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Assessment of the Validity of Implementing the Shopfloor Management (SFM) Method. Methodology and Its Application

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ABSTRACT

Nowadays, tools originated from Lean Production (LP) are becoming more common, for example visual management implementations. One of the visualization methods supporting the idea of continuous improvement is Shopfloor Management method (SFM). The aim of using SFM is effective verification and presentation of production results, promoting better cooperation between production units and their supervisors. However, the implementation of the SFM method does not always bring the expected results and may meet with aversion of the crew, especially when it leads to excess information or excessive focus on analysis. To be an effective tool supporting continuous improvement, SFM's usefulness for the organization must be evaluated, justifying the need for implementation. Literature research has shown both the high effectiveness of the SFM method and its low use in Polish business practice. The publications do not provide useful guidance on when it is appropriate to implement the SFM method. Therefore, a methodology for assessing the validity of SFM implementations was developed and successfully used in a medium-sized manufacturing company. The checklist associated with the methodology allows for a numerical assessment to determine whether implementing SFM is justified or not. The aim of the study is to present both the methodology for assessing the validity of the SFM implementation and an example of its application.

Keywords: Shopfloor management (SFM), Methodology for assessing the validity of SFM implementations, Visual management

INTRODUCTION

Shopfloor Management (SFM) is one of the instruments of Lean Production (LP) tools related to the visualization of production results. LP is a holistic philosophy of waste elimination derived from the principles of the Toyota Production System (TPS). According to TPS, the seventh of the fourteen management principles requires 'to use visual control so that no problem remains hidden' (Liker, 2005).

Visualization is a set of practices that simplify managing of the production process by effectively presenting results and quickly detecting anomalies and problems on the production floor (Ingaldi and Klimecka-Tatar, 2015). Visual management plays a key role in streamlining production processes by improving flow of information and reporting. As a result, both production employees and management gain improved control over processes and can make more informed decisions (Ciarniene and Vienazindiene, 2015). Visualization is a tool that can improve production efficiency by increasing transparency of processes and effective communication in the sphere of production units of various complexity levels (Bullinger, 1999; Kubis, 2005). Indicators and charts serve as informative tools for current production outcomes, enabling employees and management to continuously monitor progress and identify any deviations from established standards (Knopp, 2016). Visualized work outcomes aligned with goals and plans enhance employee engagement and accountability. Furthermore, visualization facilitates superior internal communication, as it allows employees to convey their insights and feedback clearly (Tezel, Koskela, Tzortzopoulos, 2010), directly fostering more effective team collaboration.

Visual management facilitates the making of rational decisions by providing clear communication that enables quick situational recognition. It also enhances work safety, develops employee competencies, and reduces errors in operations (Kubik, 2010; Kandler, May, Kurtz, Kuhnle, Lanza, 2022; Parry and Turner, 2006). Nevertheless, its implementation can present challenges, including the organization of excess information, temporary disorganization, and the need to change established habits.

Within the LP concept, Shopfloor Management (SFM) is considered a method of effectively visualizing results and shaping appropriate employee attitudes. It is a method of verifying and presenting production results, which contributes to coupling the initiative of direct production units with production supervision in order to jointly strive to eliminate errors and improve the efficiency of the process (Suzaki, 1993). Thanks to the transparency of results and a clear presentation of goals, SFM can strengthen cooperation and competition among employees. According to the literature on the subject, SFM is an effective tool for reorganizing and ordering the production area in a situation of diversity and time pressure created by the market (Imai, 2006; Krishnamurthy, Yauch, 2007, Hertle, Siedelhofer, Metternich, Abele, 2015; Ciszewski and Wyrwicka, 2020).

However, the implementation of the SFM method does not always produce the desired results, and is not always accepted by the company's staff. Too much information can cause an employee to waste time finding the right data - and this is a classic waste. Moreover, there is a risk of incorrect interpretation of data and focus excessive attention on analysis instead of core activities (Knop, 2016). For SFM to become a useful tool for stimulating continuous improvement, its use should be justified.

Therefore, the goal was to develop a methodology for assessing the validity of SFM implementations in manufacturing enterprises in Poland, dedicated to the metal industry. The choice of the metal sector is justified due to its high contribution to Polish GDP and specific challenges, such as financial and organizational constraints, which may delay adaptation to new management methods, including SFM.

METHODOLOGY FOR ASSESSING THE VALIDITY OF IMPLEMENTING THE SFM METHOD

Research Procedure

The development of an original methodology for assessing the validity of implementing the SFM method began with preliminary research and conducting structured, in-depth interviews with production directors in three production companies in the metal industry. Based on the results of the interviews, a list of factors influencing the validity of implementing SFM was prepared.

The next stage was to conduct surveys on a representative sample of 300 practitioners associated with the production department (e.g., production workers, managers, foremen, etc.) in various manufacturing companies. The survey results facilitated the identification and refinement of implementation factors. Ultimately, sixteen determinants of SFM implementation validity were identified.

