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Article

Proposition of a hierarchical model for lean implementation in organizations

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Abstract: The process of implementing the lean philosophy, through its different phases, consists of a set of practices and factors that contribute to its operationalization. The literature review showed a lack of studies that address implementation models exploring the integration between phases, practices, and factors that influence implementation success. The objective of this study is to propose a hierarchical model for lean implementation that includes the phases, practices, and factors affecting its implementation. The approach adopted was a Systematic Literature Review (SLR), considering articles published between 2017 and 2025 in the Scopus, Emerald, PubMed, and Web of Science databases, using the search term "lean implementation model." Analysis of 83 articles was conducted after the PRISMA method was applied. Consequently, this study aimed to determine the phases of lean implementation, the practices used during the implementation process, and the factors influencing it.
Keywords: lean1, model2, implementation3, phases4, practices5, factors6

1. Introduction

Lean philosophy has been widely adopted across different organizational settings and described as an approach based on elimination of waste, process optimization and value generation (Costa and Godinho, 2016; Radnor et al., 2012). Its implementation requires the articulation of phases, practices and organizational factors that influence the sustainability of results (Apostu et al., 2021; Reponen et al., 2021; Demirkesen and Bayhan, 2020; Sarhan et al., 2019).

The phases represent the maturity levels from the preparation to the consolidation of the lean culture. The practices include the technical dimensions, based on process improvement, and the social dimensions, related to leadership, engagement, and organizational development (Reis et al., 2023; Sahoo, 2019; Hadid et al., 2016). Furthermore, factors such as leadership alignment, employee engagement, organizational structure, and financial resources can either facilitate or hinder the implementation (Puram et al., 2022; Basu and Dan, 2020; Kurpjuweit et al., 2018).

Nevertheless, many organizations struggle with lean adoption, especially in the beginning stages, which limits the progression of maturity (Shortell et al., 2018). Although the literature has advanced in terms of identification of practices, there is still a lack of integration between the phases, practices and factors, especially in relation to lean sustainability.

Thus, the present paper aims to analyze these dimensions in an integrated way and proposes a hierarchical theoretical model for lean implementation based on a Systematic Literature Review (SLR) of 83 articles published between 2017 and 2025. The proposed model contributes to the literature by integrating technical and social dimensions with the different phases of lean implementation and the factors that influence its development. By

adopting a systemic perspective, the model supports a more structured approach to lean implementation and may contribute to the sustainability of lean initiatives and their results.

The article is divided into six sections excluding this introduction. The lean implementation model is described in Section 2. The SLR based methodology is detailed in section 3. Section 4 presents the results and discussion based on the three analyzed dimensions. The theoretical model developed is presented in Section 5. Section 6 concludes the paper, discusses the limitations of the present work and suggests future research.

2. LEAN IMPLEMENTATION MODEL

Lean Manufacturing (LM) has its origins in the Toyota Production System (TPS) and Just-in-Time (JIT), with an emphasis on reducing waste, creating value, and continuously improving processes (Vinodh et al., 2015; 2013). It has been adapted over time to different contexts such as Lean Startup, Lean Product Development and Lean Healthcare expanding its use beyond traditional manufacturing environments (Fernandes et al., 2023; Reis et al., 2022; Reis et al., 2021).

The implementation is a strategic change that transforms the organizational processes and is a factor of performance and sustainability of the results (Secchi and Camuffo, 2019). This implementation usually develops through different phases, from preparation to the consolidation of a lean culture (Apostu et al., 2021).

Lean practices can be divided into two main dimensions: Lean Technical Practices (LTP) and Lean Social Practices (LSP), the latter being necessary for engagement and to maintain changes. Other factors affecting success include commitment, training and resources. This shows lean as an integrated system.

3. Methodology

This study was conducted through a Systematic Literature Review (SLR) aiming to identify, analyze and synthesize the main scientific contributions related to the implementation of the lean philosophy. As shown in Figure 1, the PRISMA method is a stepwise method to select the articles analyzed in this research.

