



Development of Lean Manufacturing Implementation Framework in Machinery and Equipment SMEs

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References

- [1] A. Pearce, D. Pons, and T. Neitzert, "Implementing lean—Outcomes from SME case studies," *Oper. Res. Perspect.*, vol. 5, pp. 94–104, 2018, <https://doi.org/10.1016/j.orp.2018.02.002>.
- [2] P. Achanga, E. Shehab, R. Roy, and G. Nelder, "Critical success factors for lean implementation within SMEs," *J. Manuf. Technol. Manag.*, vol. 17, no. 4, pp. 460–471, 2006, <https://doi.org/10.1108/17410380610662889>.
- [3] D. T. Matt and E. Rauch, "Implementation of lean production in small sized enterprises," *Procedia CIRP*, vol. 12, pp. 420–425, 2013, <https://doi.org/10.1016/j.procir.2013.09.072>.
- [4] J. Bhamu and K. S. Sangwan, "Lean manufacturing: Literature review and research issues," *Int. J. Oper. Prod. Manag.*, vol. 34, no. 7, pp. 876–940, 2014, <https://doi.org/10.1108/IJOPM-08-2012-0315>.
- [5] I. Veža, N. Gjeldum, and L. Celent, "Lean Manufacturing Implementation Problems in Beverage Production Systems," *Int. J. Ind. Eng. Manag.*, vol. 2, no. 1, pp. 21–26, 2011.
- [6] N. Nordin and H. M. Belal, "Change agent system in lean manufacturing implementation for business sustainability," *Int. J. Supply Chain Manag.*, vol. 6, no. 3, pp. 271–278, 2017.
- [7] I. S. Mohammad and C. F. Oduoza, "Lean-excellence business management for manufacturing SMEs focusing on KRI," *Int. J. Product. Perform. Manag.*, 2019, <https://doi.org/10.1108/IJPPM-11-2018-0389>.
- [8] S. Azuan, S. Ahmad, W. Khairuzzaman, and W. Ismail, "Lean manufacturing, culture, lean culture," *J. Bus. Manag.*, vol. 1, no. 1, pp. 6–14, 2017.
- [9] SME Corp. Malaysia Secretariat. "Guideline for SME Definition." [Online]. Available: https://www.smecorp.gov.my/images/pdf/2020/Guideline-SMEDefinition_updated.pdf [Accessed: 10-May-2020].
- [10] Department of Statistics Malaysia. "Press Release Small and Medium Enterprises (SMEs) Performance 2018." [Online]. Available: https://www.dosm.gov.my/v1/index.php?r=column/cthemByCat&cat=159&bul_id=R0Vka2RpeVJ0cUlpR3BqdjhudDZhdz09&menu_id=7E5CRUZCbhlh4ZTZMODZiBmk2aWRRQT09 [Accessed: 10-Dec-2019].
- [11] Malaysian Investment Development Authority. "Malaysia's Machinery & Equipment and Engineering Supporting Industries." [Online]. Available: https://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20191024164247_M&E%202019%20edition.pdf [Accessed: 10-Dec-2019].
- [12] A. Belhadi, F. E. Touriki, and S. El Fezazi, "A framework for effective implementation of lean production in small and medium-sized enterprises," *J. Ind. Eng. Manag.*, vol. 9, no. 3, pp. 786–810, 2016, <https://doi.org/10.3926/jiem.1907>.
- [13] M. Almani, K. Saloni, and Y. Xu, "Lean Implementation Frameworks: The Challenges for SMEs," *Procedia CIRP*, vol. 63, pp. 750–755, 2017, <https://doi.org/10.1016/j.procir.2017.03.170>.
- [14] R. Ulewicz and R. Kuceba, "Identification of problems of implementation of Lean concept in the SME sector," *Eng. Manag. Prod. Serv.*, vol. 8, no. 1, pp. 19–25, 2016, <https://doi.org/10.1515/emj-2016-0002>.