Then, the identified factors underwent network analysis using the Network Thinking Methodology of Probst and Gomez (Gomez, Probst, 1987) to determine the mutual interactions between the factors and to identify the factors that can be managed from the point of view of production manager. The result was a set of five key implementation validity factors:

- Managerial and foreman competencies,
- Production shortages,
- Problem source analysis,
- Implemented LP tools,
- Integration of management IT systems.

The key factors influencing validity became the basis for developing an original methodology called 'the methodology for assessing the validity of the implementation of the Shopfloor Management method' for use in medium-sized enterprises. This methodology consists of a validity assessment algorithm and a checklist.

MOZ-SFM Algorithm

The algorithm of the methodology for assessing the validity of SFM implementation - MOZ-SFM (Figure 1), allows the decision-maker to determine whether it is justified to start implementing the SFM method in the enterprise.

This part of the methodology steers the user through a five-step process. At each juncture, it inquires if one of the essential states for KC4SFM is achieved, following the provided guidance and instructions.

The use of the MOZ-SFM algorithm will indicate:

- The absence of a valid case for implementing SFM (thus concluding the procedure without the necessity of employing the checklist),
- Unconditional validation for the implementation (meeting all KC4SFM criteria),
- Conditional viability for implementation (should a six-month grace period be required to fulfill the minimum criteria for any KC4SFM).

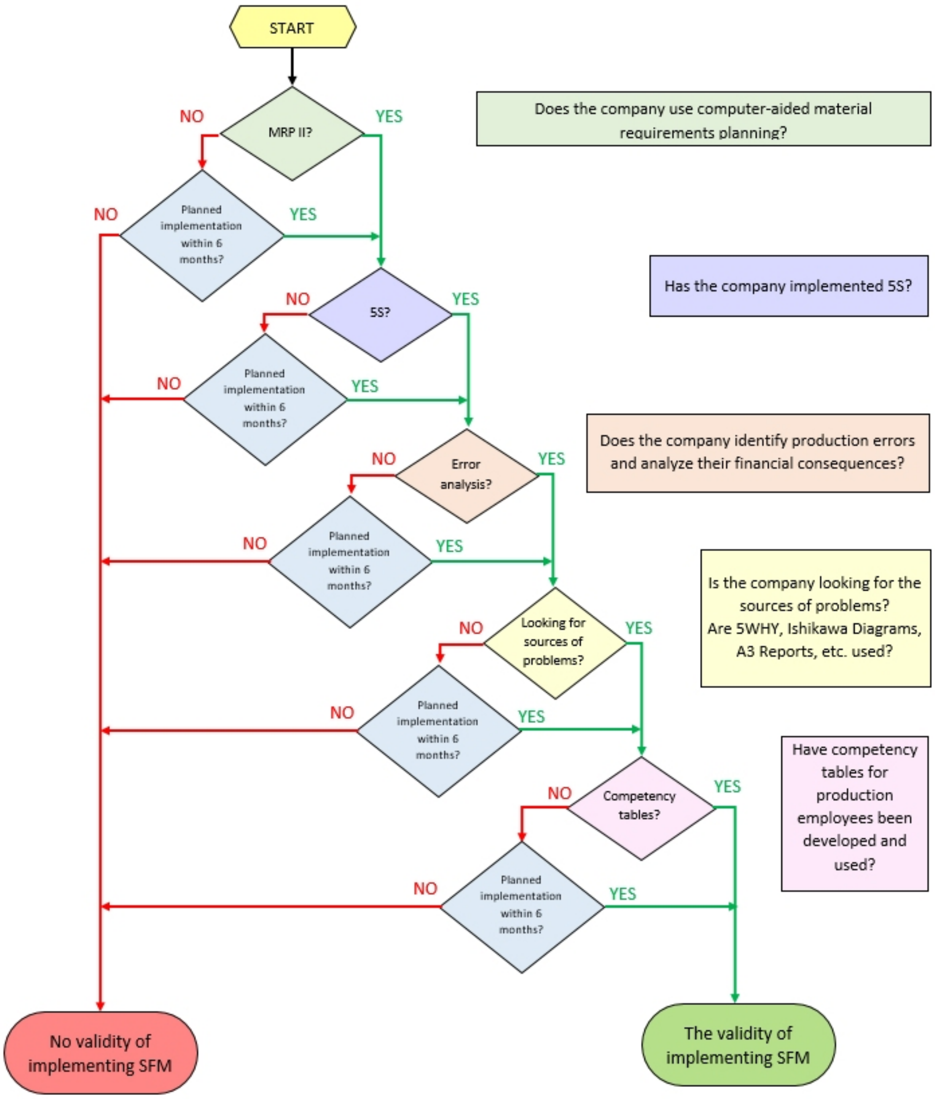

Figure 1: MOZ-SFM algorithm.

To numerically assess the appropriateness of SFM implementation, one should use the checklist (Figure 2). Point values for individual KC4SFM components were assigned based on conclusions from the survey results.

The checklist can be used in two ways:

- complete the appropriate fields on the printed form,
- complete the required data in a file opened in a browser on any device - the test result will be provided automatically.