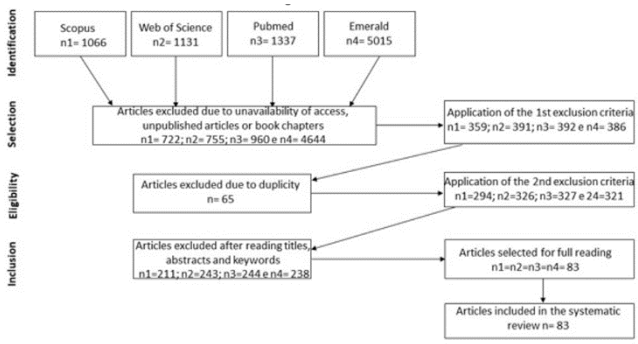


Fig. 1 Article selection using the PRISMA method

First, we identified 8,549 records from the Scopus, Web of Science, Emerald and PubMed databases. After duplicate removal and preliminary screening of titles and abstracts, we excluded 7,081 records.

The full texts of 327 articles were screened for eligibility. Using the inclusion and exclusion criteria, 244 articles were excluded because they were outside the scope of the study. Finally, a qualitative and systematic analysis was conducted on a final sample of 83 studies.

4. Results and Discussion

The analysis of the selected studies in the Systematic Literature Review (SLR) allowed the identification of three main dimensions of lean implementation: (i) implementation phases, (ii) technical and social lean practices, and

(iii) factors that influence this process. These dimensions are interconnected and collectively, lead to more effective and sustainable implementation.

4.1 Lean Implementation Phases

The SLR identified five phases of lean implementation: (i) Preparation (P), (ii) Proof of Concept (PC), (iii) Expansion (E), (iv) Measurement (M), and (v) Adoption (A) of lean as a culture sustainable lean. These phases reflect the evolution of organizations in the adoption of this philosophy. Based on the studies identified in the SLR (collected in the Appendix I), it was possible to identify and characterize the phases and their respective subphases. These are presented in the Figure 2.

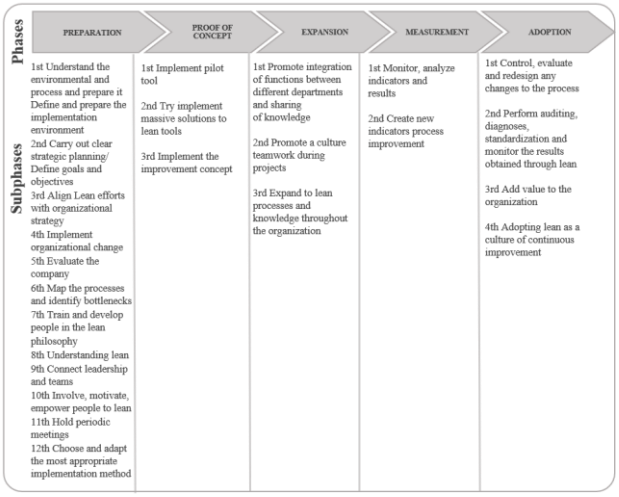


Fig. 2 Phases and subphases in sequence for lean implementation

The first stage is the preparation phase, which involves the preliminary activities of training, strategic alignment, process mapping, and the engagement of leaders and employees to underscore the role of leadership in creating an environment conducive to change (Marsilio et al., 2022; Vadivel et al., 2022).

The proof of concept phase is made up of the implementation of pilot projects that allow testing lean practices and validating improvements (García and Montenegro, 2021). In the growth phase, practices are transferred to other sectors, concentrating on knowledge sharing and cooperative work (Bednarek, 2018).

The measurement phase involves monitoring performance indicators to assess results and support decision making (Aquino et al., 2021). Finally, the adoption stage involves the embedding of lean as an organizational culture, with emphasis on continuous improvement and standardization (Apostu et al., 2021).

