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Lean Manufacturing Practices Assessment Case Study of Automotive Company

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Abstract
Lean Manufacturing (LM) practices have gained popularity as a means to achieve high-quality products while reducing costs and delivery times. However, the implementation of LM can be challenging, with a high failure rate. This paper aims to explore the perspectives of employees and managers on LM practices implemented in an automotive company. The research involved primary and secondary data analysis, combining observation, interviews, and a questionnaire survey. The survey assessed knowledge and skills, impact on quality improvement, motivation, supervisor support, control, and engagement in LM development. The results highlight the importance of management commitment and support in achieving successful LM implementation. Moreover, the study emphasises the positive impact of LM practices on employee motivation and the overall quality of processes and products. The PDCA cycle emerged as the most impactful tool, along with other recognised tools like Poka Yoke, Andon, Kaizen, Visual Management, and the 5S method. The findings contribute to understanding the implementation and effects of LM practices, providing insights for companies seeking improvement through Lean Manufacturing methodologies.

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1. Introduction

Product quality is essential to the success of any company. Competitiveness in the business environment increasingly forces companies to constantly improve the quality of products and adapt them to the requirements and expectations of customers (Pech & Vaněček, 2018). Every company must realise that the customer is most important, as everything begins and ends with him. In the automotive industry, product quality plays a significant role, as customers expect cars to be not only safe, but also durable and functional. Customers are also interested in the unique appearance and the latest car technology. An important aspect is also availability, which is becoming problematic these days, and this is due to the current geopolitical situation, as well as the effects caused by the Coronavirus pandemic. Many companies opt for the Lean Manufacturing concept, which allows them to achieve high-quality products while eliminating waste (Kaneku-Orbegozo et al., 2019), reducing production costs and delivery times (Bouazza et al., 2021). It should be noted that 75% (Maware and Parsley, 2022), of companies implementing Lean transformation fail. This is mainly caused by a lack of support from top management. The success of the remaining 25% is very often astonishing and leads companies not only to a stable financial situation but also to position them as market leaders. This is due to the management's commitment, which can motivate its team in the right way to achieve success (Produção et al., 2019) but also by building a relationship based on trust and support.

This paper aims to explore the two perspectives of employees and managers on Lean Manufacturing practices implementation in a chosen automotive company. The rest of the paper is structured as follows: the next section provides an overview of lean manufacturing on previous studies. The methodology used in the research process is then presented. A further section is dedicated to delivering the research findings. Finally, the paper ends with a summary and conclusion section.

2. Literature review

The Lean Manufacturing concept has evolved over time. It has expanded beyond its initial applications within the automotive industry, becoming a widely adopted management approach across various functional areas and organisations. Despite the criticisms and the absence of a formal definition, Lean has emerged as a global operations paradigm with a primary objective of minimising variability and streamlining processes to enhance the flow of operations (Samuel et al., 2015).

Stemming from its origins in the Toyota Production System (TPS) and Just-in-Time (JIT) principles, the adoption and differentiation of Lean Manufacturing from the JIT/TPS concept can be attributed to several factors (Holweg, 2007). First, its rise coincided with a significant crisis in the U.S. auto industry, making Lean Manufacturing a timely and attractive solution for organisations looking to improve their operational efficiency. Additionally, the accessibility of Lean Manufacturing literature played a crucial role, as it presented concepts more practitioner-friendly, avoiding complex technical language found in earlier publications. Moreover, the scope of Lean Manufacturing extended beyond the shop floor and operational improvements, offering a broader framework applicable to various aspects of an organisation. This expansion has led to the emergence of different variants, such as Lean manufacturing, Lean production, Lean management, or simply Lean (Hines et al., 2004).

The evolution of the Lean Manufacturing concept has paved the way for its widespread adoption across various industries (Aadithya et al., 2023; Sankowska and Rygowska-Zielińska, 2014; Ulewicz et al., 2021). However, the implementation of Lean principles and practices can be challenging. Organisations often encounter difficulties in effectively applying Lean Manufacturing due to numerous factors. Almanei et al. (2017) state that Lean is not merely a set of tools for productivity improvement; it represents a new management philosophy that affects all aspects of an organisation. Introducing Lean philosophy into an organisation is a complex and substantial endeavour. Stakeholders with conflicting interests must be considered, and a comprehensive understanding of the organisation's context is necessary.

