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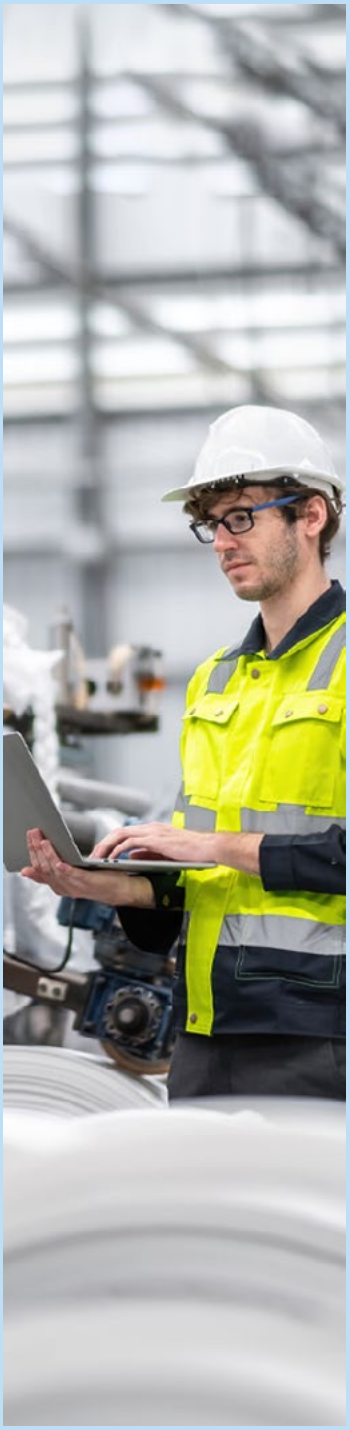

LEAN 4.0

A collaboration between Lean and Industry 4.0

PREFACE

In today's competitive business environment, enterprises should reorganize their processes and strategies to adapt to dynamic market needs and improve their market share. This business imperative is further intensified in manufacturing, where enterprises are competing to deliver products of the highest quality at the lowest possible price. Consequently, manufacturing plants need to boost productivity and enhance the quality of products, while reducing costs. In this context, lean manufacturing and Industry 4.0 allow enterprises to achieve superior efficiency and quality.

However, the advent of Industry 4.0 presents several possibilities as well as intriguing questions. Can Lean and Industry 4.0 co-exist? Will traditional lean survive technological innovations where systems and processes are more auto connected? Will Industry 4.0 replace lean or co-exist? And if the two can co-exist, what will be their relationship status?

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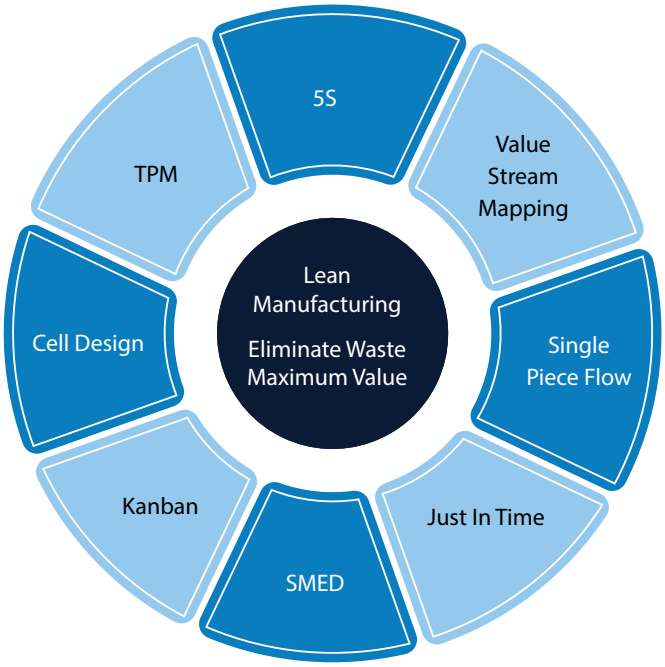
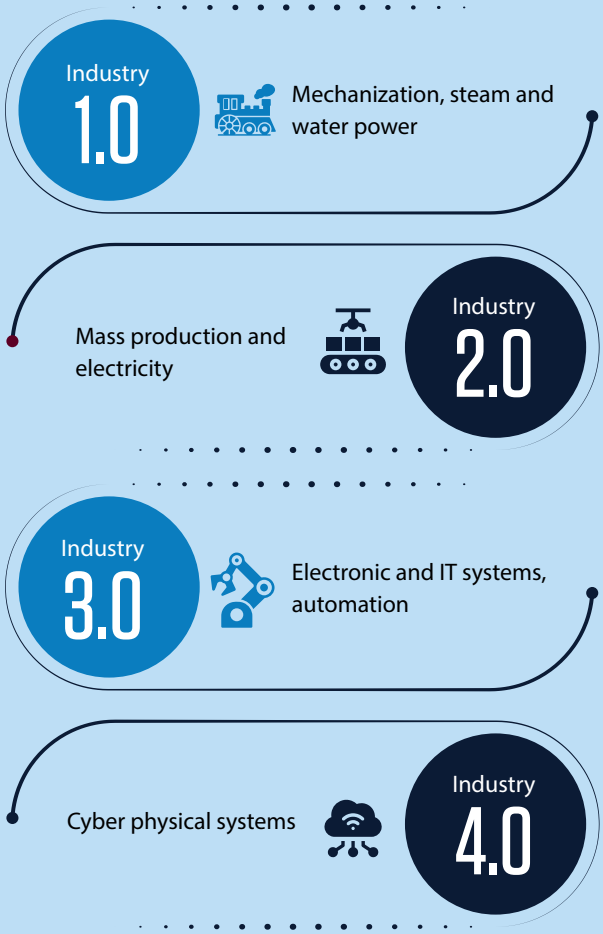
Introduction

