the five core principles that form the guidelines for reviewing the existing system:

- A. Define the value from the customer's point of view. Defining the value from the customer's point of view means examining exactly what is to be produced and matching the products exactly to the customer's needs.
- B. Identify the value stream. Identifying the value stream means examining the processes that are necessary to produce the services from the initial product to the customer in detail. The value stream describes all activities that are necessary to produce the product or service. If you focus on these value-creating processes, you avoid waste and support the orientation towards the needs of the customer.

- C. Implementing the flow principle. One of the most important design principles of lean management is the continuous and smoothed flow of production, the flow principle. In many organizations, optimization takes place within departmental boundaries, production units are run at maximum productivity, but this function-oriented approach does not necessarily lead to the optimum. If you look at the production process from the product point of view, you notice the many interruptions to the flow in the form of intermediate stocks and buffer stocks. From a lean management perspective, there is often considerable potential for improvement hidden here, which also has a major impact on the efficiency of the entire value stream [3, 7].
- D. Introduce the pull principle. In many companies, production is based on maximum machine utilization. However, if the company is oriented towards the customer and the value stream is organized according to the flow principle, production must only take place when the customer orders or when stocks have reached a minimum. These order points form the impetus for production. With the pull principle, products are pulled through production from the customer's point of view instead of being pushed into production by planning specifications.
- E. Aiming for perfection. Perfection cannot be achieved; it can only be aimed for. Standing still means going backwards. Since the framework, conditions are constantly changing and even bad habits quickly return it is important to ensure continuous improvement in a lean production system.

The so-called Continuous Improvement Process (CIP [14]) or Kaizen [15] (Japanese for change) are methods by which employees are continuously encouraged to question processes and contribute ideas, thus further developing their own potential.

After all, they have the best view to their workplaces and the daily processes on the factory floor (shopfloor).

In addition, the lean management concept relies heavily on visualization to make it easier for employees to apply the methods. In this way, achieved progress become measurable and visible through key performance indicator systems.

As an example:

- effectiveness of equipment,
- stocks upstream and downstream of equipment,
- lead time,
- costs,
- working time,
- number of employees, etc.

This is where shopfloor management [16] comes in. Explanation of terms: The English term "shopfloor" stands for "place of value creation" in German. Management is understood to mean all leadership and management tasks

for the production of goods and services, therefore management at the point of value creation. Shopfloor management (SFM) is therefore understood as the optimization of management and leadership tasks of a production or a process. Shopfloor management is applied both in production and in the indirect sub-areas of a company's service processes. All processes are adapted to the requirements of the customers. The visualization of key figures and their reporting is not a new invention and has been used in various forms for decades. In larger companies, visualization boards are usually limited to production data. However, pure visualization boards have some disadvantages compared to the shopfloor board. Previously, key figures were not always transparent in terms of their numerical basis and calculation. Secondly, the key figures cannot be influenced by the employees and those involved can often only react to a problem instead of acting. Another disadvantage is that there is no feedback on the key figures.

#### **This is one of the real innovations:**

"With a well-structured shopfloor board, all workplace-specific data and information are available in such a way that even an outsider could quickly get an overview of the team's tasks, processes and goals." Shopfloor is not just a new controlling tool, but also a holistic management instrument that aims at an optimal flow of information.

How do you achieve this?

The employees are involved in the conception of the shopfloor board from the very beginning. All those involved select important key values. The ability of each individual to influence the value becomes clearer. Acceptance increases as a result. Through daily work at the point of value creation, those responsible continuously improve both in administration and production processes. Here, the next innovation arises directly: responsibility – everyone now bears a part of the responsibility, either by delegating a task that arises in the workplace or by each individual taking responsibility for achieving the common goals. [17, 18].

#### **Core elements of shopfloor management**

##### **Leadership**

The element of leadership [19, 20, 21] is attributed as one of the most crucial roles in the context of shopfloor management. The lean approach therefore places three elementary requirements on leadership:

- Hansei (Japanese: The self-reflection). The need for self-reflection and an open culture of error. Hansei is about refraining from assigning blame and developing a positive error culture. Against this background, mistakes should be seen as something positive, offering the opportunity for continuous improvement and development.

