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*Sincerely yours,
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IMPLEMENTATION OF CIRCULAR ECONOMY AND LEAN APPROACHES FOR A MORE COMPETITIVE AND SUSTAINABLE INDUSTRY

Abstract: *The circular economy concept has been considered one of the most innovative and essential approaches for more sustainable economic and industrial growth in the 21st century. Regardless of their size, organizations are frequently structurally designed to be efficient and optimized at all levels or defined as being LEAN. LEAN is a widely acclaimed approach for identifying and eliminating unnecessary and wasteful activities in the production process with simultaneously increasing the value of products. Observing the efficiency and advantages of circular economy and LEAN approaches, this article aims to show how their application can support the establishment of a more competitive, sustainable and green industry.*

Keywords: *circular economy, LEAN, sustainable industry, environmental improvements*

1. Introduction

Over the past decades, environmental issues such as ozone depletion, the greenhouse effect, air pollution, toxic materials, noise pollution, ecosystem imbalances, and loss of biodiversity have caused great concern in economies around the world (Safari et al., 2018; Yang, 2018; Kuo & Lin, 2020). This concern is justified by the growth of population, along with technological advancement. The global problem of population growth is that the production of material goods is also growing, in order to satisfy consumer needs through the market. Contemporary consumer society is characterized by the syndrome of instantism (Nikolić et al., 2013), which is caused by the speed of change and instability of market flows. The global economy has been fluctuating over the last few decades (Fu & Liu, 2023) so characteristics of business

environment at the global level have experienced significant changes. Since the beginning of the first industrial revolution, economic activities have been continually growing, while the basis of their development has recorded a constant reduction of available reserves. In the period from 1970 to 2017, a significant exploitation increase of natural resources was noted at the global level, from 27.1 to 92.1 billion tons, which represents an average annual growth of 2.6 %. Demand for natural resources per capita has increased annually from 7.4 tons in 1970 to 12.2 tons in 2017 (IRP, 2019). On the other side, for the global economy, it is devastating that about one-fifth of the extracted resources worldwide end up as waste (OECD, 2015). In accordance to prior, resource extraction and waste production have increased rapidly in recent decades (Marín-Beltrán et al., 2022).

To reduce the impact that population have on the environment at a global level, it is necessary to transform unsustainable patterns

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of production and consumption of goods. The rapid changes in technology and global politics that characterize the modern world require management methods and the business environment which is constantly changing and improving. Innovation, flexibility and the ability to anticipate, identify and meet market needs are considered as crucial mechanisms for the growth and development of the economic system (Ćosić & Maksimović, 2014; Stanković, 2018).

The development of the global green economic system can be realized if business management finds and manage new working procedures and methods in organizations in order to increase resource efficiency and sustainability (Bengtsson et al., 2018; Kurdve & Bellgran, 2020). One of the types of adaptation to the requirements of modern economic development and technological progress is a LEAN and circular approach, which implementation in a particular organization includes techniques for establishing a productive and efficient work environment. The combination of these concepts represents an ideal solution to the current global problems, such as resource scarcity and environmental damage as well as a solution for the establishment of a closed-loop economic system (Nadeem et al., 2019).

The recognition of LEAN management and circular economy by academics and policymakers is apparent, but of the highest importance is that organizations accept and implement those concepts. Consideration of these approaches has shown that many of their shortcomings of them result from the way they are implemented rather than any other aspect of business culture. These approaches allow rational business devoid of all forms of costs, losses and waste. Both analyzed approaches are considered relatively new and therefore there is still not much expert research on their long-term effect on industrial organizations.

In order to answer the question of whether the application of the circular economy and LEAN approaches can support the establishment of a more sustainable industry, this research aims to understand the relationship between the circular economy and the LEAN approach through a literature review and comparative analysis of their basic principles.

2. Literature review

The current global business environment is characterized by dynamism, unpredictability, and intense competition, creating a demand for innovation in various forms, particularly in business philosophy. Primarily, high competition in the global market forces organizations to look for ways to maintain and improve competencies and gain a competitive advantage (Simeunovic et al., 2012). Competitive advantage and consumer satisfaction can be achieved through continuous work on improving business processes (Abbas & Hosein, 2010), which is possible through the implementation of modern approaches such as the circular economy and LEAN.