Table 1. Phases and subphases of lean implementation

Phases	Subphases	Authors
Preparation	Understand the environment and process and prepare it/ Define and prepare the implementation environment	A63, A68
	Carry out clear strategic planning/ Define goals and objectives	A17, A24, A31, A32, A41, A45, A46, A49, A52, A53, A59, A63, A67, A72, A74, A78
	Align Lean efforts with organizational strategy	A50
	Implement organizational change	A47, A60
	Evaluate the company	A26
	Map the process and identify bottlenecks	A21, A51
	Train and develop people in the lean technique	A6, A19, A22, A25, A28, A44, A45, A39, A41, A56, A63, A66, A67, A70, A73, A74, A78, A81
	Understanding lean	A43
	Commit leadership and team	A22, A35, A40, A44, A45, A51, A53, A55, A56, A57, A60, A65, A67, A69, A71, A72, A73, A75, A77, A78, A80, A81
	Involve, motivate, empower people to lean	A23, A25, A27, A40, A42, A55, A65, A67, A71, A72, A75, A77, A80
	Hold periodic meetings	A45
	Choose and adapt the most appropriate implementation method	A42, A68
Proof of concept	Implement pilot test	A17, A22, A29, A50, A51, A73, A74
	To implement/execute the lean tools	A1, A2, A6, A7, A8, A15, A17, A19, A20, A22, A24, A25, A26, A28, A29, A31, A34, A35, A41, A50, A51, A60, A63, A64, A67, A70, A73, A79, A80, A81, A83
	Implement the improvement concept	A21
Expansion	Promote integrationof functions betweendifferent departments and sharing of knowledge	A50
	Promote a culture teamwork during projects	A75
	Expand to lean awareness and knowledge throughout the organization	A58
Measure - ment	Monitor, analyze indicators and results	A20, A26, A28, A29, A31, A32, A36, A37, A57, A59, A67, A70, A78, A79
	Create new indicators process improvement	A34
Adoption of lean as a culture	Consider, evaluate, and readjust any changes to the process	A31
	Perform auditing, diagnosis, standardization and sustain the results obtained through lean	A19, A32, A52, A63, A68
	Add value to the organization	A50
	Adopting lean as a culture of continuous improvement	A16, A25, A40, A44, A45, A51, A60, A67, A72, A75, A78, A79

The results show that most studies are addressed to the first steps of lean implementation, mainly preparation (55.5%) and proof of concept (75.9%), indicating a strong focus on the early phases and less on maturity.

Low representation (3.7%) is found in the expansion phase, suggesting challenges in disseminating lean practices or limitations of studies to track its evolution.

Also the measurement (18.5%) and adoption (22.2%) phases are less covered, showing a gap in the literature concerning the sustainability of lean initiatives, particularly in the long term.

4.2 Integration Between Technical and Social Practices

Lean practices are divided into social (Lean Social Practices – LSP) and technical (Lean Technical Practices – LTP) (Zeng et al., 2015). LTPs include tools for process analysis and improvement such as VSM, PDCA, 5S, standardized work, kanban, visual management and performance indicators (Beers et al., 2022; Marsilio et al., 2022).

LSPs include human and organizational aspects, such as leadership, training, and empowerment (Scursulim et al., 2025; Huang et al., 2022; Vadivel et al., 2022). LTPs drive operational efficiency, while LSPs are critical to maintaining change through improved team engagement and alignment.

Table 2. Tools associated with each implementation phase

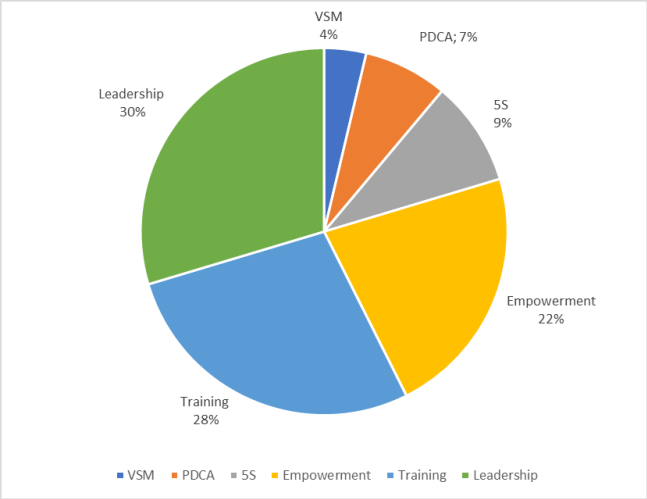
	Tools	Preparation		Proof of concept		Expansion		Measurement		Adoption	
		Authors	Nº	Authors	Nº	Authors	Nº	Authors	Nº	Authors	Nº
Lean Technical Practices (LTP)	VSM	A20, 21	2	A1, A4, A5, A6, A12, A17, A20, A22, A24, A27, A31, A41, A45, A49, A50, A52, A57, A64, A81, A83	20						
	PDCA	A31, A34, A49, A50	4	A1, A4, A8, A9, A17, A19, A21, A23, A34, A41, A42, A49, A50, A56, A59, A74	16						
	5S	A19, A16, A31, A41, A78	5	A4, A7, A9, A22, A27, A29, A37, A42, A49, A50, A57, A64, A70	13						
	Standardized work			A19, A20, A22, A23, A24, A26, A27, A29, A35, A36, A42, A56, A57, A67, A70, A73	16						
	Kanban			A12, A29, A41, A83	4						
	Line balancing			A19, A41	2						
	Visual management			A1, A20, A22, A31, A35, A37, A45, A57, A75, A80	9						
	KPIs (Key Performance) Indicator			A4, A12, A32, A34, A41, A74	6			A19, A20,23, A59, A63, A68, A70, A78, A79	9		
	Kaizen			A4, A27, A34, A40, A44, A56, A59, A67	8	A51, A68	2	A17	1	A17, A24,A25 A47,A60, A63, A68, A72, A75, A78, A69	11
	TPM			A12, A26, A27, A57, A70	5						
	A3			A56, A67	2						
	Ishikawa			A64	1						
Lean Social Practices (LSP)	Empowerment	A21, A23, A27, A40, A44, A65, A65, A66, A71, A72, A77, A81	12	A1, A3, A25, A30, A40, A21, A42, A50, A57, A63, A73, A80, A83	13						
	Training	A19, A23, A24, A44, A45, A49, A55, A66, A67, A70, A71, A73, A77, A78, A81	15	A6, A40, A41, A50, A51, A52, A63, A83	8					A20	1
	Leadership	A23, A24, A41, A44, A46, A53, A55, A56, A65, A66, A69, A71, A73, A75, A79, A81	16	A3, A12, A13, A14, A22, A28, A30, A35, A36, A46, A51, A57, A78	13						