Today, Lean thinking is primarily associated with improving the efficiency of operations by eliminating waste, minimising waste and controlling the flow of added value (Logu et al., 2021; Ingaldi and Jagusiak-Kocik, 2014). This means, in effect, lean production, lean service delivery, lean office work, etc., consuming as few resources as possible for the value obtained. Value added is, in some simplification, the value (expressed in monetary units) that a customer is willing to pay for what is included in a given product or part of a product, arising at a given stage of the production process (service delivery). In this context, three categories of activities (operations) can be distinguished (Hamrol, 2016):

- VA (value added) - value-enhancing activities, i.e., those in which the characteristics of the product or service expected and accepted by the customer are shaped.
- BVA (business value added) - activities that do not add value, but are necessary, with a given level of technology and work organisation, for the product to be created and meet customer requirements.
- NVA (not value added) – unnecessary operations from the point of view of both internal and external customers. They must necessarily be eliminated.

Therefore, waste is any activity requiring labour but not creating added value. The value we can understand as the final value for our customers. This means that only those activities in the production process that give value to the product in the eyes of the customer are not wasteful. The Japanese use a term for waste: Muda. The seven basic types of Muda, according to Ohno (Hamrol, 2016) are:

- all forms of overproduction (e.g., production for stock),
- failure to produce on time (e.g., delays, production of wrong components),
- excessive transportation,
- prolonged searching for tools and materials,
- overseeing a machine running in automatic mode,
- processing the same information in many different places.

The concept of Lean Manufacturing is implemented in all industries, which is definitely due to its effectiveness (Nallusamy and Adil, 2017; Wolniak, 2014). It is not only the increase in productivity that is its greatest asset but also the quality improvement, customer and employee satisfaction improvement and the reduction of costs (Aripin et al., 2023).

A complex web of interconnected barriers can impede the successful implementation of Lean manufacturing (Jadhav et al., 2014). To ensure the effective implementation of Lean production, top management must recognise these barriers and their interdependencies (Zargun and Al-Ashaab, 2014). Among these barriers, financial constraints emerge as a major obstacle, greatly influencing decision-making processes associated with Lean implementation. Moreover, the lack of commitment and support from top management, along with organisational cultural differences, serve as additional barriers that are contingent upon financial constraints. The interconnected nature of these barriers underscores the necessity of a holistic approach to address them.

Effective measurement of Lean Manufacturing implementation is essential for organisations aiming to assess their advancements and pinpoint areas for enhancement. Shah and Ward in their work, (Shah and Ward, 2007) introduce a comprehensive 10-dimension assessment system that encompasses key elements of Lean production. These dimensions include supplier feedback, JIT (Just-in-Time) delivery by suppliers, supplier development, customer involvement, pull (Kanban system), continuous flow, set-up time reduction, total productive/preventive maintenance, statistical process control, and employee involvement. By utilising these dimensions, organisations can adopt a holistic framework to evaluate the degree to which Lean principles have been incorporated into their operations.

A system-thinking approach is necessary to implement Lean successfully, as highlighted by Yadav et al. (2017). This approach involves aligning all socio-technical elements, such as people, technology, organisational structure, and the external environment. Understanding the interconnected nature of these elements and their influence on the lean transformation

of an organisation is vital for achieving effective implementation.

A comprehensive analysis by Elkhairi et al. (2019) identifies various barriers and critical success factors in Lean implementation. Lack of expertise, planning, commitment from top management, strategic perspective, misunderstanding of Lean, and resistance to change are identified as barriers. On the other hand, competence and expertise, education and training, commitment from top management, and cultural change are critical success factors. These findings underscore the importance of developing the necessary competencies, providing training and education, and fostering a culture that supports Lean principles.