2.1. Circular economy

The concept of the circular economy (abbr. CE) is observed in contrast to the traditional linear economy based on the "take-make-dispose" model, where resources are extracted, transformed into products, used, and ultimately disposed off in the form of waste (Morseletto, 2023). The CE can be described as an industrial economy which is based on the restorative capacity of natural resources (Bastein et al., 2013; Rizos et al., 2015) and in order to achieve minimization of generated waste, utilization of renewable sources of energy and gradual abolition of harmful substances (Ellen MacArthur Foundation, 2012) as well as retention of the value-added in products for as long as

possible.

The implementation of CE is a process which takes place throughout society, involving different stakeholders and largely depends on the emergence of innovations in technology, social practices, organizational forms and business models. The main goals of adopting a CE are to reduce waste, increase resource efficiency and achieve a better balance between the economy, environment and society, in order to achieve sustainable development.

Consequence to prior, resource efficiency and green innovation have been identified as two key factors in achieving sustainable economic growth in developing countries (Sun et al., 2023). Namely, the fundamental principles of the CE are based on identified key factors in achieving sustainable economic growth. According to the Ellen MacArthur Foundation (2023), the implementation of a CE is guided by three main principles:

- Eliminate waste and pollution - materials used in the design of products should be able to re-enter the economy at the end of their life cycle;
- Circulate products and materials (at their highest value) - keeping materials in use, either as products or, when they can no longer be used, as components or raw materials.
- Regenerate nature - shifting the focus from extraction to regeneration of materials, since it is important to instead of continuously degrading nature, build natural capital.

In practice, the CE is implemented through a range of industrial and business solutions and applications based on 3R (reduce, reuse, and recycle) or an expanded 6R model (Jawahir & Bradley, 2016) that represents a new way of thinking about the use of resources.

The 6R model defines the CE through six activities that are shown in Figure 1.

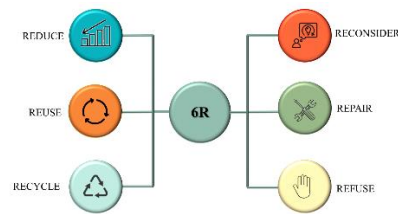


Figure 1. 6R model

The mentioned activities in a context of a CE can be described as follows:

- Reducing energy and material consumption in production processes as well as pollutant emission through the application of eco-design;
- Reusing products by giving or selling them to someone who needs them instead of disposing of them;
- Recycling waste into products, materials, or substances for their original or alternative purposes;
- Reconsidering business models to reduce waste generation and achieve cost savings;
- Repairing components and parts to prolong the product's lifespan;
- Refusing the use of anything that is not strictly necessary.

In response to climate change and resource concerns, the industry has recognized the significance of implementing CE through 6R activities. As a result, there has been a noticeable increase in the number of publications and case studies that seek to explain and demonstrate the specific strategies and technical elements necessary to achieve desired sustainability and circularity level in the industry.

2.2. LEAN

LEAN thinking originated in the Japanese automotive industry after World War II and is

based largely on the Toyota Production System (abbr. TPS) developed by Eiji Toyoda and Taiichi Ohno, and it was used to improve quality and productivity at the Toyota Motor Company (Čiarnienė & Vienažindienė, 2014; Kumar et al., 2022). Before the establishment of LEAN, traditional business practices were used. The traditional concept of business was focused on ensuring the welfare of capital owners neglecting the other aspects of sustainable business. However, this orientation is not compatible with the convictions of the LEAN business philosophy.

The LEAN approach is a set of tools that help identify and frequently eliminate losses, and improve quality, time and cost of production and business. The LEAN philosophy improves the entire organization by eliminating losses that occur during the work process. The LEAN organizations use fewer materials than traditional organizations, require less investment, use less equipment, require a lower labour force and generate less waste through the simultaneous creation of added value. Literally, the LEAN philosophy is a productivity approach used in business and production to optimize processes, provide resources, and maintain conditions that ensure the maximum quality of products and services delivered to customers. Implementation of the LEAN approach in the production process focuses on the reduction of waste and improvement of operational efficiency using a set of different tools to get these objectives (Al-Zuheri et al., 2021). The point of LEAN is not only in the concrete implementation of LEAN methods and tools but in the sweeping change of employees' and employers' consciousness (Abu et al., 2019).