Two graphs were created to assess the use of practices in each phase.

In the preparation phase (Graph 1) the technical practices VSM and PDCA are the most relevant as they are key processes to map and identify bottlenecks (Wildauer, 2015). Leadership, training and empowerment are prominent within the social practices with more emphasis on leadership (32%) and training (30%) which highlights the human factors.

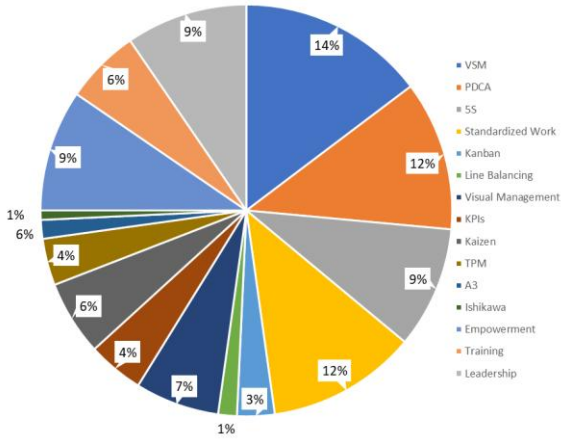
At this stage, people are central because of the challenges related to behavioral and mindset changes (Dombrowski and Mielke, 2013). Training contributes to dissemination of knowledge and sustainability of lean practices (Seidel et al., 2019; Näslund, 2013) and leadership should promote engagement, development of capabilities and empowerment of the team.

Graph 1. Preparation Phase



In the proof of concept phase, all LTP and LSP practices were identified with emphasis on standardized work (14.3%), VSM (13.7%) and PDCA (10.7%) (Graph 2). Standardized work ensures process stability (Dennis, 2008) and VSM maps the flows and identifies bottlenecks (Huang et al., 2022). PDCA allows you to test and refine solutions, helping you continually improve. Together, these practices improve implementation by systematizing processes, and by reducing failures.

Graph 2. Proof Of Concept Phase



Kaizen is the dominant practice in the expansion phase and it promotes continuous improvements in quality, productivity and organizational culture through incremental changes (Singh and Singh, 2012; Liker and Meier, 2007). Its application may contribute to the diffusion of improvements across different domains, broadening the spectrum of lean initiatives (Marsilio et al., 2022; Akmal et al., 2021; Bednarek, 2018).

During the measurement phase, the performance indicators (KPIs) are the most important, with an incidence of 90%, followed by kaizen with 10%. KPIs are used for monitoring processes, evaluation of results and decision making in line with the organizational objectives (Chong and Perumal, 2022; Aquino et al., 2021; Stefanovic, 2014).

In the adoption phase the most prominent practices are kaizen (91.7%) and training (8.3%). Kaizen proves its transversal nature, offering continuous improvement, while training provides continuous capability development.