(Achanga et al., 2006) Achanga et al. observe that the successful implementation of Lean manufacturing is influenced by various factors encompassing leadership, management, finance, skills and expertise, and the culture of the recipient organisation. Effective leadership and management practices are crucial for driving Lean initiatives and ensuring sustained progress. Additionally, the availability of financial resources plays a vital role in supporting Lean implementation efforts. Skills and expertise within the organisation are necessary for utilising Lean tools and techniques effectively. Furthermore, the culture of the recipient organisation, including its values, norms, and attitudes, significantly impacts the adoption and integration of Lean principles.

Rymaszewska (2014) highlights that long-term orientation and the willingness to sacrifice short-term benefits are essential for the successful adoption of Lean. Lean should be perceived as a holistic concept that extends beyond manufacturing processes, encompassing the entire organisation. Creating a relentless improvement and waste elimination culture is imperative for overcoming challenges and driving Lean transformation.

Yadav et al. (2019) find that the lack of management commitment and leadership is a critical barrier to successful Lean implementation in SMEs. This is consistent with previous studies and highlights the need for solid management commitment and leadership. Furthermore, resource limitations, communication challenges, and a lack of understanding of Lean benefits are significant barriers that impact other factors.

Noticeably, perceptions of barriers to Lean implementation vary across hierarchical levels within an organisation (Lodgaard et al., 2016). Top managers acknowledge most barriers but emphasise the lack of knowledge about Lean and the failure to use appropriate tools and practices. On the other hand, workers place less emphasis on knowledge, tools, and practices and instead focus on management-related challenges. Middle managers recognise all barriers but place particular importance on roles and responsibilities and the inadequate selection of tools and practices. Interestingly, both managers and workers agree on the significance of managerial barriers.

The statement that people create value is also true for Lean Manufacturing concept. Since it is people who implement processes and use technology and equipment. Rooting out waste through Lean practices depends on creating the right culture of continuous improvement and environment where people are engaged, think creatively and do work that matters (Sayer andWilliams, 2019; Oliveira, J. and Sá, José and Fernandes, 2017).

3. Methodology

The research was based on primary and secondary data analysis. In the first phase, observation and interviews were used following a questionnaire survey. The observation focused on the workplace operation, especially in the main assembly area and other related areas, to gain knowledge about the production process and the Lean Manufacturing tools used. The results of the observations and the results of the literature analysis related to LM allowed the development of a survey questionnaire. The survey was designed to explore the perspectives of both production workers and managers on LM practices and their benefits.

The survey's questionnaire contained questions regarding the following:

- assessment of knowledge and skills of LM methods and tools that are used in the company,
- assessment of LM methods and tools' impact on quality improvement,
- assessment of the impact of LM tools and methods on motivation
- assessment of supervisors' support
- assessment of control on LM
- assessment of the engagement in LM development

The questionnaire for production workers was distributed in paper form, while that for managers was in electronic form. The Quality Manager delivered paper questionnaires to all company departments, and electronic questionnaires were distributed to managers by inserting the link to the online questionnaire in the invitation e-mail. This resulted in 70 questionnaires completed by production employees and 16 electronic questionnaires completed by the plant managers. The study was conducted from January to February 2023.

4. Results

4.1. Company characteristics

Company X is a manufacturing plant belonging to an automotive concern that produces X brand of passenger cars. The plant currently employs around 3,500 workers. Company X has undergone many changes since its foundation. Initially, the production plant focused on producing the X1 model, and as the years passed, other models, such as the X2 and X3, were added. In 2012, the company began producing the new generation of the X model, which marked a turning point in the company's history. The plant specialises in producing passenger cars using state-of-the-art technologies and production processes. Currently, the company, after transformations, has withdrawn from the production of the X model and has undertaken the production of the Y model. The management decided to provide customers with models for which demand will increase in the future - electric cars. Among other things, the plant uses robotisation, automation of assembly processes, and specialised production management software. The plant

follows the Lean Manufacturing philosophy in its operations. The company has been applying Lean Manufacturing principles to its manufacturing for a long time, and many of its activities are focused on streamlining production processes and reducing costs. To assess the LM practices in the company, we explore the opinion of managers and employees to have different perspectives on the same topic.