Date:	
Company:	
Conducted by:	

No.	Key Validity Factor (KC4SFM)	Preferable factors for individual KC4SFM	Effectively implemented	To be implemented within 6 months	Points
1	Competencies of managers and shiftmasters (4)	**Competence tables (workshop workers and foremen/shiftmasters)**	☐	☐	1
		Individual improving competency management	☐	☐	1
		Production department shiftmasters	☐	☐	1
2	Production shortages (6)	**Shortage awareness (analisis)**	☐	☐	1
		Gap analysis (preventive and corrective actions)	☐	☐	1
3	Rootcase analysis (7)	**Implemented a "gap buster" or 5x Why? program. – management and employees acknowledge problems and investigate their causes**	☐	☐	1
		Brainstorming	☐	☐	2
		A3 sheets	☐	☐	1
		Ishikawa diagrams	☐	☐	1
4	Lean tools implementation (11)	**5S program implemented**	☐	☐	1
		TPM - total productive maintenance of machines	☐	☐	1
		Kanban	☐	☐	1
		Kaizen	☐	☐	1
		Visual Stream Mapping	☐	☐	1
5	IT system supporting management usage (12)**only one answer can be selected*	**Implemented MRP II class system**	☐	☐	1
		Implemented ERP system without a production module	☐	☐	1
		Implemented ERP system with a production module	☐	☐	2
		Implemented APS system (Advanced planning and scheduling)	☐	☐	3

As a result of above checklist, it was found:	

Figure 2: Checklist belonging to MOZ-SFM.

Application of the SFM implementation validity assessment methodology, which includes the MOZ-SFM algorithm and checklist, can lead to one of six potential validity states for the SFM method implementation:

- Low validity (5-10 points),
- Low validity with conditions (5-10 points and required grace period),
- Moderate validity (11-16 points),
- Moderate validity with conditions (11-16 points and required grace period),
- High validity (17-22 points),
- High validity with conditions (17-22 points and required grace period).

PRACTICAL APPLICATION OF THE MOZ-SFM METHODOLOGY

Company Profile

To validate the practicality of the MOZ-SFM methodology, inclusive of the algorithm and checklist, its utility was tested on the assessment of SFM implementation within a manufacturing context.

The subject was a medium-sized manufacturer based in Pleszew, Poland, specializing in metal processing and welded structure production for over two decades. The company employed 60 workers, 3 foremen, and 1 manager, engaging in activities such as precision laser cutting, metal bending, CNC machining, and boiler welding. The necessity to evaluate SFM's applicability arose from a developmental crisis precipitated by rapid growth from 2018 to 2021, which had led to operational management challenges. Key issues included delays in order execution and identifying deficiencies. Although restructured into three departments - laser cutting, machining, and welding - to streamline operations, the company still faced difficulties with material, semi-product, and information flow coordination. Persistent issues in order execution reporting precipitated overproduction, delays, and significant shortages.

An analysis underscored the requirement for management methods aligned with the Lean Production philosophy, aiming not only to solve coordination problems but also to elevate production manager competencies for adopting modern management techniques and fostering a culture of continuous improvement.

In response, the management sought to adopt the SFM method as a means to synchronize information exchange and probe into production shortfalls. Prior to its full-scale adoption, an evaluation of the method's validity was deemed essential.

Assessment of the Validity of Implementing the SFM Method Using the MOZ-SFM Algorithm

On May 16, 2023, the owner of the company personally conducted an assessment to determine the validity of implementing the SFM. The evaluation utilized printed materials featuring the MOZ-SFM algorithm and the associated checklist. The assessment process comprised the following: reviewing the methodology manual (20 minutes), conducting an interview with the production manager (20 minutes), examining the quality management system documentation (30 minutes) and going through the MOZ-SFM algorithm's steps and filling out the checklist (30 minutes).

Applying MOZ-SFM indicated a moderate conditional validity for implementing the SFM method. This classification, following the methodology's guidelines, stemmed from scoring 15 points on the checklist. The 'conditional' status arose due to the need for the 'tables of competences of production employees' to be implemented within a six-month period.

A notable benefit of MOZ-SFM methodology was its user-friendliness and efficient framework, which enabled the decision-maker to establish a moderate, conditional implementation validity in only 100 minutes. Users described the methodology as intelligible and straightforward.

The practical test of the methodology in an authentic manufacturing environment affirmed its efficacy and applicability, yielding critical data to facilitate decision-making for SFM method implementation.

LIMITATIONS

The MOZ-SFM method was developed for the specific needs of enterprises in the metal industry (strong price competition, high dependence on raw material prices, limited financial resources and low production automation). Industry restrictions mean that MOZ-SFM may not be suitable for companies operating in industries other than metal due to differences in their functioning.

Universalization of the method would require additional research that could reveal new validity factors (e.g. resulting from the specificity of the industry) or other connections between them.

CONCLUSION

To meet the practical needs of decision-makers in manufacturing companies, this study presents the MOZ-SFM methodology, including both an algorithm and a checklist, as a systematic approach to assessing the validity of implementing Shopfloor Management (SFM).

The effectiveness of the MOZ-SFM method has been proven through its application in real operating conditions.

This method is intended for metal industry enterprises, and its wider application in other sectors of the economy would require additional research.

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