The literature shows that the integration of technical (LTP) and social (LSP) practices brings better results, reduces waste and improves organizational performance (Reis et al., 2026; Helmold, 2020; Sanz et al., 2019; Chiarini,

2013). The combined use of practices such as VSM, kaizen and empowerment fosters the integration between people and processes, leading to a more effective and sustainable implementation (Reis et al., 2023; Magnani et al., 2019; Fernandes et al., 2017).

4.3 Factors Influencing Implementation

The implementation of lean is affected by organizational, technical and contextual factors such as leadership commitment, training, resistance to change, availability of resources and strategic alignment (Kurpjuweit et al., 2018; Ramadas and Satish, 2018; Belhadi, 2017).

The SLR identified six factors: (i) organizational and people, (ii) suppliers and customers, (iii) process and product, (iv) financial, (v) strategy and lean knowledge, and (vi) governmental. The organizational and people factor is highlighted because it is directly connected with social practices (LSP) like leadership, training and empowerment, being fundamental to the success of its implementation.

Table 3. Factors influencing lean implementation

Factors/ Subfactors		Studies	Phases				
			P	PC	E	M	A
Organizational/ people	Training; communication between people in the organization; opportunity and skills; resistance to change and the adoption of innovations; employee motivation and engagement; employee teamwork; framework for implementation; clear strategic planning; senior management commitment.	A11, A13, A14, A16, A18, A33, A36, A38, A48, A39, A40, A43, A58, A61, A62, A63, A54, A73, A76, A82.	10	7	1	1	1
Suppliers and customer	Supplier management; customer relationship management; supply chain and performance strategy.	A36, A38, A48, A61, A54, A76.					6
Process and product	Process control; product design and development; strategic process control; quality governance; standardization; improve efficiency; planning and control management; complexity of the underlying processes; product design and quality.	A2, A10, A11, A14, A33, A38, A48, A58, A61, A63, A73.		8		2	1
Financial	Lack of financial resources; reduce costs; investor and shareholder pressure; financial performance.	A16, A33, A35, A45, A54, A58, A62, A63, A73, A82.	8				2
Lean strategy and knowledge	Lack of strategic alignment between lean and corporate strategy; lack of long-term vision and supportive organizational culture; lack of lean consultants; lack of knowledge, experience and training; difficulty in quantifying the benefits of lean.	A33, A54.	1				1
Government	Lack of government support; social pressure and legislation.	A62.					1

The most significant element is the organizational and people factor, which includes engagement, leadership, training, and organizational culture (Cunha et al., 2025; Bhadu et al., 2022; Puram et al., 2022). Resistance to change and lack of training are persistent barriers that demand proactive leadership engagement.

The process and product factor are connected to the standardization and improvement of flows, bringing efficiency and quality (Basu et al., 2020). The economic factor is related to the availability of resources and the measurement of gains and is decisive for the continuity of initiatives (Reponen et al., 2021).

The strategy and lean knowledge factors emphasize the importance of strategic alignment and knowledge diffusion. Suppliers, customers, and governmental context are the external influences (Javied et al., 2019; Singh et al., 2019).

Finally, the success of lean implementation depends on the integration of technical and human factors.

5. Proposition of a Hierarchical Lean Implementation Model

The SLR allowed the proposition of a hierarchical lean implementation model that integrates three dimensions: sequential phases; technical lean practices (LTP); social lean practices (LSP); and influencing factors. These dimensions connect the organizational strategies to operational actions, promoting sustainability of improvements.

The phases are maturity levels from preparation to adoption. LTP and LSP are used to support execution, contributing to process mapping, mitigating internal and external impacts. Thus, the model offers an integrated

framework for guiding implementation, improving continuous improvement, and enabling sustainable organizational transformation.