4.2. Sample

The study on the impact of Lean Manufacturing on product quality involved 16 respondents from management staff and 70 from the production staff. The age of respondents from the group of managers was split into two groups. 87% of managers were over 45, and 13% of respondents were between 36 and 45. Managers under 36 years were not present in the sample. Therefore, it can be concluded that the management staff is mature with extensive professional experience. Group Leaders and Team Managers took part in the study. The Group Leader usually manages a team of 6 to 11 people in this plant. The next group is Team Managers, to whom Group Leaders and production staff report directly (Team Managers usually supervise 3 or 4 Group Leaders and from 18 to 44 production staff). Seven Group Leaders and nine Team Managers joined the survey.

The age of production staff was 70% of respondents over 45 years, and 25.71% (18 respondents) were employees aged 36-45. The smallest group of respondents were aged between 25-35 years (3 respondents). Therefore, persons under 25 years were not present in this study. The largest group of respondents were employees with more than ten years of experience (94.3% of respondents). The next group of respondents were employees with 5-10 years of work experience, respectively 4.3% of respondents. Only one respondent was an employee with 1-5 years of work experience.

4.3. Survey results

4.3.1. Knowledge and skills

The first questions asked about the level of knowledge and skills of employees regarding Lean Manufacturing. The management rates their own and their employee's knowledge and skills regarding Lean Manufacturing as high or very high. However, there is a significant difference between the self-assessment of management and the perception of employees. While most managers rate their own knowledge as very high, only a small percentage of employees rate their own knowledge at that level (Table 1). The difference between the self-assessment of management and the perception of employees could be attributed to the Dunning-Kruger effect (Kim et al., 2016). This cognitive bias suggests that individuals with low ability in a particular area tend to overestimate their competence, while those with higher ability may underestimate their competencies. In this case, managers may overestimate their knowledge and skills regarding Lean Manufacturing.

The result can be considered satisfactory, as 64.3% of production staff claim more than average knowledge and skills. It is essential to continuously improve the knowledge and skills of employees in Lean Manufacturing in the plants where it is applied. It is also important to refresh information through the use of refresher training.

Table 1. Lean Manufacturing Knowledge and Skills

	Very low	Low	Average	High	Very high
Self-assessment of management staff concerning lean manufacturing knowledge and skills				37.5%	62.5%
Evaluation of the Lean Manufacturing knowledge and skills of the team (perceived by the management staff)				56.25%	43.75%
Evaluation of the Lean Manufacturing knowledge and skills of the team (perceived by the employees)	1.4%	1.4%	32.9%	50%	14.3%

4.3.2. Methods of LM supervision used by Management

Management staff uses various Lean Manufacturing supervision methods. One of the most frequently mentioned is internal audit, used by 87.5% (14 respondents). This is followed by Kaizen workshops by 81.25% (13 respondents) and problem-solving boards used by 81.25% (13 respondents). These two ways of supervision simultaneously involve employees in the development of Lean Manufacturing. This certainly positively impacts the areas where these methods are used. In third place are Quality Circles utilised by 75% (12 respondents). Finally, the least popular methods are production analysis boards 25% (4 respondents) and the suggestion system 37.50% (6 respondents). These results (Figure 1) indicate that managers use a variety of ways to supervise Lean Manufacturing, and these most popular methods involve employees and can positively impact areas where they are implemented.

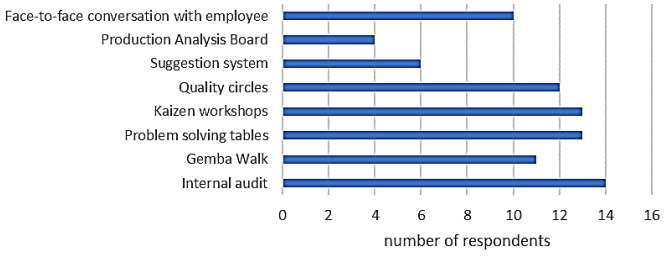

Fig. 1. Methods of LM supervision used by management

According to the production employees, 71.43% consider that management staff supervises Lean Manufacturing, 5.71% (4 respondents) think that they do not, and 22.86% (16 respondents) have no opinion on the subject.