Today, the implementation of the LEAN production system includes a large number of tools, but the type of applied tools depends on the conditions of certain goals specific to the company. Except for tools, this philosophy incorporates various models, methods and techniques to achieve predefined goals

including Kaizen, Jidoka, Poka Yoke, 5S, Total productive maintenance (abbr. TPM), Total quality management (abbr. TQM), Value stream mapping (abbr. VSM), Kanban, and Just in time (abbr. JIT), Heijunka, etc. (Despoudi, 2021). LEAN combines theory and tools that include both fundamental TPS concepts and newly created tools for process optimization and communication between people. TPS bases its philosophy on three Japanese terms, more precisely, on the 3Ms model shown in Figure 2.

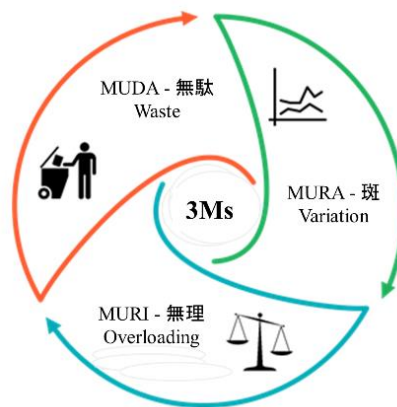


Figure 2. 3Ms model

Namely, the 3Ms model defines three causes of business inefficiency:

- MUDA - stands for loss (waste) and is used for any activity that does not add value to the product/service but adds cost to it such as overproduction, inventory, motion, defects, over-processing, waiting, and transport;
- MURA - represents all kinds of variations that can occur in production (in demand, in processing time, in product quality, etc.), which prevent the production process from taking place efficiently and effectively;

- MURI - shows the loss due to overloading that occurs due to the demand that a worker, machine or any technical system work beyond their capabilities.

The LEAN approach to process improvement is a popular and effective method for achieving significant positive results in various industries or organizations (Womack et al., 1990) but first, it is necessary to identify all inefficiencies in the organization. To ensure the benefits of applying the LEAN business concept, the following principles must be respected (Womack & Jones, 2003):

- Identify value - defining value from the point of view of the end consumer;
- Map the value stream - identifying all procedures in the business process and eliminating those that do not create value;
- Create flow - ensuring the smooth flow of products to consumers;
- Establish pull - harmonizing the product flow with consumer requirements;
- Seek perfection - clearly defining the value for consumers, adequately identifying and establishing the value stream and eliminating redundant procedures and resource losses in the process.

It is essential to understand that LEAN principles can be used to improve all processes in a particular industrial organization, and not only its production part (Jina et al., 1997). Applying the basic principles of the LEAN business concept leads to numerous benefits both at the operational and strategic levels.

Application of the analyzed LEAN concept improves the level of sustainability in the industry. The contribution of LEAN tools to support organizations in achieving sustainable production is due to synergies between LEAN tools and sustainability (Silva

et al., 2021).

3. Implementation of CE and LEAN approaches for a more competitive and sustainable industry

Considering European Green Deal whose main objective is to form the world's first continent that is climate-neutral by 2050, industry will need a secure supply of clean and affordable energy as well as raw materials (European Commission, 2020). Additionally, one of the main European Green Deal goals is to encourage the development of new markets for climate-neutral and green products which is the result of an established sustainable industry.

Establishment of a sustainable industry has become a necessity for modern consumer society. Sustainable industry represents manufacturing of products using economically sensible procedures that reduce their negative effects on the environment while conserving energy and natural resources („EPA”, 2023). There are numerous benefits to promoting a sustainable industry including improving worker, community, as well as product safety.

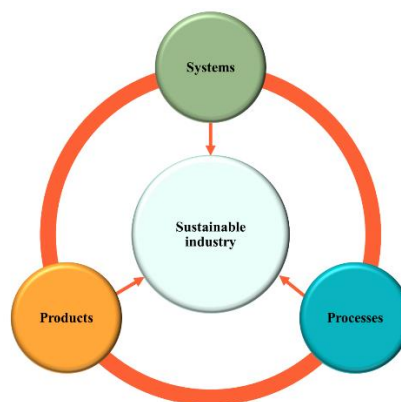


Figure 3. Integrated elements of sustainable industry (Jawahir & Bradle, 2016)

Contemporary and sustainable industry is based on the use of advanced manufacturing method which promotes innovative technology for improving products or processes that drives the industry. Therefore, three integral interacting levels must be taken into account to attain a sustainable industry: products, processes and industry systems (Figure 3). It can be concluded that the achievement of a sustainable industry is a very complex task since identified elements must be integrated. Regardless, organizations are faced with the need to innovatively address their product development challenges to remain competitive in today's market. More precisely, to improve the resource efficiency and environmental friendliness of industrial processes, manufacturers must

identify unique techniques or methodologies. Promising plans to accomplish this goal include a CE and green-LEAN production. Integrating CE and LEAN thinking into the product development process can encourage a sustainable industry since both approaches focus on optimization of products, processes or systems. Based on the findings of the literature, there is a necessity for the coalescing of these approaches in the industry (Schmitt et al., 2021; Ciliberto et al., 2021; Skalli et al., 2022).

