

## HUMAN SIDE OF LEAN MANUFACTURING: AN INSIDER'S PERSPECTIVES ON WORK ENVIRONMENT

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**Purpose:** We aimed to understand how integrating lean principles with human factors can contribute to a more productive, satisfied, and motivated workforce. Additionally, the paper investigated the roles of employee empowerment, continuous improvement, and organizational support in creating a human-centered lean manufacturing environment.

**Design/methodology/approach:** The authors conducted a detailed analysis of the literature. This theoretical analysis enabled the preparation of a comprehensive and detailed examination using a survey questionnaire, providing in-depth insights into the research statements. This data was extended due to the participant observation which allowed to immerse in the day-to-day activities of the workers.

**Findings:** Lean Manufacturing positively impacted the humanization of work, with effective team cooperation and communication boosting productivity. However, some employees felt excluded from joint decision-making and feedback processes, which could harm motivation and organizational effectiveness. Enhancing training opportunities could help employees better adapt their skills to their tasks.

**Research limitations/implications:** The limitation of the research is the pilot study which was conducted among 15 respondents from one company. In the future, it is planned to extend it to other production companies.

**Originality/value:** The paper makes a contribution to the field by linking Lean Manufacturing and human aspects in a Polish work environment. Instead of exploring the traditional benefits of Lean Manufacturing in enhancing operational efficiency and reducing waste, we focused on its impact on the workforce, workplace culture, and employee engagement.

**Keywords:** human-centered approach, Lean Manufacturing, work environment.

**Category of the paper:** Research paper.

## 1. Introduction

Nowadays, technological and information progress determines the new challenges that work faces, such as the need for continuous skill development, adaptation to rapidly changing environment, and managing the integration of advanced technologies into existing workflows (Guest et al., 2022). Despite the increase in the implementation of automation and robotics in production systems, human involvement remains vital because of their essential skills in supervising and managing these processes (Ahmed et al., 2022). Therefore, the well-being of employees becomes not only a moral duty but also a factor that provides benefits for the company (Ho, Kuvaas, 2020). Additionally, these advancements bring about new considerations for data security, remote collaboration, and maintaining a balance between automation and human oversight. In order to overcome all these challenges, new attitudes such as a human-centered approach can be introduced to companies.

A human-centered approach, which prioritizes the well-being and satisfaction of employees, customers, and communities, is essential for building an efficiently operating enterprise. It enables the integration of the technical system and human capital in the organization. By its adoption, enterprises can create a positive work environment that not only drives employee engagement and motivation but enhances efficiency and productivity. It leads to sustainable growth and success for the organization. It can be noticed in Lean Manufacturing, which focuses on creating more value for customers with fewer resources. Lean principles emphasize the elimination of waste, continuous improvement, and optimizing processes to enhance efficiency and productivity. It may seem that its idea focuses solely on organizational and technical aspects, but that would be a mistake. The primary objective of Lean Manufacturing is to focus on people (Gaiardelli et al., 2019; Mrugalska, 2020). It assumes maximum utilization of the potential of workers and machinery but without overproduction or ordering too large quantities of raw materials that would require subsequent storage. From this perspective, it leads to enhanced employee satisfaction, reduced stress, and improved collaboration, ultimately resulting in a more motivated and productive workforce. Additionally, lean manufacturing emphasizes employee involvement and empowers workers to take ownership of their roles, encouraging innovation and a proactive approach to problem-solving. Reducing waste, including those relating to the non-exploitation of human potential, is the key to improving the efficiency of processes. The analysis of the human role in the context of Lean Manufacturing allows to identify areas that may affect the productivity of work and the elimination of unwanted inconveniences of the work environment (Bouranta et al., 2022).

In this paper we analyzed the human aspect in the concept of Lean Manufacturing in a production enterprise. We did not explore traditionally if Lean Manufacturing enhances operational efficiency and reduces waste but we emphasized its impact on the workforce, workplace culture, and employee engagement. By examining the integration of lean principles

with human factors, we aimed to understand how lean practices can contribute to the creation of a more productive, satisfied, and motivated workforce. Furthermore, the paper investigated the roles of employee empowerment, continuous improvement, and organizational support in fostering a human-centered lean manufacturing environment. It allowed to highlight the significance of the human element in the successful implementation of Lean Manufacturing.