4.3.3. LM and the motivation of employees in the opinion of the management

As many as 81.25% of management staff (13 respondents) believe that employees are more motivated to work thanks to Lean Manufacturing tools and methods, and only 6.25% (1 respondent) disagree with this statement. On the other hand, 12.50% (2 respondents) do not know whether Lean Manufacturing tools impact employee motivation.

4.3.4. Employee Motivation and the Use of Lean Manufacturing in the Opinion of Employees

In the opinion of production staff, the use of Lean Manufacturing tools and methods translates into their motivation, according to 48.57% of employees. However, 21.43% (15 respondents) claim that this is not the case. And 30% (21 respondents) do not know whether Lean Manufacturing tools and methods impact their motivation (Table 2).

Table 2. Employee Motivation and the Use of Lean Manufacturing Tools

	Yes	I don't know	No
Do employees feel more motivated to work due to using Lean Manufacturing tools? managers opinion	81%	13%	6%
Do you feel more motivated to work due to using Lean Manufacturing tools? employees opinion	49%	30%	21%

The majority of managers believe that employees are more motivated to work due to the use of Lean Manufacturing tools and methods. However, the opinions of employees vary, with around half of them agreeing that Lean Manufacturing tools positively impact their motivation. A significant percentage of employees are unsure about the impact of these tools on their motivation.

4.3.5. The ways of motivating employees

Almost half of the respondents from manufacturing staff say they are motivated to work by using Lean Manufacturing tools and methods, but as many as 30% do not know it (Table 2). However, in the study on methods of motivation, as many as 87% of employees (Figure 2) see the greatest motivation in the "Bonus for a selected idea submitted in the Kaizen program", which may indicate that the 30% of respondents in the question on the impact of LM tools on motivation did not think about motivation in this form until they saw this answer in the next question of the survey. This may prove a standard that the organization developed, in which employees perceive submitting Kaizen ideas as a natural, regular activity. Next, 42.86% (30 respondents) see motivation in entrusting more responsibility. The third best method of motivation is praise in the team forum, respectively 32.86% (23 respondents). Another method of motivation is promotion, and this answer is supported by 31.43% (22 respondents). Praise in person is considered a way of motivation according to 28.57% (20 respondents), and additional training by 24.29% (17 respondents). As can be seen, the best form of employee motivation is rewarding them for a selected idea submitted in the Kaizen program, which certainly translates into the development of Lean Manufacturing.

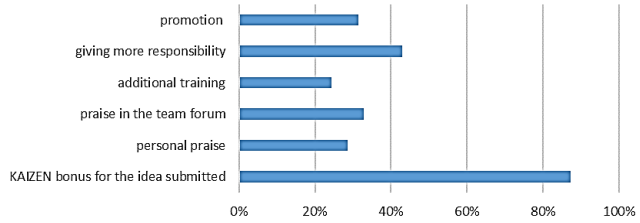

Fig. 2. Important ways of employees' motivation

The findings suggest that rewarding employees for their ideas and providing opportunities for growth and recognition are effective motivators.

4.3.6. Employee ideas and their implementation

Over 60% of production employees (44 respondents) claim they are listened to by their superiors and their ideas are implemented (Figure 3). As many as 23% of respondents believe they are fully heard, but their ideas are implemented after modifications and 14% (10 respondents) are only partially heard, and their idea is not implemented.

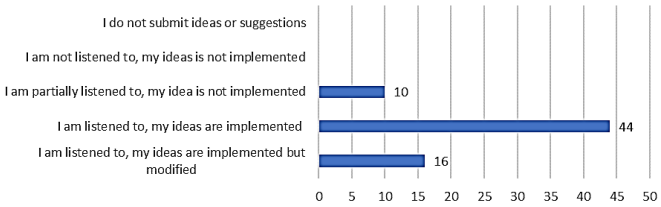

Fig. 3. Employees' ideas and their implementation

None of the respondents answered "I am not heard, the idea is not implemented", and "I do not submit ideas or suggestions". This study shows that in the analyzed plant, employees have an impact on their work and fully participate in improving the quality of processes and products. Sixty respondents confirm that their ideas are implemented. The data also shows that the level of employee involvement in the improvement process and their inventiveness is high, as only a few ideas are modified.