- Genchi Genbutsu (Japanese: go and see for yourself) & Gemba (Japanese: the actual place): Leading the staff in the actual place. It is to be understood as a clear request to the managers to appear more often at the place of action again, i.e. in the production. Managers should again seek proximity to the shopfloor in order to exchange more with employees (communication, knowledge transfer) and to develop a better understanding of the cause of the problem when finding solutions.
- Hoshin Kanri (Japanese: Literally: compass needle/steering = directional management). Directional management with visionary goals from the top. Hoshin Kanri or Policy Deployment is ultimately a goal management system used to project the long-term goals of a corporate vision and the short – and medium-term goals of a company down to all areas, departments and teams.

##### **Communication**

Communication [22] is closely linked to the leadership of employees. "If you want to lead, you have to communicate". Good communication is a prerequisite for avoiding misunderstandings. This communication takes place on equal terms and on the shopfloor. In this context, it is important to promote and coach the self-management skills of the employees – and thus their potential (see also under Leadership). One instrument is open-ended questions in which the employees are guided by the manager and encouraged to reflect. Using these questions, the employees should have the feeling that they have worked out the success of the solution themselves. Being asked the right question can help employees to put together information, evaluate existing contexts and generate new ideas. Communication is also an important factor in that the manager can get first-hand information. The flow of information takes place in both directions.

##### **Visualization**

Every employee should be able to answer the following questions at the shopfloor board [23]:

- What are the team's goals?
- Which key figures are used to measure them?
- Is the deviation from the ACTUAL state to the TARGET state recognizable?
- What processes are running and what problems are there?
- What improvements/measures are planned (CIP)?

Key figures form the basis of the visualization used in this context. Key figures should reflect relevant relationships in a quantitatively measurable form.

#### **The second step in implementing the shopfloor idea: Structured problem solving**

The prerequisite for sustainable and structured problem solving is a systematic approach. The goal is not to implement complicated methods, but to introduce methods

that are independent of the employees level of education. The development towards independent problem solving is a learning process that goes beyond the implementation of a training course.

### Continuous Improvement Process (CIP)

CIP [16, 24, 25, 26] is an important building block for establishing a lean culture in a company. Thus, this approach also forms a partial foundation of the presented shopfloor management. The CIP method originates from Japan and is known as KAIZEN (Japanese: kai = change, zen = good). Kaizen means change for the better and is thus intended to strive for a never-ending improvement process.

### Example of a shopfloor board according to SNQAK logic

The SF board shown here in Fig. 1 was introduced and continuously optimized in a company in the West German steel industry. Of course, shopfloor boards are always geared to a specific area of application and can therefore be designed in countless ways – this example is only intended to provide a visual orientation.

The respective function is described in the following text based on the letter markings.



Fig. 1 Shopfloor Board

### About the procedure

Communication between employees and managers takes place at least once a day on the shopfloor board [27, 28, 29]. However, it can make sense to have the communication take place several times a day in order to enable all employees to have the same level of information, e.g. in the case of a multi-shift system.

R: Every board should start with this: Communication needs rules, of course. e.g.

All participants arrive at the board in time!

All participants are prepared for the meeting!

Every contribution is important!

We let each other finish!

P: At the beginning of a shopfloor communication, we first document the presence. This symbolizes both the importance and a certain commitment.

B: Current facts of the day are constantly entered and supplemented. E.g. in department 12, work is planned by the company Maxi Mini on the fire extinguishing system on 18.6.20 from 7:30 am.

What is behind the SNQAK logic?

S: Safety

N: Sustainability

Q: Quality

A: Delivery

K: Costs

S: Safety: under this heading, accidents and fire incidents of the previous day are documented for the board's area of validity and discussed with the board's participants. Questions arising from this: What can we do to prevent this in the future? All health protection topics (e.g. measures to prevent pandemics) are also included under this heading.

N: Sustainability: under this heading, plant malfunctions or interruptions to the process are documented and discussed with a view to improvement.

Q: Quality: almost self-explanatory: achieved quality goals or deviations in the sense of errors in and around the product/process. Questions that arise from this: What can we do to prevent these errors in the future?

A: Delivery: This is the category of performance indicators. Achieved tonnage/plant utilization/quantities shipped/electricity consumption etc. For a better classification of the values, they are always presented in a target/actual comparison.

K: Costs: An important aspect, e.g. how high are the failure costs for a product if quantities fail due to quality defects.