The possibility of implementation of CE and LEAN approaches for a more competitive and sustainable industry can be verified by analysis of the principle between these two approaches (Figure 4).

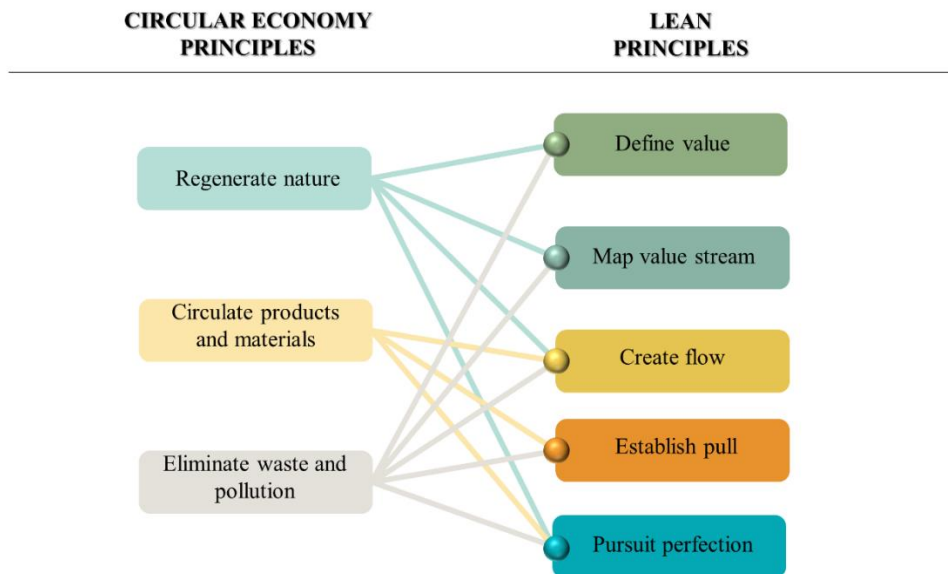


Figure 4. Relation between CE and LEAN principles

Based on Figure 4, it can be concluded that the main common elements of analyzed approaches are waste minimization and value creation. LEAN and CE approaches have a lot in common to contribute to one another (Nadeem et al., 2019). Even though they have certain differences, these approaches complement each other in creating significant

results in industry (Pernstål et al., 2013). LEAN and CE differ in that CE takes a more holistic approach from a systems perspective to maximize the utility of the resource even after one life cycle of the product, whereas LEAN focuses on the immediate usage of the resource within a specific process (Nadeem et al., 2019).

Integration of the LEAN and CE is based on the maximum application and promotion of all positive sides of the analyzed approaches („Novotek“, 2022). In order to attain circularity as well as efficiency and effectiveness in industry, this integrating approach combines LEAN tools and processes with CE principles. Therefore, this paper introduces the first definition for proposed integration entitled **C-LEAN** which uses key principles from considered approaches. The abbreviated name of integration indicates that its application can contribute to the development of a **cleaner** production that is a crucial element for the transition to a green and sustainable industry. C-LEAN is a framework for the sustainability transformation of business models in industrial organizations. Industrial business models formed in this way would help organizations to make and save money by maximising resource use, reducing resource loss, and eliminating waste generation. C-LEAN emphasizes lean thinking, design thinking, systems thinking, extending life of product, as well as reuse and recycling.

Downside of C-LEAN is reflected during the actual implementation of this approach since is not universal and uniform and cannot be applied in every organization in the same way. To address these issues, a uniform methodology and implementation of the newly defined approach should be developed.

4. Possibility for applying the C-LEAN approach in the Republic of Serbia

C-LEAN should be the target of many industrial organizations nowadays, all over the world. However, the problem is to implement this kind of model in industrial organizations operating in developing countries.