4.3.7. Supervisors support

For further development of the LM concept in the analysed plant, the employees' answers to the question related to superiors' support seem optimistic. As many as 85.71% (60 respondents) claim that they receive satisfactory support from their supervisors in the field of Lean Manufacturing. Five respondents do not receive such support and another five do not

know whether they receive such support. The result could be treated as satisfactory and shows that the management, in the opinion of production employees, is engaged and willing to help employees solve problems. This level of support encourages employees to submit ideas (Figure 4).

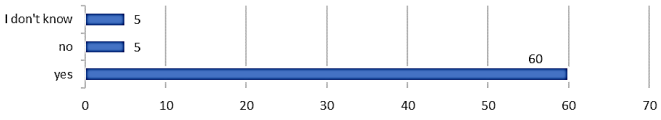

Fig. 4. Supervisors' support

4.3.8. Impact on quality

The next question concerned the impact of the tools and methods used in the company on quality after implementing LM.

Managers observed the most significant changes in the quality level of processes and products after using the PDCA cycle (Figure 5).

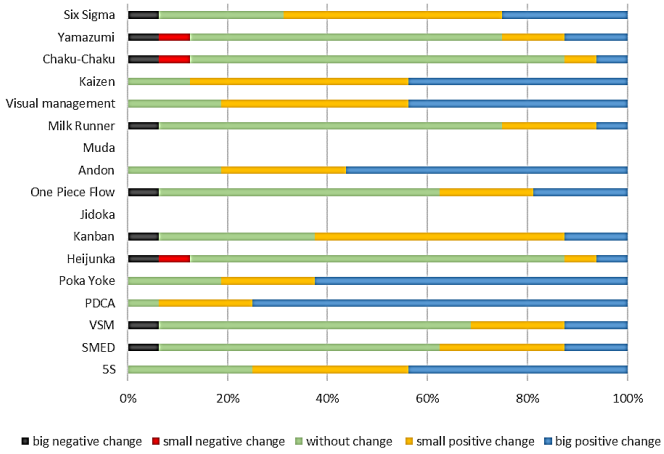

Fig. 5. Impact of the used tools and methods on quality after the implementation of LM as perceived by managers

Significant positive changes were observed by 75% (12 respondents), small positive changes by 18.75% (3 respondents), and changes were not noticed by only one respondent. The second most frequently indicated tool was Poka Yoke, where significant positive changes by using it were observed by 62.50% (10 respondents), small positive changes by 18.75% (3 respondents) and the changes were not noticed by 18.75% (3 respondents). Andon is The third in order regarding observed changes in quality level. Thanks to the use of the Andon system, significant positive changes were observed by 56.25% (9 respondents), small positive changes by 25% (4 respondents), and no changes were observed by 18.75% (3 respondents). Kaizen is the fourth tool for positive change; 43.75% of respondents (7 respondents) noticed significant positive changes, 43.75% (7 respondents) saw small positive changes, and two respondents did not notice any changes. Finally, visual management was assessed in terms of significant positive changes by 43.75% (7 respondents), small positive changes by 37.50% (6 respondents) and no differences were observed by 18.75% (3 respondents). Sixth place went to the 5S method. Thanks to the use of 5S, significant positive changes were observed by 43.75% (7 respondents), small positive changes by 31.25% (5 respondents), and changes were not noticed by 25% (4 respondents).

Management also quite visibly stated that they did not see any change when using Chaku-chaku 75% (12 respondents), Heijunka 75% (12 respondents), Milk Runner 68.75% (11 respondents), Yamazumi 62.50% (10 respondents), Jidoka 62.50% (10 respondents) and VSM method 62.50% (10 respondents). They claim that these tools have no direct impact on the quality. Single respondents noticed negative changes. The management may know the tools, and knows how to use them, but it needs to see the benefits of the Lean Manufacturing tools fully.