At the top of each section are fields for current topics from the individual subject areas whose processing can be assigned to one or more participants of the shopfloor communication. For example: A certain defect has been detected in the product. Employee Huber is asked to take care of the correction of the error and to report on the progress of the work the next day (next communication on the SF board).

I: At the end of the board, there is space for the collection of tasks that cannot be completed within a 10-day period. If necessary, CIP (Continuous Improvement Process) projects are derived from the generated tasks. The participants of the SF Board determine the need themselves.

With good coordination of the shopfloor board and appropriate preparation of the participants, communications are possible in a period of about 15-20 minutes. The advantage of this is that the attention span of the participants is significantly higher over a short period than it would be the case of a long meeting.

The Covid 19 pandemic and the resulting distance regulations to avoid contact have meanwhile also produced purely digital versions of the shopfloor boards [9, 30]. In this application, a variant was chosen that was realized via Microsoft Teams and Microsoft One Note. However, pure

Microsoft Excel applications are also in use. This is only to be understood as an example – other digital applications are of course just as possible. The digital form offers a much higher level of detail, but follows the original logic of the analogue board. However, from a wealth of advantages of the digital solution, there is also a decisive disadvantage: one of the basic ideas of the shopfloor, to be at the place of value creation, has been moved away from again to some extent due to the distance that is currently necessary.

## RESEARCH METHODOLOGY

### Interview methods in science

Interview methods have the same goals as those of surveys. The common feature is the form of a conversation between interviewer(s) and interviewee [31]. Interviews play an important role in empirical social research (especially in qualitative social research) as a basis for analysis and documentation. Empirical social research can pursue different goals: Social societal "macro phenomena" (e.g. unemployment rates, birth rates, etc.) can be described based on systematically collected data and working hypotheses can be developed on this basis. Social science theories and hypotheses developed from them can be tested by empirical data (deductive procedure). Theories and hypotheses can be developed or modified based on empirical observations (inductive procedure). Quantitative social research works primarily with standardized data (such as the results of surveys in which respondents choose between fixed response alternatives, as for this report) because standardized information is particularly easy to process with statistical methods. An important principle of quantitative social research is that research should be independent of the subjectivity of the researcher in principle.

Advantages: Rapid data collection possible.

Comparison of standardized answers possible.

Effort per interview is low – no extensive preparation per respondent.

Disadvantages: Information limited to questionnaire.

There is a risk of generalizing responses.

The method used for this report is a structured interview with 63 respondents.

## RESULTS

In order to prove the hypotheses from the introduction, a survey in the form of a structured interview was conducted for this purpose in a company in the West German steel industry where the SFB system was introduced. The company is positioned along the entire value chain from ore to flat steel products. The company's high-quality products are used worldwide, especially in the automotive industry and automotive supply industry. The survey was conducted in the form of a structured interview by means of a direct approach, in January 2021, approx. 6 months after the initial introduction of the Shopfloor Board (SFB). Due to the employee structure, the sample consisted of 100% men.

The average duration of the interview was about ten minutes. For this purpose, 63 employees, aged between 20 and 61, with different functions (plant operators, crane operators, supervisors, industry master, engineers), who regularly participate in the Shopfloor Board (SFB) communication, were asked the following five questions, see Fig. 2 – Fig. 6.

The first question of the interview was: Has the flow of information (since the introduction of the SFB) been improved? What does information flow mean in this context? Employees (e.g. plant operators, crane operators and managers) receive more targeted and detailed information on the working environment. See Fig. 2: 58.7% of the respondents answered with "yes" and 31.7% with "rather yes", which results in a positive basic attitude of more than 90%. The majority of respondents thus see a clear improvement in the flow of information.

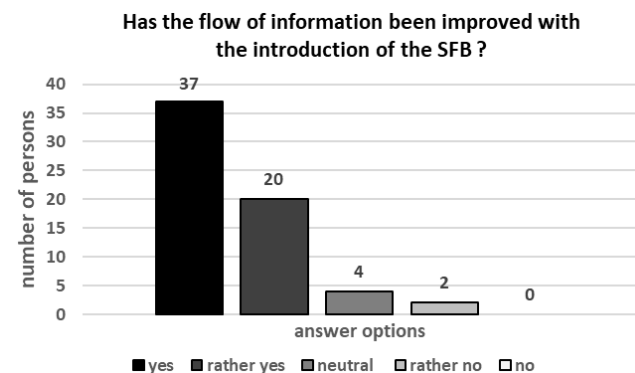


Fig. 2 Has the flow of information been improved?