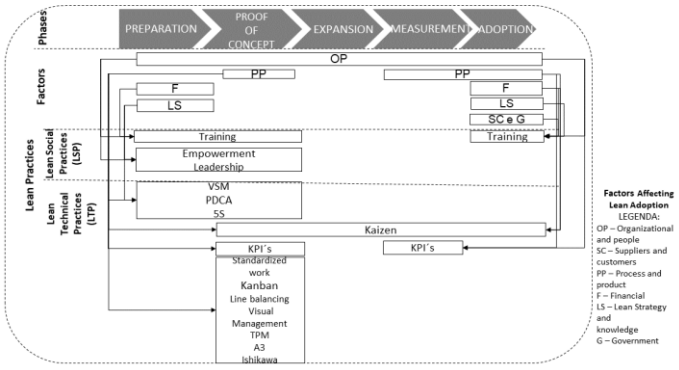


Fig 3. Proposition of a hierarchical lean implementation model

The first phase of the lean implementation focuses on organizational and people related factors, financial factors and strategy and lean knowledge factors. The main challenges are lack of leadership commitment, resistance to change, lack of training and planning weaknesses. In this regard, social practices (LSP), such as leadership, training and empowerment are vital to promote alignment and engagement (Marsilio et al., 2022; Vadivel et al., 2022). Developing internal capabilities may help overcome financial constraints (Ciannella and Santos, 2021).

In the proof of concept phase the organizational and process-related factors become central. LSPs support execution, while LTPs, such as VSM and PDCA, enable the identification of bottlenecks and the validation of improvements. KPIs and standardized work help to stabilize the process (Huang et al., 2022; Bednarek, 2018).

The growth phase is dominated by human factors, particularly leadership and teamwork, with kaizen and empowerment supporting the spread of continuous improvement (Apostu et al., 2021; Cadden et al., 2020).

In the measurement phase, leadership, training, KPIs, and standardization are important practices to monitor and sustain results (Aquino et al., 2021). The adoption phase is where organizational, strategic and external factors come into play and where engagement and strategic alignment are fundamental (Chinchay-Morales et al., 2022; Sohani and Yadav, 2021).

To summarize, practices like VSM, PDCA, 5S, kaizen, and KPIs support continuous improvement, underscoring lean as an interdependent system encompassing technical, social, and contextual dimensions.

6. Conclusions, Limitations and Future Research

This study proposed a hierarchical model for lean implementation by integrating phases, practices and factors. The SLR findings suggest that lean implementation is a multidimensional phenomenon that needs to be aligned with both technical and social dimensions to produce a sustainable result.

As main contribution, the model proposes a systemic approach that addresses the gaps identified in the literature (Antony et al., 2022; McDermott et al., 2022). It emphasizes the significance of organizational and human aspects, especially leadership, training, and engagement, along with technical practices such as VSM, PDCA, and kaizen. This incorporation reduces barriers and improves organizational performance (Bhadu et al., 2022; Henao and Sarache, 2019).

From a practical point of view, the model provides structured guidelines to support organizations in performing lean implementation, fostering strategic alignment, employee engagement and sustainability of results over time. Its

applicability is especially relevant to medium and large organizations, especially when considering emerging economies where the need for operational efficiency is higher.

This study has limitations despite its contributions. The results are based on a Systematic Literature Review, therefore their quality and scope rely on the analyzed studies. Moreover, the proposed model has not been validated empirically thus limiting its generalization to other organizational contexts.

Therefore, future research should focus on empirical validation of the model in various sectors and at different levels of organizational maturity. It is also recommended to develop studies that explore the interaction between technical and social practices, and the influence of external factors on the implementation of lean. Refining the model might be achieved through comparative studies and applications in different contexts.

Finally, the results reinforce the importance of integrated approaches to lean implementation, considering not only operational tools but also human, cultural, and strategic aspects as essential conditions for sustaining initiatives over time.

7. Acknowledgement

The authors would like to thank the Federal University of Ouro Preto (UFOP/Brazil), the Postgraduate Program in Production Engineering (PPGEP), and the Coordination for the Improvement of Higher Education Personnel (CAPES) for their support and funding throughout the development of this research.

APPENDIX I – Compilation of articles evaluated in this research

ode	Reference	Journal	S		T
1	Bajjou et. al., (2025)	Engineering, Construction and Architectural Management			
2	Mamoojee-Khatib el. al., (2025)	The TQM Journal			
3	Gatell el. al., (2024)	Total Quality Management & Business Excellence			
4	Hegedić el. al., (2024)	Sustainability			
5	Kumar et. al., (2024)	International Journal of Lean Six Sigma			
6	Parameswaran.and Ranade wa (2024)	Smart and Sustainable Built Environment			
7	Polat and Demirkesen (2024)	Engineering, Construction and Architectural Management			
8	Van Zyl-Cillié et. al., (2024)	BMC Health Serv			