Regarding the changes in quality level observed by production staff after implementing Lean Manufacturing, they observed positive changes mainly after using Poka Yoke (Figure 6). Nearly 70% (45 respondents) noticed significant positive changes, 20% (13 respondents) had small positive changes, and 9.23% (6 respondents) did not see any changes.

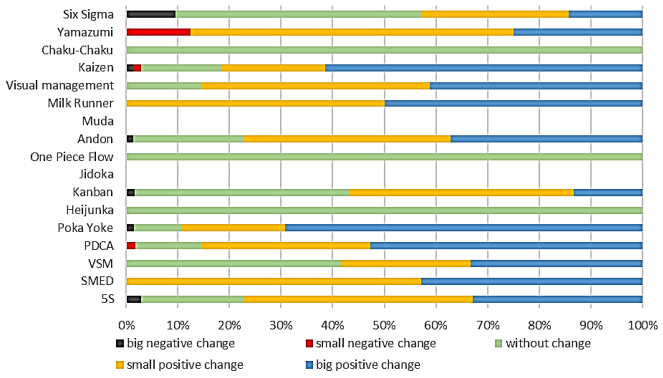

Fig. 6. Impact of the used tools and methods on quality after the implementation of LM as perceived by employees

One respondent observed significant negative changes. In second place was Kaizen was chosen, where 61.43% (43 respondents) noticed significant positive changes while using this tool. Small positive changes were observed by 20% (14 respondents), and no changes were noticed by 15.71% (11 respondents). One respondent noticed small negative changes as well as big negative changes. PDCA was ranked third, in which 52.73% (29 respondents) see big positive changes, 32.73% (18 respondents) see small positive changes, and 12.73% (7 respondents) see no difference when using PDCA, and 1 respondent notices small negative changes. Another tool is Andon, big positive changes after its introduction were noticed by 37.14% (26 respondents), small positive changes by 40% (28 respondents), and 21.43% (15 respondents) answered no changes. One respondent was in favour of major negative changes after the implementation of the Andon system. The 5S method was ranked fifth. Over 30% (23 respondents) notice significant positive changes, while 44% (31 respondents) see small positive changes, and 20% (14 respondents) do not see any changes. Significant negative changes due to the use of the 5S method were observed by two respondents. Visual management was assessed in terms of significant positive

changes by 41% (14 respondents), small positive changes by 44.12% (15 respondents), and no changes were observed by 14.71% (5 respondents).

Both management and employees perceive positive changes in quality after implementing Lean Manufacturing. The tools and methods that are most commonly associated with positive changes in quality include PDCA, Poka Yoke, Andon, Kaizen, Visual Management, and the 5S method.

Referring to the opinion on the impact of LM tools on quality, it is worth finding out which tools are really known by employees. And 100% of production staff (70 respondents) marked three tools in the survey that they know are used in the company (Figure 7).

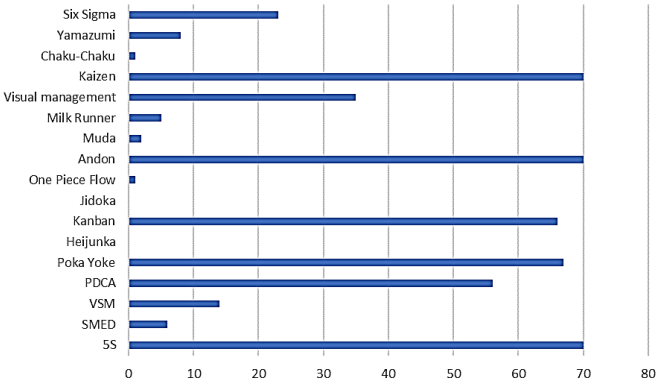

Fig. 7. Knowledge of LM tools according to employees

Therefore, tools and methods such as 5S, Kaizen, and Andon are well-known to employees. They then pointed to tools such as Poka Yoke 95.71% (of 67 respondents), Kanban 94.29% (of 66 respondents) and PDCA 80% (of 56 respondents). The group of less known ones includes Visual Management 50% (35 respondents), Six Sigma 32.86% (23 respondents) and VSM 20% (14 respondents). Employees showed very low knowledge of such tools and methods as SMED 8.57% (6 respondents), Yamazumi 11.43% (8 respondents), Milk Runner 7.14% (5 respondents), Muda 2.86% (2 respondents)) and One Piece Flow and Chaku-chaku 1.43% each (1 respondent). None of the respondents knows methods such as Jidoka or Heijunka.