## 2. Human aspects in work environment

Humanizing a work means understanding human nature and growing a culture that lets humans succeed while the organization can flourish in the same time. In the long run, humanizing work requires constant, continual, continuous attention, where it is implemented a system of principles and practical actions focused on the individual psychophysical capabilities of a worker (Kawecka-Endler, Mrugalska, 2014). For this aim, the activities are indicated and introduced into practice to eliminate or at least limit the negative impact of work on people by the work environment. Such a system offers working conditions that not only do not harm the physical and mental health of employees but also pay attention to improving the comfort and safety of work. Humanizing work is often visible in the implementation of modern forms of labor organization, the enrichment of its content, and the increase of employee participation as well as the flexibility of working time (Walczyzna, 2012).

Some authors claim that the human aspect of work can be easily distinguished in its technological elements (elimination of heavy and burdensome work, improvement of the comfort and safety of work, and the introduction of new, human-friendly forms of organization of work) and social (mainly increased employee participation and satisfaction of other employee needs, such as social or cultural) (Mikuła, 2009). It shows that the humanization of work is multifaceted. Furthermore, it is important to emphasize that improving the quality of life at work must be carried out from the perspective of every employee who enters the organization with all their needs, goals, values and limitations (Umair et al., 2023a; Umair et al., 2023b). Work environment significantly impacts the quality of human life and is reflected in other areas of personal life (Marquez et al., 2020).

Humanizing work means making work and places of work more human-centered approach. To achieve this, the following actions must be taken (Venema, 2024):

- recognize and treat employees as people, and only as resources,
- put your people first,
- believe and trust that people want to do good work, and you will achieve the best results if you get out of their way and trust that they will cope,
- appreciate that people can only do their best when they feel safe from physical, emotional and mental hazard,

- understand reciprocity: trust breeds trust, and the opposite of trust is fear, and acting out fear breeds fear,
- to manage does not mean to lead, you manage work and lead people, and only respect for leadership creates leaders,
- treat your people as unique, individual human beings with unique, individual desires and needs who need unique, individual support to ensure you benefit from their best efforts,
- adapt work and workplaces to people, and not the other way around,
- understand that humanizing work is the first step towards accepting diversity, ensuring equality and social inclusion,
- accept the fact that high performance and amazing results come not from measurement and management, but from enticing, encouraging, and appreciating,
- understand human nature and the development of a culture that allows people to thrive so that the organization can prosper.

### **3. The role of humans in the concept of Lean Manufacturing**

The concept of Lean Manufacturing efficiently utilizes a company's resources to improve production. While it may initially appear to focus primarily on the technological aspects of production, it significantly impacts its human resources (Trenkner, 2008). Within the framework of Lean Manufacturing, the human aspects are expressed through several key principles (Mikuła, 2009):

- giving priority to people in the organization,
- continuous improvement of production processes and reduction of waste,
- development of employees and upgrading their qualifications,
- teamwork and regular communication along with collegial decision-making,
- joint planning of organizational activities by employees,
- decentralization of control and information systems and transfer of responsibilities and powers to lower levels of the organization,
- use of customer relations.

These principles highlight how Lean Manufacturing not only optimizes technological and production processes but also places a strong emphasis on the human element, fostering a more inclusive, empowering, and efficient work environment. Additionally, employee training and skill development serve as boosters for unlocking the true potential of a Lean Manufacturing operation. If we create conditions for personal and professional development and leverage individual abilities employees will experience job satisfaction. Increasing skills is perceived as an investment in human capital that benefits both employees and employers (Pietras, 2015).

Teamwork plays a crucial role in Lean Manufacturing. Individuals inherently seek to be part of a social group, and workplace relationships are vital for achieving specific goals. Effective communication and collaborative decision-making help employees feel integral to the team and ensure their opinions are valued by the company. Joint planning of organizational activities humanizes work, enabling employees to influence the transformation of work processes and maintain control over their professional development (Sikora, 2013).

Another human element in the concept of Lean Manufacturing is the decentralization of tasks. Employees are given greater autonomy and responsibility for decisions about their work, which provides them with a sense of control and influence over the implementation of production processes. The transfer of responsibility allows for the rapid detection and resolution of problems, fostering a sense of belonging and enhancing internal motivation and commitment to work. An example of this decentralization is the standardization of work, where employees are actively involved in developing labor standards and thus are motivated to continuously improve them.