In general, the LEAN approach found application in the Republic of Serbia at the beginning of the 21st century, first in foreign

organizations, and then in domestic ones (Kirin et al., 2018). On the other hand, CE was popularized in Serbia since the European Union adopted a package of measures for the transition to a CE at the end of 2015 to improve the region's competitiveness, open new workplaces, and establish sustainable growth systems (European Commission, 2015). Given that these business models are still new in the Republic of Serbia, their coalescent implementation would require systemic transformation. One of the characteristics of such transformation is that the costs are relatively low and that improvements are achieved primarily by better resource utilization that organization already possesses (Stojanović, 2019). Therefore, C-LEAN could be interesting for organizations that operate in transition economies like the economy of the Republic of Serbia since there are limited resources.

Applying C-LEAN approach in the Serbian industry is possible through one complex 5-phase process shown in Figure 5.



Figure 5. C-LEAN implementation process („CircularTRANS“, 2023)

This implementation process starts with a diagnostic part where management of organization conducts research on the current business model and checks whether there is a possibility to apply analyzed approaches. Namely, in the first phase of implementation, performance measurement of CE, as well as LEAN thinking, is carried out. Obtained results represent a base for identifying opportunities in the C-LEAN implementation. The fourth step consists of defining a roadmap and finally, an action plan to address C-LEAN opportunities. C-LEAN

implementation process is created in accordance with the already developed CircularTRANS complete process. Undoubtedly, although Serbia is a developing country, applying C-LEAN in industrial organizations would create numerous benefits.

It is important to note that the biggest barrier to C-LEAN implementation in the Republic of Serbia is the lack of legal regulations in this area, as well as the lack of guidelines on how to implement and monitor this approach. Many organizations are not able to fully apply the C-LEAN due to the lack of a clear understanding of performance measurement of the CE as well as LEAN thinking which is considered as the first step of implementation (diagnosis).

5. Conclusion

C-LEAN approach in industry will create an opportunity to encourage circular, sustainable and working-intensive economic activities. CE and LEAN are two related concepts that are often discussed in the context of sustainability and operational efficiency in different aspects of business and production. CE is a sustainable economic model that seeks to minimize waste and maximize reuse of resources by keeping materials in use for as long as possible. It is based on the principles of reduce, reuse and recycle.

LEAN, on the other hand, is a production

philosophy that aims to optimize the flow of products and eliminate waste in manufacturing and service processes. It is focused on delivering high-quality products with minimum waste and maximizing value for customers.

Relation between CE and LEAN lies in their shared goal of reducing waste and maximizing efficiency. Principles of LEAN can be applied to support the implementation of CE by reducing waste in the production process and enabling reuse of resources. Additionally, CE offers a more holistic approach to sustainability, including the entire lifecycle of a product, which can be integrated into LEAN methodologies to further optimize the production process. When suggesting a particular organization to shift to a system where all operations are harmonized with the mentioned concepts, the risks associated with changes in the system must be analyzed. Namely, if one company already operates according to the LEAN approach, it will be easier for the management to transform it into a circular business, but there are undoubtedly certain risks. Barriers to the implementation of the CE in LEAN organizations largely depend on how much employers and employees are eager to change and to what extent they are engaged in the process of implementation. For this reason, further research will analyze some of the main structural barriers and risks when industrial organizations pursue C-LEAN business approach.

References:

- Abbas, S., & Hosein, D. (2010). Application of Analytic Network Process in Selection of Six Sigma Projects. *International Journal of Industrial & Production Research*, 20 (4), 157-164.
- Abu, F., Gholami, H., Mat Saman, M. Z., Zakuan, N., & Streimikiene, D. (2019). The implementation of lean manufacturing in the furniture industry: a review and analysis on the motives, barriers, challenges, and the applications. *Journal of Cleaner Production*, 234. 660-680. doi:10.1016/j.jclepro.2019.06.279.
- Al-Zuheri, A., Vlachos, I., Amer, Y. (2021). Application of lean six sigma to reduce patient waiting time: literature review. *International Journal for Quality Research*, 15(1), 241-258. <https://doi.org/10.24874/IJQR15.01-14>.