The second question was: Has the speed of information transfer increased? In this context, this means that information reaches the right addressee in 24 hours or less compared to days and weeks before. Fig. 3 shows that 55.6% answered with yes and 34.9% with "rather yes". This results in around 90% agreement with the perception of an increase in the speed with which information is passed on. The transparent visualization of the performance indicator system and the associated presentation of a TARGET and ACTUAL comparison are seen in a positive way.

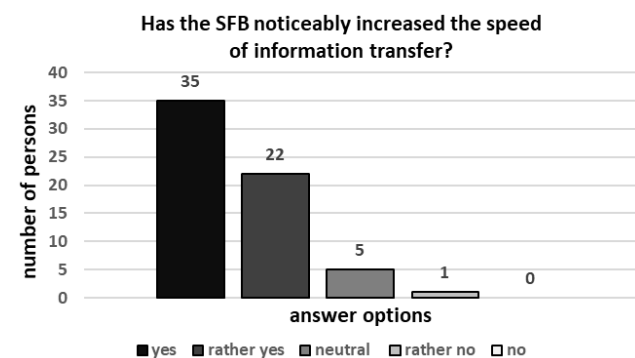


Fig. 3 Has the speed of information transfer been increased?

At position 3 in the interview, the question is asked: Does the SFB involve the employee more in the process? What does this mean in this context: process stands here for the work process/what is organized and how it is organized. Fig. 4 shows that about 33% of the respondents answered this with "yes" and 63.5% with "rather yes". This corresponds to a positive basic attitude of 96.79%; the employees perceive a strengthening of the participation possibility in the process design.

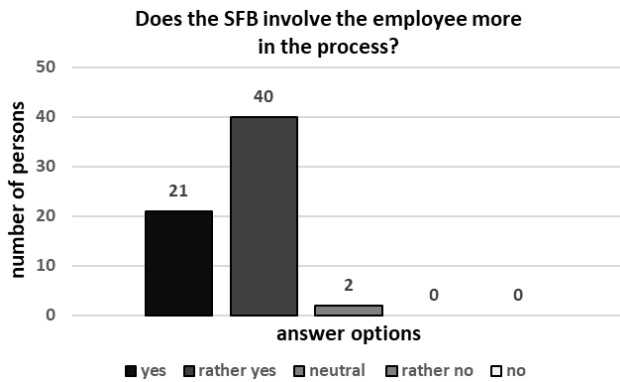


Fig. 4 Is the employee more involved?

Fig. 5 shows the result of the question: Is the existing employee potential being used more effectively since the introduction of SFB? What does this mean in this context: Employees are encouraged to make their own contributions and suggestions for solutions at the SFB. 93.65% of the employees surveyed feel it as positive that their own opinions and potential (employee potential) are used more in and for the work process. A feeling of appreciation arises. This not only motivates employees, but also makes use of their knowledge.

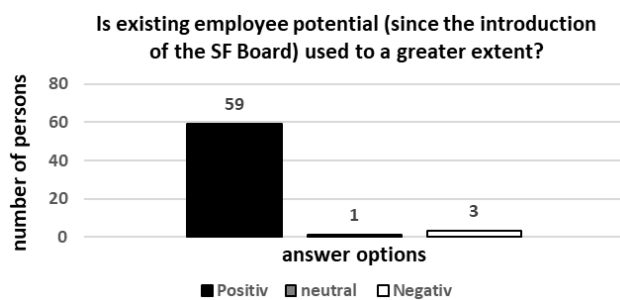


Fig. 5 Is existing employee potential (since the introduction of the SF Board) used to a greater extent?

Position 5 of the survey asks the question: Is the extended accountability from the SFB seen rather positively or rather negatively? What does this mean in this context? Each person participating in the SFB can receive a task from the SFB to complete and is required to make their own contributions to the SFB. Fig. 6 shows a clear vote, with 93.65% viewing this positively.