9	Ayfokru el. at., (2023)	Advances in Civil Engineering			
10	El Faydy et. al., (2023)	International Journal of Production Management and Engineering			
11	Qureshi et. al., (2023)	Sustainability			
12	Sandoval and Javier (2023)	Journal of Engineering Science and Technology Review			
13	Nicholas (2023)	Total Quality Management & Business Excellence			
14	Vanichchinchai (2023)	Business Process Management Journal			
15	Rahimi et al., (2022)	International Journal of Lean Six Sigma			
16	Allen (2022)	Journal of Innovation and Entrepreneurship			
17	Beers, Dun e Wilderom (2022)	International Journal of Lean Six Sigma			
18	Bhadu et al., (2022)	International Journal of Productivity and Performance Management			
19	Chinchay-Morales, Laura-Ulloa e Quiroz-Flores (2022)	International Conference on Industrial Engineering and Industrial Management			
20	Chuman-Bobadilla, Liendo-Carrillo e Quiroz-Flores (2022)	International Conference on Industrial Engineering and Industrial Management			
21	Huang et al., (2022)	Processes			
22	Marsilio et al., (2022)	BMC Health Services Research			
23	Vadivel et al., (2022)	International Journal of Engineering Research & Technology (ijert)			
24	Akmal et al., (2021)	International Journal of Lean Six Sigma			
25	Apostu, Vasile e Veres (2021)	Int J Environ Res Public Health			

26	Aquino et al., (2021)	International Conference on Industrial and Business Engineering			
27	Ciannella e Santos (2021)	Social Responsibility Journal			
28	Chong e Perumal (2021)	International Journal of Production Management and Engineering			
29	García e Montenegro (2021)	LACCEI International Multi-Conference for Engineering, Education, and Technology			
30	Lameijer et al., (2021)	Production Planning & Control			
31	Morell-Santandreu, Santandreu-Mascarell e Garcia-Sabater (2021)	International Journal of Environmental Research and Public Health			
32	Nader e El-Khalil (2021)	International Conference on Industrial Engineering and Operations Management Sao Paulo			
33	Puram et al. (2021)	The TQM Journal			
34	Pozzi, Cannas e Ciano (2021)	International Journal of Production Research			
35	Reponen et al., (2021)	BMC Health Serv Res			
36	Sharma, Sohani e Yadav (2021)	Journal of Engineering, Design and Technology			
37	Valdivia e Rivas (2021)	LACCEI International Multi-Conference for Engineering, Education, and Technology			
38	Basu e Dan (2020)	International Journal of Lean Six Sigma			
39	Bhadu, Singh e Bhamu (2020)	International Journal of Productivity and Performance Management			
40	Cadden et al., (2020)	International Journal of Production Economics			
41	Castro-Chara et al., (2020)	IOP Conference Series: Materials Science and Engineering,			
42	Cespedes-Pino et al., (2020)	IOP Conference Series: Materials Science and Engineering			

43	Connor e Cormican (2020)	International Journal of Lean Six Sigma			
44	Dehdasht et al., (2020)	Plos one			
45	Demirkesen e Bayhan (2020)	Engineering Management Journal			
46	Doeleman et al., (2020)	Journal of Strategy and Management			
47	Dorval e Jobin (2020)	International Journal of Productivity and Performance Management			
48	Hassani, Ceausu e Iordache (2020	Proceedings of the 14th International Conference on BusinessExcellence 2020 - Sciendo			
49	Veres (2020)	Procedia Manufacturing			
50	Zanon, Ulhoa e Esposto (2020)	Production Planning & Control			
51	Almutair e Al-Ashaab (2019)	International Journal of Lean Six Sigma			
52	Colín-Lozano et al., (2019)	Proceedings of the International Conference on Industrial Engineering and Operations Management Toronto			
53	Elrhanimi e Abbadi (2019)	The TQM Journal			
54	Gaiardelli e Songini (2019)	International Journal of Productivity and Performance Management			
55	Gao e Gurd (2019)	BMC Health Serv Res			
56	Mazur, Stokes e McCreery (2019)	Engineering Management Journal			
57	Pienkowski (2019)	International Business Information Management Association Conference (IBIMA)			
58	Ramori et al. (2019)	Total Quality Management & Business Excellence			
59	Romero, Gonzales e Raymundo (2019)	ACM International Conference Proceeding Series			

60	Sarhan et al., (2019)	Engineering, Construction and Architectural Management			
61	Shafiq e Soratana (2019)	Journal of Humanitarian Logistics and Supply Chain Management			
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