Lean Manufacturing is a methodology focused on continuous improvement in processes by minimizing waste and maximizing productivity. It eliminates waste or non-value-added activities within processes to reduce manufacturing issues and costs. Lean Manufacturing employs tools such as 5S, continuous flow, Kanban, Total Productive Maintenance (TPM), and Just-in-Time (JIT) to achieve goals. Lean has been successfully applied across industries and businesses.

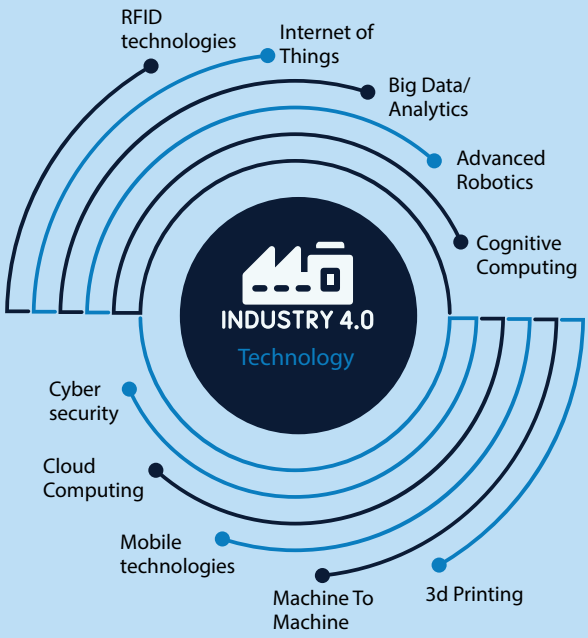


Lean Manufacturing

Industry 4.0 or the 4th wave of the Industrial Revolution advocates creating a smart factory by integrating people, products, and machines across the value chain. Industry 4.0 uses advanced technologies such as Big Data and analytics, cloud computing, Machine Learning (ML) and Artificial Intelligence (AI), advanced robotics, Augmented and Virtual Reality to develop flexible and integrated manufacturing processes and supply chains. This technology-driven approach aims to achieve superior production efficiency, customer serviceability, and effectiveness. The implementation of Industry 4.0 has enhanced traditional production systems with technological production systems, especially high speed Internet (data flow) and the ability to store and process a huge volume of data.



Phases of Industrial Revolution

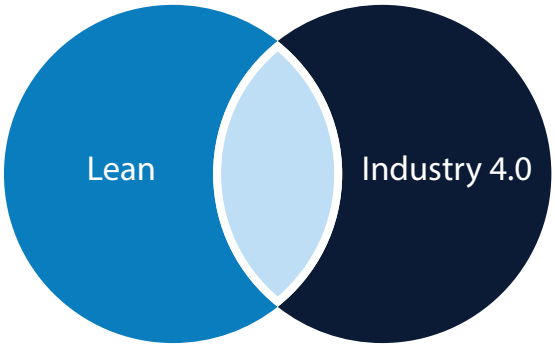


Industry 4.0 Technological Pillars

Relationship Between Lean and Industry 4.0

Both Lean and Industry 4.0 models focus on designing and improving manufacturing operations. The key difference being Industry 4.0 relies on technology to address business issues while lean revolves around people, culture and processes. Another major difference between them is the speed of implementation: lean advocates continuous small or prompt improvements while Industry 4.0 involves more time, money and energy for implementation as it is driven by technology.

