Transition to industry 4.0: impediments, facilitators and gains

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Abstract

Industry 4.0, an integral part of the fourth industrial revolution, is a technological trend that brings strong implications to industrial production worldwide. The transition to Industry 4.0 is shown to be inevitable, even if the results to be obtained are not yet widely known. Lean manufacturing's management philosophy, associated with Industry 4.0 technological principles, can accelerate this process and minimize potential risks, thereby facilitating implementation solutions, even though the transition occurs gradually. The methodology applied for this research is exploratory, possessing both qualitative and quantitative aspects. Primary data were collected through a survey answered by 50 managers from the automotive sector. Based on the obtained results, it was seen that companies have different levels of maturity regarding their digital transformation process. Although competitive advantages might be gained by such technological advancements, the surveyed companies did not show that competitiveness could be a differential, but recognizes that lean manufacturing can contribute to leverage the transition to Industry 4.0.

Keywords
Lean Manufacturing; Industry 4.0; costs.

The Industry 4.0 concept considers the major technological innovations in the fields of automation, control and information technology applied to manufacturing processes (LEE ET AL. 2015). Being part of the fourth industrial revolution, it is a technological trend that brings reflexes to world production, based on the concept of physical cyber systems, internet of things, big data and cloud computing (SCHWAB, 2016).
In an intelligent factory, the production process can promote real-time communication of workers, machines and inputs, allowing information to be obtained in real time (RODRIGUES, JESUS; SCHUTZER, 2016). The transition to Industry 4.0 is shown to be inevitable, even if the consequences for manufacturing operations are not yet widely known, which brings the need for companies to define their manufacturing model and plan their transformation program (ALMADA LOBO, 2016).
Lean manufacturing's management philosophy, which applies Toyota Production System concepts, can leverage the transition to Industry 4.0. The combination of Industry 4.0 technologies and Lean concepts can accelerate this process and minimize potential risks, thus facilitating implementation solutions, even though the transition occurs gradually (KOLBERG; ZUHLKE, 2015). The Brazilian automotive chain is made up of a large number of manufacturers and is divided into four different segments: automakers, spare parts dealers, providers and importers (FERREIRA; MARTINS; MOREIRA, 2012).
Considering the pillars of Industry 4.0, the competitiveness and companies' requirements in the automotive segment, the questions to be studied in this research are: How does the auto parts industry in Brazil is being prepared for the transition to Industry 4.0? What are the impediments to this transition and what gains can be made? Aiming to identify the facilitators for this transition.
The methodology applied for this research is exploratory, qualitative and quantitative. The primary data were collected through a survey system called survey answered by 50 industrial managers from the automotive industry. The research talked about the bottlenecks for using new technologies, the facilitators for the transition to industry 4.0 and the gains and impediments of this transition. The surveyed sample consisted of 70% of auto parts companies, 30% of automakers.
The most cited bottlenecks were the lack of indicators to measure return on investment, connection between business chain participants and the availability of financial resources relative to Industry 4.0. The most cited impediments were lack of knowledge on the subject, lack of interest of the company and investments incompatible with available resources. Cost reduction, agility in production processes and availability of information were the most cited gains, while the competitive advantage was less pointed. As for the facilitators, 96% of the companies considered Lean important for the transition.
Based on the obtained results, it can be seen that companies have different levels of maturity in relation to the transition. Although competitive advantages might be gained by such technological advancements, the surveyed companies did not show that competitiveness could be a differential, but recognizes that lean manufacturing can contribute to leverage the transition to Industry 4.0.

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References

ALMADA-LOBO, FRANCISCO. "The Industry 4.0 revolution and the future of manufacturing execution systems (MES)." Journal of innovation management 3.4 (2016).
FERREIRA, M.; MARTINS, H.; MOREIRA, A. A informalidade como estratégia competitiva no mercado de autopeças. Amazônia, Organizações e Sustentabilidade, v. 1, n. 2, 2012.
KOLBERG D; ZUHLKE D. Lean Automation enabled by Industry 4.0 Technologies. IFAC. Vol. 48; p. 1873; 2015.
LEE, J., BAGHERI, B., & KAO, H. A. (2015). A cyber-physical systems architecture for industry 4.0-based manufacturing systems. Manufacturing letters, 3, 18-23.
RODRIGUES, L. F.; JESUS, R. A.; SCHÜTZER, K. Industrie 4.0: Uma revisão da literatura. Revista de Ciência & Tecnologia, v. 19, n. 38, p. 33-45, 2016.

SCHWAB, K. The Fourth Industrial Revolution. 1st Edition, World Economic Forum. Crown Busines: New York. ISBN: 9781524758869, 2016.

Biography

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