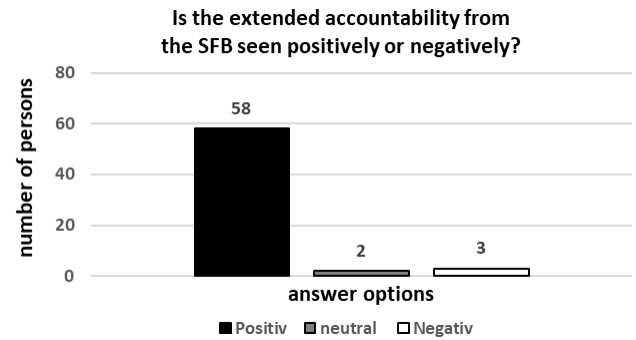


Fig. 6 How is extended accountability viewed?

**CONCLUSION**

Lean management means, "creating value without waste", with the aim of increasing the effectiveness of the company. Lean management enables the linking of processes with the strategy and goals of the company. These are made visible through key figures, among other things. Nevertheless, despite targeted improvement at all levels, the corporate strategy must be regularly linked to the processes through operational goals across all levels. Only in this way, continuous improvement of the processes can take place. This is where shopfloor management (SFM) starts as a component of Lean Management [32].

1. The installation of an SFM will optimize the internal flow of information compared to the situation before the launch.
2. By installing an SFM, the existing potential of the employees will be utilized to a greater extent than before the introduction.
3. By introducing an SFM, employees at all levels are more closely involved in the process.

The early involvement of employees in the conception and implementation of the derived measures as well as the sensitization for errors and waste is a new and important element of Lean projects. In previous management approaches, too little attention was paid to the issue of employee knowledge. Often enough, one could hear in this context: "No one ever asked me, but I would have solved it differently".

Another "deficiency" also becomes clear from this statement: "the lack of communication". This is where the great advantage of shopfloor management becomes apparent: regular communication on the board with employees and managers. All key issues relevant to a process are regularly addressed and everyone can contribute their ideas for solutions.

As can be seen Results Fig. 4, 5 and 6, the employees see the responsibility of this method as fundamentally positive, the employees want to get involved and also take responsibility.

At the same time, the optimizations in the company create new challenges to which the company must adapt.

Thus, it is a prerequisite for a functioning shopfloor management that management and employees work together optimally. Shopfloor management should by no means only serve as a control for management, but primarily improve the flow of information between employees and management. This is also particularly clear in the results of the survey in Results from Fig. 2 and 3. Meißner, Hertel, Metternich [33, 34] underline this statement in their report on "Digital shopfloor management."

It is important to note that the content of the SFB is not fix for all time, but can be rearranged in line with requirements. It is important to bear in mind that the board must not be a one-way communication street, but that employees and managers receive information from the board and bring it to the board. This is done with the aim of providing everyone with an equal knowledge base and thus promoting effective procedures with the aim of continuous process improvement, which is created through cooperation between employees and managers.

Dombrowski, Wullbrandt, Jäger, Linge [35] write in the Braunschweig shopfloor management Assessment, even of visual management and refer to the guidelines 2870 and 2871 and various recommendations for action of the VDI (Association of German Engineers) [36, 37].

This report shows, not least through the survey of employees involved (Results), but also through the explanation of the theoretical background of shopfloor management, that the hypotheses set out in Introduction have been clearly substantiated. Taking into account the personnel, spatial and technical infrastructure, SFM is an efficient tool for improving and accelerating information logistics.

#### Advantages for the company.

The optimization of processes in numerous areas of the company automatically results in advantages for the company and its employees [38]:

- Shorter reaction times to deviations due to increased speed of information transfer.
- Optimized use of human resources through greater utilization of existing employee potential. Efficient planning and control (see Fig. 1).
- Clear presentation of optimization potential and results (see Fig. 1).
- Increased transparency of target/actual states and their trends (see Fig. 1).
- More efficient communication and increased self-discipline in teams (through the application of the SFB systematics).

Benefits for employees:

- More efficient communication and faster information transfer.
- Increased transparency of target/actual states (see Fig. 1).
- Increased self-discipline in the teams through greater involvement in the process.
- Shorter reaction times to deviations due to increased speed of information transfer.
- Increased employee participation in problem solving.

A consistently used SFB also supports the implementation of the continuous improvement process (CIP). However, this is part of a separate report.

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