- [15] N. D. Minh and N. T. Van Ha, "'Made in Vietnam' Lean Management Model for Sustainable Development of Vietnamese Enterprises," *Procedia CIRP*, vol. 40, pp. 602–607, 2016, <https://doi.org/10.1016/j.procir.2016.01.141>.
- [16] T. Ohno, *Toyota Production System: Beyond Large-Scale Production*. Portland, OR, USA: Productivity Press, 1988.
- [17] J. P. Womack, D. T. Jones, and D. Roos, *The Machine that Changed the World*. New York, NY, USA: Rawson Associates, 1990.
- [18] J. K. Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*. New York, NY, USA: McGraw-Hill, 2004.
- [19] J. P. Womack and D. T. Jones, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. New York, NY, USA: Simon & Schuster, 2003.
- [20] N. A. A. Bakar, T. Z. Mat, F. M. Fahmi, and S. T. Urus, "Lean Management Practices and its Effect on Malaysian Local Government Performance," *Manag. Account. J.*, vol. 12, no. 2, pp. 1–20, 2017.

- [21] Y. C. Wong and K. Y. Wong, "A Lean Manufacturing Framework for the Malaysian Electrical and Electronics Industry," *Proc. 3rd Int. Conf. Inf. Financ. Eng.*, vol. 12, pp. 30–34, 2011.
- [22] S. M. Yusof and E. Aspinwall, "Total quality management implementation frameworks: Comparison and review," *Total Qual. Manag.*, vol. 11, no. 3, pp. 281–294, 2000, <https://doi.org/10.1080/0954412006801>.
- [23] M. Dora, M. Kumar, and X. Gellynck, "Determinants and barriers to lean implementation in food-processing SMEs - A multiple case analysis," *Prod. Plan. Control*, vol. 27, no. 1, pp. 1–23, 2016, <https://doi.org/10.1080/09537287.2015.1050477>.
- [24] S. M. Yusof and E. Aspinwall, "Conceptual framework for TQM implementation for SMEs," *TQM Mag.*, vol. 12, no. 1, pp. 31–36, 2000, <https://doi.org/10.1108/09544780010287131>.
- [25] A. Belhadi, Y. B. M. Sha'ri, F. E. Touriki, and S. El Fezazi, "Lean production in SMEs: literature review and reflection on future challenges," *J. Ind. Prod. Eng.*, vol. 35, no. 6, pp. 368–382, 2018, <https://doi.org/10.1080/21681015.2018.1508081>.
- [26] L. Goehnera, L. C. B. Mello, and R. A. M. Bandeira, "Lean Manufacturing Implementation for Multinational Companies With Production Subsidiary in Brazil: Development of a Roadmap," *Int. J. Lean Think.*, vol. 7, no. 1, pp. 26–46, 2016.
- [27] S. Mostafa, J. Dumrak, and H. Soltan, "A framework for lean manufacturing implementation," *Prod. Manuf. Res.*, vol. 1, no. 1, pp. 44–64, 2013, <https://doi.org/10.1080/21693277.2013.862159>.
- [28] M. Almani, K. Salonitis, and C. Tsinopoulos, "A conceptual lean implementation framework based on change management theory," *Procedia CIRP*, vol. 72, pp. 1160–1165, 2018, <https://doi.org/10.1016/j.procir.2018.03.141>.
- [29] N. V. K. Jasti and R. Kodali, "Lean manufacturing frameworks: review and a proposed framework," *Eur. J. Ind. Eng.*, vol. 10, no. 5, p. 547, 2016, <https://doi.org/10.1504/ejie.2016.078799>.
- [30] R. C. Mamat, B. Md Deros, M. N. Ab Rahman, M. K. Omar, and S. Abdullah, "Soft lean practices for successful lean production system implementation in malaysia automotive smes: A proposed framework," *J. Teknol.*, vol. 77, no. 27, pp. 141–150, 2015, <https://doi.org/10.11113/jt.v77.6910>.
