

## **A Pathway for Industry 4.0 Implementation in a Lean Environment: With Special Reference to the Sri Lankan Apparel Sector**

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The foundation of the fourth industrial revolution (I4.0) was built on several technological pillars that were established over the years. The adoption of these technologies by organizations is expected for them to benefit from I4.0. However, manufacturing organizations that have improved their operations through lean management philosophies need a clear roadmap to embrace the I4.0 technologies without disrupting the current business practices. In addition, to the extent we know, only a few studies in the literature empirically investigate how I4.0 can be implemented in a lean environment in a developing economy. Hence, the objective of this study is to devise a much-needed roadmap for implementing I4.0 technologies in a Lean environment. To achieve that, we conducted focused group interviews with ten respondents from four Sri Lankan apparel industries that have implemented I4.0 technologies in a lean environment. The collected data was analyzed through thematic analysis, allowing the identification of different themes. Our findings suggest that such a roadmap involves four steps: (1) setting a lean base, (2) strategic management, (3) human resource development, and (4) getting external support. We also found that higher implementation costs and resistance of the people are the major challenges in implementing I4.0 technologies in a Lean environment. Our recommendation for the organizations that have mastered Lean is to start their I4.0 journey by introducing a few technologies such as cloud computing, the Internet of Things, Automation, and Industrial Robotics. Since the implementation of I4.0 technologies in a lean environment is a relatively recent phenomenon, our study provides a better understanding of how lean manufacturing can support the implementation of I4.0 technologies, allowing companies undergoing I4.0 technology implementation to better manage their change process and prioritize their efforts and narrow their attention more objectively to the proper mix of technologies while moving towards the lean manufacturing.

**Keywords:** Lean manufacturing, Industry 4.0, Technology implementation roadmap, Apparel industry