People and processes have always been critical for the success of any business. The advent of Industry 4.0 does not eliminate human resources. Despite widespread digitalization and automation of processes and operations, enterprises need employees to design, execute, operate, and improve the machines and processes. Actually, enterprises need to continuously enhance processes and improve the skillset of professionals.



Relationship between Lean and Industry 4.0

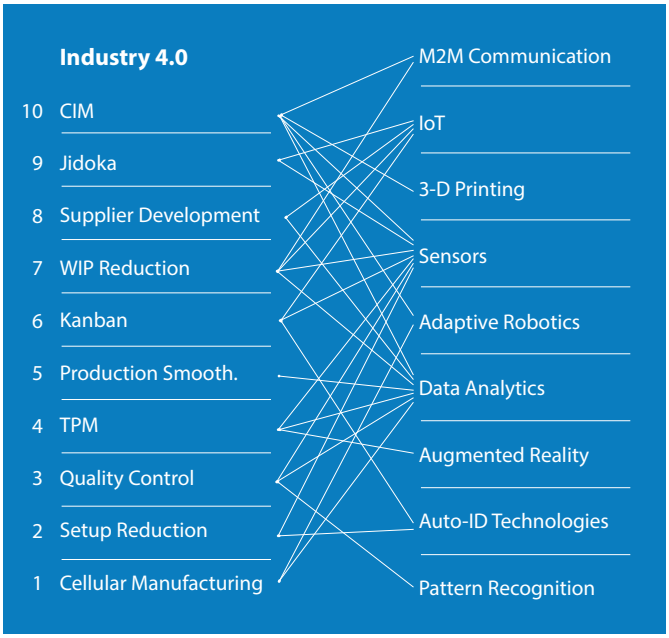
Moreover, implementing the latest technology works best when processes are as efficient and effective as possible. In fact, automating inefficient processes may not just prevent better results, but also increase inefficiencies.

So Industry 4.0 and lean can co-exist and complement each other in delivering optimal results and rproviding competitive advantage for enterprises. The collaboration is being referred to as Lean 4.0 or Lean Industry 4.0.

Lean 4.0 Tools

The technological advancements of Industry 4.0 push traditional lean to reinvent itself. Traditional lean manufacturing may not be capable to address the needs of new and emerging technology. While the underlying principles of lean may not change, the implementation methods need to be upgraded. Interactions of lean manufacturing tools with Industry 4.0 technologies such as Big Data Analytics, Virtual Simulation and Augmented Reality, Machine Learning, and Internet of Things enhance the quality and effectiveness of lean.

- **e-Value Stream Mapping (e-VSM)**: The collection of real-time data in factories with the support of Big Data and IoT improves the quality and efficiency of the VSM, which helps identify waste in processes.
- **Just-in-Time (JIT)**: The digitalization of supply chains provides better tracking and accurate inventory data, which makes it easier for implementation of JIT.
- **Total Productive Maintenance (TPM)**: Big Data, AI and ML help early detection of machine wear and tear. It enables better implementation of TPM and effective preventive maintenance.
- **Single Minute Exchange of Die (SMED)**: Machines leverage sensors and applications to identify the product scheduled to run on the lines and make necessary changes by loading the required program and tools automatically.



Lean tools and Industry 4.0 technologies ladder

So Lean and Industry 4.0 can indeed co-exist. Moreover, with systematic planning and implementation, they can complement each other and offer robust solutions to improve enterprise performance and revenue.

Lean 4.0 Use Cases

Global companies have been successful because of the integrated implementation of Lean and Industry 4.0. Companies have achieved superior productivity, efficiency, quality and flexibility. Let us evaluate how the application of Lean 4.0 enabled enterprises to add value to their processes by eliminating non-value-added activities.