Standardization of work, as a tool for enhancing safety, quality, and productivity, creates opportunities for joint problem-solving and reliance on colleagues (Pawłowski et al., 2010). This collaborative approach fosters a dynamic work environment where employees actively engage in improving processes and supporting each other. One of the most significant advantages of Lean Manufacturing in ensuring employee satisfaction is its ability to avoid monotony. Monotony is detrimental to employees' health and learning abilities. Workers exposed to monotonous tasks experience a decline in intellectual abilities and skills over time, eventually becoming indifferent to their duties. An inadequate working environment can lead them to underperform, reducing both their productivity and well-being. Lean Manufacturing addresses this by enabling employees to continually develop their skills and knowledge, transforming them into agents of change within the workplace. These activities aim to facilitate work and ensure uninterrupted workflows. As a result, employees become more self-sufficient and capable of performing tasks across different positions, which increases their autonomy and fosters a proactive attitude (Selimović, 2022).

The concept of Lean Manufacturing is focused on respect for people. Individuals are crucial in the implementation process; their behavior, thinking, and actions can provide a competitive advantage by reducing waste and streamlining processes. It is accurate to say that Lean is based on two fundamental principles: respect for people and continuous improvement. Balancing human factors and technical elements is essential to determine the suitability of Lean Manufacturing for implementation (Halling, 2020).

## 4. Methods

In order to collect information on the impact of the concept of Lean Manufacturing on human aspects, empirical research was carried out among employees in a selected production company. This company specializes in the production of assembly lines. It is localized in the Wielkopolska region. The research was performed in April-May 2023. It consisted of two parts: a survey questionnaire and a participant observation. The questionnaire consisted of 17 statements:

- feedback on workflow information,
- communication,
- opportunity to show your own initiatives and be creative,
- search for solutions to improve work,
- adapt work to employees' skills,
- influence on the implementation of your work,
- joint decision-making about workflow,
- consultations or talks about problems,
- influence of working conditions on the results,
- performance of unnecessary activities,
- monotony,
- opportunity to use your own knowledge, capabilities and skills in practice,
- extension of your skills by using the experience of colleagues,
- a sense of belonging to a team,
- employee awareness of their role in the production process,
- possibility to participate in training and improve your qualifications,
- safety at work.

The 5-point Likert scale was used with five answer options, including a neutral option, to assess respondent's opinions. It was a pilot study as it involved only 15 employees of this company working on the assembly of the technology line. In the participant observation, one of the researchers was immersed in the day-to-day activities of the workers. This allowed her to gain firsthand experience due to engaging directly with the tasks and routines of the employees.

In the analyzed production line there were employed only men. Thus, all the respondents invited to participate in the investigation were the same sex. However, it is essential to consider that the respondent group might influence the results, particularly in understanding perspectives on Lean Manufacturing's impact on the workforce, workplace culture, and employee engagement. The gender homogeneity could also affect the generalizability of the conclusions, necessitating a careful interpretation of the data and an awareness of potential biases in the

responses. Therefore, future research should aim to include a more diverse respondent pool to gain a comprehensive understanding of Lean Manufacturing's effects across different demographic groups.

## 5. Results

The age structure of the respondents was as follows: under 25 years – 13.3%, in the 25-35 years – 40%, in 36-45 years – 33.3%, 46-55 years – 6.7% and over 55 years of age – 6.7%. When analyzing the work experience, it should be noted that in each group there were 5 employees, i.e. 5 people employed over 1 year, 5-10 years and over 10 years. None of the respondents worked for less than 1 year.

According to the questionnaire results, 80% of respondents felt that they were receiving or rather receiving feedback on the progress and results of their work. Only 20% of respondents said that they were unlikely to get feedback about their work. In addition, all employees claimed that their relationships are based on mutual communication.

The vast majority of respondents (approximately 87%) believed that they had the ability to demonstrate initiative in improving the workflow. 13.3% of respondents did not give an unambiguous answer to the question. In response to the question about finding solutions to improve work, respondents most often gave positive answers on this topic. Only 26.7% of respondents did not express their opinion, and the remaining 6.7% did not notice the steps taken to improve work processes. In the surveyed group of respondents 53.3% agreed that the job was adapted to their skills and capabilities, 26.7% also agreed with this statement. The remaining 20% of respondents believed that the job was not adequately adapted to their capabilities.

When assessing the impact of employees on their own work, all respondents found that they influenced decision-making. The majority of the team (i.e. 73.3) believed that decisions were taken by a team. However, it should be noted that 26.7% of respondents disagreed with this opinion. All respondents had the opportunity to discuss problems with their team or supervisor. 73.3% of respondents explicitly agreed with the statement.

