Towards Lean Production in Industry 4.0

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Abstract: Lean Production principles were published in the early 1990s. Since then they have become widely recognized and accepted in the industrial setting. They concern the strict integration of humans in the manufacturing process, a continuous improvement and focus on value-adding activities by avoiding waste. However, in order to achieve it, the commitment is required from everyone in the organisation, i.e. people should feel respected, the production should be levelized and Just-in-Time, whereas the quality should be built into the whole manufacturing process. Recently, a new paradigm called Industry 4.0 or the fourth industrial revolution has emerged in the manufacturing sector. It refers to the process optimization, which is driven by cloud computing, Internet of Things, real-time sense-and-response technologies, cloud-based services, big data analytics, robotics, artificial intelligence, and 3D printing. It allows creating a smart network of machines, products, components, properties, individuals and ICT systems in the entire value chain to have an intelligent factory. So, now a question arises if and how these two approaches can coexist and support each other.
This paper gives an overview of the existing possibilities and examples for combining the information technology and Lean Production. Moreover, it shows how Industry 4.0 can add value to Lean Production in the future.

Keywords: industry 4.0; lean automation; lean production; production management.

References

[1] Womack JP, Jones DT. *Lean thinking: banish waste and create wealth in your corporation*. New York: Simon and Schuster; 1996.
[2] Wyrwicka MK, Mrugalska B. Barriers to eliminating waste in production system. In: Ejdys J, Chua D, Smallwood J, *Proceedings of the 6th international conference on engineering, project, and production management*, Australia: Griffith School of Engineering; 2015, p. 354–363.
[3] Shah R, Ward P. Lean manufacturing: context, practice bundles, and performance. *Journal of Operations Management* 2003;21:129–149.
[4] Hobbs DP. *Lean manufacturing implementation: a complete execution manual for any size manufacturer*. Boca Raton: Ross Publishing; 2004.
[5] Bicheno J, Holweg M. *The lean toolbox*. Buckingham: PICSIE Books; 2009.
[6] Wyrwicka MK. Kultura techniczna a rozwój przedsiębiorstwa [Technical culture and development of enterprise]. In: Szymańska K, editor. *Kultura organizacyjna we współczesnych organizacjach [Organizational culture in contemporary enterprises]*, Lodz: Publishing House of Lodz University of Technology; 2014, p. 66–75.
[7] Schmitt M, Meixner G, Gorecky D, Seissler M, Loskyll M. Mobile interaction technologies in the factory of the future. *Analysis, Design, and Evaluation of Human-Machine Systems*. 2013;12(1):536–542.
[8] Gorecky D, Schmitt M, Loskyll M. Human-machine-interaction in the industry 4.0 era. In: *12th IEEE International Conference on Industrial Informatics (INDIN)*, Porto Alegre, Brazil; 2014, p.289–294.
[9] Posada J, Toro C, Barandiaran I, Oyarzun D, Stricker D, de Amicis R, Pinto EB, Eisert P, Döllner J, Vallarino I. Visual computing as a key enabling technology for Industrie 4.0 and industrial internet. *Computer Graphics and Application, IEEE* 2015;35(2):26–40.
[10] Kolberg D, Zühlke D. Lean automation enabled by Industry 4.0 technologies. *IFAC-PapersOnLine* 2015;48(3):1870–1875.