- Bastein, T., Roelofs, E., Rietveld, E., Hoogendoorn, A. (2013). *Opportunities for a Circular Economy in the Netherlands*. TNO, Report commissioned by the Netherlands Ministry of Infrastructure and Environment.
- Bengtsson, M., Alfredsson, E., Cohen, M., Lorek, S., Schroeder, P. (2018). Transforming systems of consumption and production for achieving the sustainable development goals: moving beyond efficiency. *Sustainability Science*, 13(2), 1533–1547. <https://doi.org/10.1007/s11625-018-0582-1>.
- Čiarnienė, R., Vienažindienė, M. (2014) How to Facilitate Implementation of Lean Concept? *Mediterranean Journal of Social Sciences*, 5(3), pp. 177-183. DOI: 10.5901/mjss.2014.v5n13p177.
- Ciliberto, C., Szopik-Decpczyńska, K., Tarczyńska-Łuniewska, M., Ruggieri, A., Ioppolo, G. (2021). Enabling the Circular Economy transition: a sustainable lean manufacturing recipe for Industry 4.0. *Business Strategy and the Environment*, 30 (7). 3255-3272. <https://doi.org/10.1002/bse.2801>.
- CircularTRANS. (2022). CircularTRANS is your ally. Retrieved from: <https://circulartrans.mondragon.edu/en/home> [online]. Accessed: April 24th, 2023.
- Ćosić, I. P., Maksimović, R. M. (2014). *Proizvodni menadžment [Production management]*. University of Novi Sad, Faculty of Technical Sciences, Novi Sad, pp. 264, ISBN 978-86-7892-625-9.
- Despoudi, S. (2021). Circular and Lean Food Supply Chains. *Lean Manufacturing. IntechOpen*. 16. <http://dx.doi.org/10.5772/intechopen.99769>.
- Ellen MacArthur Foundation. (2012). *Towards the Circular Economy. Economic and business rationale for an accelerated transition*. Cowes: Ellen MacArthur Foundation.
- EPA – United States Environmental Protection Agency. (2023). Sustainable manufacturing. Retrieved from: <https://www.epa.gov/sustainability/sustainable-manufacturing> [online]. Accessed: April 22nd, 2023.
- European Commission. (2015). *Closing the loop - An EU action plan for the Circular Economy*. COM(2015) 614 final. Brussels, Belgium.
- European Commission. (2020). *A New Industrial Strategy for Europe*. COM(2020), 102 final. Brussels, Belgium.
- Fu, R., Liu, J. (2023). Revenue sources of natural resources rents and its impact on sustainable development: Evidence from global data. *Resources Policy*, 80(103226). <https://doi.org/10.1016/j.resourpol.2022.103226>.
- IRP. (2019). *Global Resources Outlook 2019: Natural Resources for the Future We Want*. A Report of the International Resource Panel. United Nations Environment Programme. Nairobi, Kenya.
- Jawahir, I. S., Bradley, R. (2016). Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing. *3th Global Conference on Sustainable Manufacturing - Decoupling Growth from Resource Use*. Procedia CIRP, 40 (pp. 103-108). <https://doi.org/10.1016/j.procir.2016.01.067>.
- Jina, J., Bhattacharya, A. K., Walton, A. D. (1997). Applying lean principles for high product variety and low volumes: some issues and propositions. *Logistics Information Management*, 10(1), 5-13.