Würth Industrie Services GmbH & Co. KG introduced a digitalized Just-in-Time delivery system for C-type (small) parts, which allowed accurate monitoring of stock in the bin during real-time production. The company introduced iBin as an extension of Kanban bins. The iBin module has a camera installed in the bin that carries small parts (C-type parts). The camera placed inside the bin can detect the level of parts in the bin and report the status wirelessly to an inventory control system. iBin also allows the ordering information to be sent directly to the ERP system.

It has optimized the Just-in-Time delivery system and delivered significant advantages such as reduction in stock levels of parts, lesser waiting time for parts replenishment through continuous inventory transfer, and lower manual effort for part ordering by developing automated order triggering.

iBin system installed in a bin

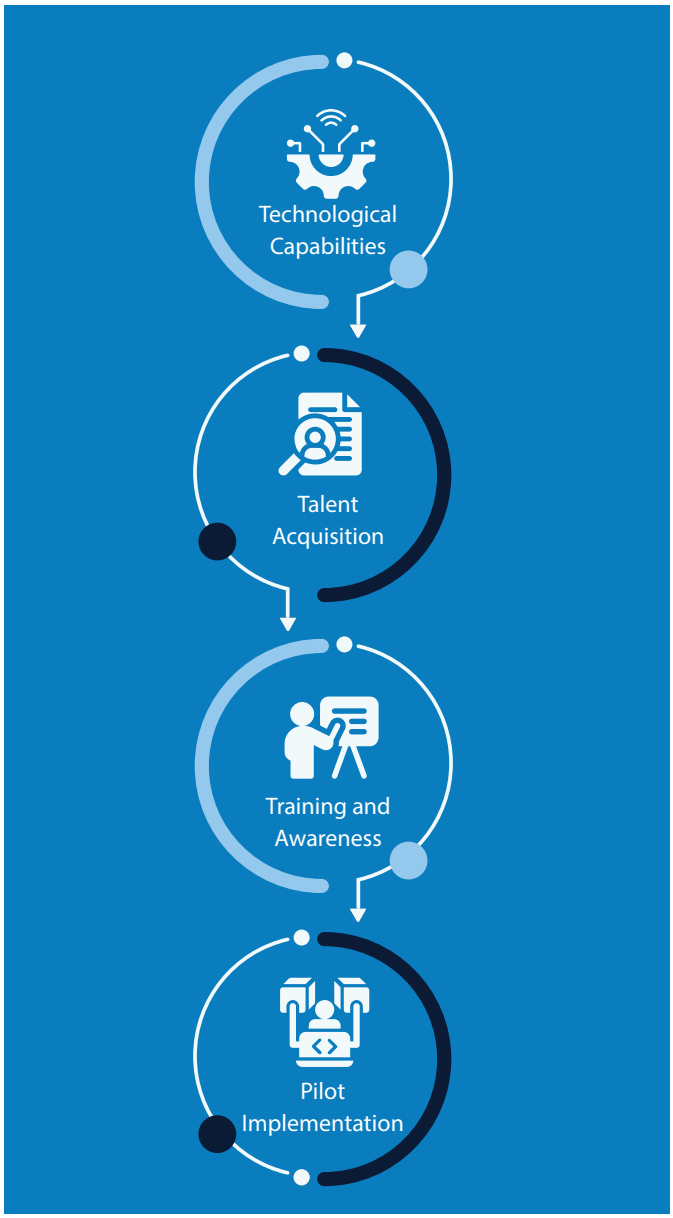
A global supplier of automotive parts adopted the Lean Industry 4.0 approach to enhance its quality control process. Initially, the manufactured parts were subjected to a visual quality inspection through a self-inspection process by quality assurance inspectors. Later, the quality inspection was replaced by a camera system installed on the line that checked parts for surface defects, report and store failure data. Subsequently, the data was used to create reports on failures. The dataset, which offers qualitative and quantitative insights, enables deeper analysis.

The camera system reduced the visual inspection and manual reporting time by 70%. The data from reports helped identify the underlying causes of failure and optimize the processes to produce superior quality and defect-free parts.

Automated Quality Control

Keeping up with Lean 4.0

Significant advances in Lean 4.0 have motivated global companies across industries to adopt this approach. Enterprises should reinforce these capabilities to amplify success.



Capabilities for Lean 4.0

Technological capabilities: Lean 4.0 (or Industry 4.0) is dependent on technologies such as IoT, cloud computing, Big Data, AI, data analysis, Enterprise Resource Planning (ERP), and Robotic Process Automation (RPA). Enterprises should be adept at advanced technologies or partner with domain experts to realize their potential and develop smart solutions.