In the next part of the survey, working conditions and their impact on work results were discussed. All respondents believed that working conditions in the company were conducive to the results achieved. However, it should be noted that the majority of respondents (i.e. 93.3%) believed that they were fulfilling responsibilities that contributed nothing to the end result of their work. Only 6.7% of respondents claimed that they were unlikely to do such activities during their working day. All respondents noted a lack of monotony in their work due to the ability to perform diverse activities during their shift. Bearing in mind the question about the use of knowledge in practice, all employees answered yes. The majority of respondents (i.e. 87%) strongly said that they had, or rather had, the ability to complement their skills by

using the experience of their colleagues. In addition, as much as 93.3% of them had a sense of belonging to the team. However, it should be noted that 6.7% were unable to clearly define their position. The majority of employees (i.e. 86.7%) were aware of the importance of their role in the production process. However, 13.3% did not feel an important part of the production process and believed that without them the company could also the intended results. Some employees (33.3%) felt that they did not have many opportunities to improve their qualifications. However, the vast majority of employees noticed that they had the opportunity to attend training to improve their qualifications.

In the case of safety assessment, more than half of the respondents considered that the employer cared about safety in the workplace. Only 18.2% disagree with this statement.

## 6. Discussion

The results of the questionnaire survey indicated that the concept of Lean Manufacturing positively affected the humanization of work. Effective team cooperation was one of the most crucial values for employees. It was especially visible when we focused on communication which was viewed positively by all respondents. Effective communication allowed to achieve the desired results increasing simultaneously productivity. In the analyzed case, employees worked as a team and effectively performed their tasks and goals. In addition, they had the opportunity to influence how their tasks were implemented. Nevertheless, joint decision-making on workflow and feedback was not always viewed positively by all respondents. Research results showed that some team members felt excluded from the decision-making process. Such circumstances can have a negative impact on the willingness of employees to work and on the operation of the entire organization. Moreover, giving feedback was not always appropriate. However, this is an extremely important process, as it reduces errors and improves work efficiency. It would be worth paying attention to the possibilities of expanding your knowledge through training, which lack is sometimes noticed by respondents. It would make it easier for employees to adapt their skills to their tasks.

Following the participant observation, it can be concluded that the interests of employees were a priority. Employees were treated with respect and their well-being was extremely important. Furthermore, they were not means of achieving the goals of the organization but were active participants in the organizational processes. There was an atmosphere of mutual trust in the organization. Employers knew that the employees were a key component of the production process and that the knowledge and skills of employees had a direct impact on the development of the organization.



In order to eliminate waste, workplaces were organized in such a way that unnecessary activities were eliminated. The assembly zone was designed so that employees did not have to move around the space more than necessary. Each employee was equipped with a tool cart that allowed them to move the tools they needed.

Continuous improvement is a complex and advanced process aimed at constantly searching for areas for improvement and optimization. During the observation, it was noted that the company was systematically introducing improvements. Employees had the opportunity to submit their ideas for improving processes and eliminating difficulties through a dedicated platform. The involvement of employees in improvement processes made them feel a valuable part of the organization.

Recently, a competence matrix was developed and introduced into practice. Identifying the skills and competence levels of employees helped in managing employee development. One of the major losses in an organization was the non-exploitation of human potential. Identifying the abilities of each team member would enable the establishment of an individual development plan, including offering dedicated training programs and mentoring that would help to increase employee engagement and strengthen their relationships.

An important element affecting humanizing work is communication between employees. Within the framework of the Lean concept, stand-up meetings were introduced, allowing regular exchange of information and experiences. The meetings had a short duration and a specific formula and were intended to convey brief information about the project currently underway. The introduction of this type of meeting allowed to improve team communication and significantly affected its effectiveness. In the analyzed enterprise, decentralization of responsibility as an element of humanization of work was applied. In addition, the introduction of work standardization allowed employees to perform specific tasks consistently, which minimized the risk of errors and possible delays. The setting of standards enabled employees to take over greater control over their activities, which gave them a sense of influence on the results of their work. Effective delegation of responsibilities during the assembly works let them to be carried out more efficiently without the need for repeated inquiries to the senior management.

## **7. Summary**

In recent years, the approach to humanizing the workplace has changed significantly. At present, more attention is being paid to issues related to the humanization of work and the impact of the concept of Lean Manufacturing on its improvement. The results of the research showed that effective team cooperation and communication were highly valued by employees, contributing to increased productivity. Employees appreciated working as a team and having

the ability to influence task implementation. However, not all respondents viewed joint decision-making and feedback positively; some felt excluded from the decision-making process, which could negatively impact employee motivation and organizational operations. Additionally, feedback was sometimes deemed inappropriate. However, enhancing training opportunities could help employees better adapt their skills to their tasks.