The answers indicate that employees' knowledge of the tools and methods used is high. This may suggest that the management devoted much time to training employees and familiarising them with the knowledge of Lean Manufacturing.

4.3.9. Involvement in the development of LM

According to 62.50% (10 respondents) of the management staff, their level of involvement in the development of Lean Manufacturing is high, and 25% of respondents assess this level as very high (Figure 8).

On the other hand, a moderate level of involvement was declared by 12.50% (2 respondents). The self-assessed level of management involvement as "very high" (25%) allows us to conclude that the superiors assess the participation in developing employee teams higher than their own.

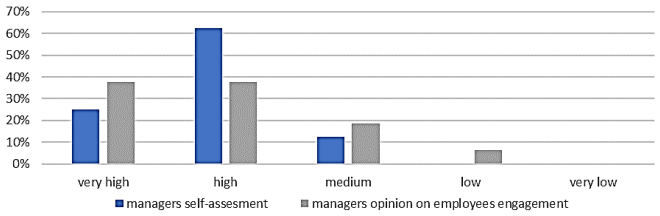

Fig. 8. The level of involvement in the development of LM in the opinion of the management

The situation is different in the case of a "high" level of involvement in developing the LM concept.Managers are satisfied with the level of involvement of their teams in the development of Lean Manufacturing. As many as 75% of respondents assess team involvement as very high and high. On the other hand, 18.75% (3 respondents) determine the level of involvement of their team in a moderate way, and only one respondent is low.

5. Conclusion

The study examined the knowledge and perceptions of management and employees regarding Lean Manufacturing practices. Overall, both management and employees demonstrated a satisfactory level of knowledge and skills in Lean Manufacturing. However, there may be a potential bias in the self-assessment of management staff, suggesting the need for further evaluation. Management was actively involved in supervising Lean Manufacturing practices through methods such as Kaizen workshops, internal audits and problem-solving boards. Employee opinions on the impact of Lean Manufacturing tools on motivation varied, with some feeling more motivated while others remained uncertain. Effective ways of motivating employees included Kaizen bonuses, increased responsibility, and recognition in team forums. Employees generally felt listened to and supported by supervisors in the field of Lean Manufacturing.

The study also delved into the impact of Lean Manufacturing practices on the quality level within the organisation. It was found that the implementation of Lean Manufacturing tools and methodologies had a significant positive effect on the quality of processes and products. The PDCA cycle emerged as the most impactful tool for driving positive changes in process and product quality, along with other recognised tools like Poka Yoke, Andon, Kaizen, Visual Management, and the 5S method.

Overall, the data suggest that while there may be some overestimation of knowledge and skills by the management, Lean Manufacturing has had a positive impact on employee motivation and the quality of processes and products. Continuous improvement and training efforts should be maintained to enhance knowledge and skills further.

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精益制造实践评估
汽车公司案例

關鍵詞

精益方法和工具
精益实施
员工和管理者的观点汽车

摘要

精益制造 (LM) 实践作为获得高质量产品、同时降低成本和缩短交货时间的一种手段而受到欢迎。 然而，LM 的实施可能具有挑战性，失败率很高。 本文旨在探讨员工和管理者对汽车公司实施的 LM 实践的看法。 该研究涉及一手和二手数据分析，结合观察、访谈和问卷调查。 该调查评估了知识和技能、对质量改进的影响、动机、主管支持、控制和 LM 开发的参与。 结果凸显了管理层承诺和支持对于成功实施 LM 的重要性。 此外，该研究强调了 LM 实践对员工激励以及流程和产品整体质量的积极影响。 PDCA 循环与 Poka Yoke、Andon、Kaizen、可视化管理和 5S 方法等其他公认的工具一起成为最具影响力的工具。 研究结果有助于了解 LM 实践的实施和效果，为通过精益制造方法寻求改进的公司提供见解。