- [31] Z. H. Ainul Azyan, V. Pulakanam, and D. Pons, "Success factors and barriers to implementing lean in the printing industry: A case study and theoretical framework," *J. Manuf. Technol. Manag.*, vol. 28, no. 4, pp. 458–484, 2017, <https://doi.org/10.1108/JMTM-05-2016-0067>.
- [32] H. Afonso and M. D. R. Cabrita, "Developing a lean supply chain performance framework in a SME: A perspective based on the balanced scorecard," *Procedia Eng.*, vol. 131, pp. 270–279, 2015, <https://doi.org/10.1108/JMTM-05-2016-0067>.
- [33] J. Bhamu and K. S. Sangwan, "A framework for lean manufacturing implementation," *Int. J. Serv. Oper. Manag.*, vol. 25, no. 3, pp. 313–333, 2016.
- [34] A. A. Osman, A. A. Othman, and M. K. I. A. Rahim, "Lean Manufacturing Adoption in Malaysia: A Systematic Literature review," *Int. J. Supply Chain. Oper. Manag. Logist.*, vol. 1, no. 1, pp. 1–35, 2020.
- [35] G. Anand and R. Kodali, "Analysis of Lean Manufacturing Frameworks," *J. Adv. Manuf. Syst.*, vol. 09, no. 01, pp. 1–30, 2010, <https://doi.org/10.1142/s0219686710001776>.
- [36] A. P. Puvanasvaran, M. H. M. A. Megat, S. H. Tang, M. R. Muhamad, and A. M. S. Hamouda, "A review of problem solving capabilities in lean process management," *Am. J. Appl. Sci.*, vol. 5, no. 5, pp. 504–511, 2008.
- [37] S. Soares and L. Teixeira, "Lean information management in industrial context: An experience based on a practical case," *Int. J. Ind. Eng. Manag.*, vol. 5, no. 2, pp. 107–114, 2014.
- [38] P. Puvanasvaran, H. Megat, T. S. Hong, and M. M. Razali, "The roles of communication process for an effective lean manufacturing implementation," *J. Ind. Eng. Manag.*, vol. 2, no. 1, pp. 128–152, 2009, <https://doi.org/10.3926/jiem.2009.v2n1.p128-152>.
- [39] Z. Radnor, "Implementing Lean in Health Care: Making the link between the approach, readiness and sustainability," *Int. J. Ind. Eng. Manag.*, vol. 2, no. 1, pp. 1–12, 2011.
- [40] A. M. N. Rose, B. M. Deros, and M. N. A. Rahman, "Development of framework for lean manufacturing implementation in SMEs," *11th Asia Pacific Ind. Eng. Manag. Syst. Conf. 14th Asia Pacific Reg. Meet. Int. Found. Prod. Res.*, vol. December, pp. 1–5, 2010.
- [41] I. Da Silva, A. R. Xambre, and R. B. Lopes, "A simulation game framework for teaching lean production," *Int. J. Ind. Eng. Manag.*, vol. 4, no. 2, pp. 81–86, 2013.
- [42] L. Medbo and D. Carlsson, "Implementation of Lean in SME, experiences from a Swedish national program," *Int. J. Ind. Eng. Manag.*, vol. 4, no. 4, pp. 221–227, 2013.
- [43] N. Štefanić, N. Tošanović, and M. Hegedić, "Kaizen workshop as an important element of continuous improvement process," *Int. J. Ind. Eng. Manag.*, vol. 3, no. 2, pp. 93–98, 2012.
- [44] T. F. Chay, "A Bottom-up Lean Implementation Study at a Malaysian Automotive Parts Manufacturer," M.S. thesis, 2014. [online] Available at: School of Applied Sci., Cranfield Univ., Cranfield, Bedfordshire, UK, 2014. [Online]. Available: https://dspace.lib.cranfield.ac.uk/bitstream/handle/1826/8608/Chay_T_F_Thesis_2013.pdf?sequence=1&isAllowed=y