## References

1. Ahmed, J., Mrugalska, B., Akkaya, B. (2022). Agile management and VUCA 2.0 (VUCA-RR) during Industry 4.0. In: B. Akkaya, M.W. Guah, K. Jermittiparsert, H. Bulinska-Stangrecka, Y. Kaya (eds.), *Agile management and VUCA-RR: Opportunities and threats in Industry 4.0 towards Society 5.0* (pp. 13-26). Emerald Publishing Limited.
2. Bouranta, N., Psomas, E., Antony, J. (2022). Human factors involved in lean management: a systematic literature review. *Total Quality Management & Business Excellence*, Vol. 33, No. 9-10, pp. 1113-1145.
3. Gaiardelli, P., Resta, B., Dotti, S. (2019). Exploring the role of human factors in lean management. *International Journal of Lean Six Sigma*, Vol. 10, No. 1, pp. 339-366.
4. Guest, D., Knox, A., Warhurst, C. (2022). Humanizing work in the digital age: Lessons from socio-technical systems and quality of working life initiatives. *Human Relations*, Vol. 75, No. 8, pp. 1461-1482.
5. Halling, B. (2020). *Human Lean Combining Sense of Coherence and Lean to achieve productivity and health*, Diss. KTH Royal Institute of Technology.
6. Ho, H., Kuvaas, B. (2020). Human resource management systems, employee well-being, and firm performance from the mutual gains and critical perspectives: The well-being paradox. *Human Resource Management*, Vol. 59, No. 3, 235-253.
7. Kawecka-Endler, A., Mrugalska, B. (2014). *Humanization of work and environmental protection in activity of enterprise*. Human-Computer Interaction. Applications and Services: 16th International Conference, HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014, Proceedings, Part III 16 (pp. 700-709). Springer International Publishing.
8. Marquez, D.X., Aguiñaga, S., Vásquez, P.M., Conroy, D.E., Erickson, K.I., Hillman, C., ... Powell, K.E. (2020). A systematic review of physical activity and quality of life and well-being. *Translational behavioral medicine*, Vol. 10, No. 5, pp. 1098-1109.
9. Mikuła, B. (2009). Humanizacja w zarządzaniu. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie*, No. 801, pp. 49-57.
10. Mrugalska, B. (2020). *Lean and ergonomics competencies: knowledge and applications*. Human Systems Engineering and Design II: Proceedings of the 2nd International Conference on Human Systems Engineering and Design (IHSED2019): Future Trends and

- Applications, September 16-18, 2019, Universität der Bundeswehr München, Munich, Germany (pp. 654-660). Springer International Publishing.
11. Pawłowski, E., Pawłowski, K., Trzcieliński, S. (2010). *Lean Manufacturing*. Poznań: Politechnika Poznańska.
  12. Pietras, A. (2015). Podnoszenie Kwalifikacji zawodowych przez pracowników jako inwestycja w kapitał ludzki. In: A. Rogozińska-Pawelczyk, *Gospodarowanie kapitałem ludzkim. Wyzwania organizacyjne i prawne* (pp. 153-162). Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
  13. Selimović, I. (2022). Advantages and Disadvantages of Principles of Scientific Management and Lean Organisation. *Challenges of the Future, Vol. 7, No. 1*, pp. 1-20.
  14. Sikora, J. (2013). Proces humanizowania warunków pracy i życia mieszkańców polskiej wsi. *Humanizacja Pracy. Kondycja współczesnej humanizacji pracy. Ciągłość czy zmiana, Vol. 3, No. 273*, pp. 157-172.
  15. Trenkner, M. (2008). Człowiek we współczesnych koncepcjach i metodach zarządzania. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu. Kierunki i dylematy rozwoju nauki o przedsiębiorstwie, Vol. 34*, pp. 71-77.
  16. Walczyna, A., Łucjan, I. (2012). Postęp techniczny a humanizacja pracy. *Postęp Nauki i Techniki, Vol. 12*, pp. 190-198.
  17. Venema, M. *Humanizing Work: What It Is & Why You Can't Win Without It*. Retrieved from: <https://www.nimblework.com/humanizing-work/humanizing-work-what-why>, 15.02.2024.
  18. Umair, S., Waqas, U., Mrugalska, B., Al Shamsi, I.R. (2023). Environmental Corporate Social Responsibility, Green Talent Management, and Organization's Sustainable Performance in the Banking Sector of Oman: The Role of Innovative Work Behavior and Green Performance. *Sustainability, Vol. 15, No. 19*, 14303.
  19. Umair, S., Waqas, U., Mrugalska, B. (2024). Cultivating sustainable environmental performance: The role of green talent management, transformational leadership, and employee engagement with green initiatives. *Work*, pp. 1-13.