- Kirin, S., Kirin, S., Sedmak, S., Arandelović, M. (2018). LEAN approach in theory and practice. *Proceedings of the 7th International Symposium on Industrial Engineering* (pp. 50-53). Belgrade: Faculty of Mechanical Engineering.
- Kumar, N., Hasan, S. Sh., Srivastava, K., Akhtar, R., Yadav, K. R., Choubey, K., V. (2022). Lean manufacturing techniques and its implementation: A review. *Materials Today: Proceedings*, 64 (3), 1188-1192, <https://doi.org/10.1016/j.matpr.2022.03.481>.
- Kuo, S. Y., Lin, P. C. (2020). Determinants of green performance in container terminal operations: A lean management. *Journal of Cleaner Production*, 275, 123105. doi:10.1016/j.jclepro.2020.123105.
- Kurdve, M., Bellgran, M. (2020). Green lean operationalisation of the circular economy concept on production shop floor level. *Journal of Cleaner Production*, 278, 123223. doi:10.1016/j.jclepro.2020.123223.
- Marín-Beltrán, I., Demaria, F., Ofelio, C., Serra, L. M., Turiel, A., Ripple, W. J., Mukul, Sh. A., Clara Costa, M. (2022). Scientists' warning against the society of waste. *Science of The Total Environment*, 811, 151359. <https://doi.org/10.1016/j.scitotenv.2021.151359>.
- Morseletto, P. (2023). Sometimes linear, sometimes circular: States of the economy and transitions to the future. *Journal of Cleaner Production*, 390, 136138. <https://doi.org/10.1016/j.jclepro.2023.136138>.
- Nadeem, S.P., Garza-Reyes, J.A., Anosike, A., Kumar, V. (2019). Coalescing the Lean and Circular Economy. *Proceedings of the International Conference on Industrial Engineering and Operations Management Bangkok, Thailand* (pp. 1082-1093).
- Nikolić, S., Tumbas, P., Kostreš, M., Stanković, J. (2013). The New Marketing Management Approach: The Glocal Prosumer. In *Engineering Management* (pp. 103-126).
- Novotek. (2022). Enabling Lean and Circular Economy initiatives using Smart Factory solutions. Retrieved from: <https://www.novotek.co.uk/2022/05/16/enabling-lean-and-circular-economy-initiatives-using-smart-factory/> [online]. Accessed: April 22nd, 2023.
- OECD. (2015). *Material Resources, Productivity and the Environment*, OECD Green Growth Studies, OECD Publishing, Paris.
- Pernstål, J., Feldt, R., Gorschek, T. (2013). The lean gap: A review of lean approaches to large-scale software systems development. *Journal of Systems and Software*, 86(11), 2797–2821. doi:10.1016/j.jss.2013.06.035.
- Rizos, V., Behrens, A., Kafyeke, T., Hirschnitz-Garbers, M., Ioannou, A. (2015). *The Circular Economy: Barriers and Opportunities for SMEs*. CEPS Working Document, No. 412/2015, pp. 25.
- Safari, A., Salehzadeh, A.R., Panahi, R., Abolghasemian, S. (2018). Multiple pathways linking environmental knowledge and awareness to employees' green behavior. *Corporate Governance International Journal of Business in Society*, 18(1), 81-103. <https://doi.org/10.1108/CG-08-2016-0168>
- Schmitt, Th., Wolf, Ch., Taro Lennerfors, Th., Okwir, S. (2021). Beyond “Leanear” production: A multi-level approach for achieving circularity in a lean manufacturing context. *Journal of Cleaner Production*. 318, 128531. <https://doi.org/10.1016/j.jclepro.2021.128531>
- Silva, Â., Alves, W., Rodrigues, H. S. (2022). Fostering the lean approach as a sustainable strategy: challenges from Portuguese companies. *International Journal for Quality Research*. 16(2), 653–664. <https://doi.org/10.24874/IJQR16.02-20>

- Simeunović, B., Tomašević, I., Stojanović, D., Radović, M., & Slović, D. (2012). Lean Implementation in Transitional Countries: Case of Serbia, *I Proceedings of the International Conference IS2012 "Innovation for Sustainability"*, Universidade Lusitana, Porto, Portugal, 27-28. September.
- Skalli, D., Charkaoui, A., Cherrafi, A. (2022). Assessing interactions between Lean Six-Sigma, Circular Economy and industry 4.0: toward an integrated perspective. *IFAC-PapersOnLine* 55(10), 3112-3117. <https://doi.org/10.1016/j.ifacol.2022.10.207>
- Stanković, J. (2018). Model upravljanja procesima brendiranja primenom LEAN koncepta [Model of brand processes management using lean concept] (Doctoral dissertation). Faculty of Technical Sciences, Novi Sad, Serbia.
- Stojanović, D., Slović, D., Tomašević, I. (2019). Lin praksa u kompanijama u Srbiji [Lean practice in companies in Serbia]. *XII Conference of Business and Science SPIN '19: Lean transformation and digitalization of Serbian industry*, November 7 - 8, Belgrade, Serbia. (pp. 105-113).
- Sun, Y., Gao, P., Tian, W., Guan, W. (2023). Green innovation for resource efficiency and sustainability: Empirical analysis and policy. *Resources Policy*, 81, 103369. <https://doi.org/10.1016/j.resourpol.2023.103369>.
- Womack, J. P., Jones, D. T., & Roos, D. (1990). *The machine that changed the world*. New York: Rawson Associates.
- Yang, C.S. (2018). An analysis of institutional pressures, green supply chain management, and green performance in the container shipping context. *Transportation Research Part D: Transport and Environment*, 61 (B). 246-260. <https://doi.org/10.1016/j.trd.2017.07.005>.

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