Talent acquisition: Consulting firms and enterprises need to develop a global pool of talent in cloud computing, IoT, AI, 3D printing, robotics, and Augmented Reality. Moreover, these companies need to have engineering and manufacturing talent to realize the potential of these technologies.

Training and awareness: Enterprises will face resistance to changes from factory workers during implementation. This challenge arises from their mindset, which can be addressed by creating awareness through training and developing competence.

The training should be focused on how the implementation of Lean 4.0 adds value to their career, lead to better productivity and efficiency, and improve their safety and work environment.

Leadership should develop a roadmap and devise a strategy for competence development of both management and factory workers.

Pilot approach: Lean 4.0 (or Industry 4.0) projects are complex. They involve a significant investment and losses due to failure entail business risks. A viable idea would be to begin with small pilot projects which, if incorrect, can either be easily identified, and/or involves low impact. The management and workers can learn from their experience of pilot projects to bridge the gaps for larger pilots.

Enterprises should identify the partner(s) in this phase where they lack the expertise or need support. Developing a partner ecosystem not only accelerates the pilot but also leads to risk sharing and better chance of success.

It is advisable to design a step-by-step approach with a clear vision, roadmap and strategy for pilot implementation and roll out. The pilot should be monitored to provide KPIs such as competence development, cost, or productivity benefits, and increase in efficiency. The roll out should follow a gradual process which allows for time to learn from mistakes and grow. The Plan, Do, Check and Act (PDCA) cycle is proven to deliver results.

Conclusion

Significant advances in Lean 4.0 have motivated global companies across industries to adopt this approach. Enterprises should reinforce these capabilities to amplify success.

Reference

- Christoph Roser [August 7, 2018]. Lean and Industry 4.0 https://www.allaboutlean.com/lean-and-industry-4-0/
- Alessandra Akkari, Luana Valamede [May 2020]. Lean 4.0: A New Holistic Approach for the Integration of Lean Manufacturing Tools and Digital Technologies https://www.researchgate.net/publication/342519629_Lean_40_A_New_Holistic_Approach_for_the_Integration_of_Lean_Manufacturing_Tools_and_Digital_Technologies
- Dennis Kolberg, Detlef Zühlke [December 2015], Lean Automation enabled by Industry 4.0 Technologies https://www.researchgate.net/publication/282465205_Lean_Automation_enabled_by_Industry_40_Technologies
- Daniel Küpper [December 14, 2017]. The Next Level of Operational Excellence https://www.bcg.com/publications/2017/lean-meets-industry-4.0
- Daniel Camara [April 21, 2020]. The Future of Manufacturing: Lean 4.0 https://www.thefuturefactory.com/blog/47
- Madilynn Angel [July 25, 2021]. How Industry 4.0 is Transforming Lean Manufacturing https://tulip.co/blog/how-industry-4-0-is-transforming-lean-manufacturing/
- Mariana Costa [January 15, 2021]. How Lean 4.0 Can Help Leverage Efficiency On Your Shop Floor https://packiot.com/how-lean-4-0-can-help-leverage-efficiency-on-your-shop-floor/
- Abdul Latif Jameel [November 12, 2018]. Unlocking Digital Success: Combining Industry 4.0 and Lean Management https://alj.com/en/perspective/unlocking-digital-success-combining-industry-4-0-lean-management/
- IBIN®: THE FIRST INTELLIGENT KANBAN BIN https://www.wuerth-industrie.com/web/en/wuerthindustrie/cteile_management/kanban/kanban_steuerung/ibin_intelligenterbehaelter/ibin.php
- Lean Manufacturing / By TQP [January 25, 2021]. Lean Manufacturing | Lean Principles | Lean 5S https://techqualitypedia.com/lean-manufacturing/
- WHAT IS INDUSTRY 4.0 AND IS INDIA PREPARED FOR THE CHANGE? https://www.proschoolonline.com/blog/what-is-industry-4-0-and-is-india-prepared-for-the-change
- Busra Guler [August 1, 2019]. Where is the Industry 4.0 in our life? https://aie-internship.com/where-is-the-industry-4-0-in-our-life-by-busra-guler/
- Christoph Roser [August 7, 2018]. Lean and Industry 4.0 https://techqualitypedia.com/lean-manufacturing/
- Banner. Automated Quality Control https://www.bannerengineering.com/be/en/solutions/quality-control/automated-quality-control.html

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