

Thesis Title: Industry 4.0 in Manufacturing & it's Integration with Lean and Six Sigma

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ABSTRACT

The term Industry 4.0 refers to 4th industrial revolution in the most recent phase of industrial advancement. It is a solution which integrates cyber physical systems & IoT. This compiles machines using self-optimization, self-configuration and even AI (artificial intelligence) to complete complex activities. So, in simple words, in I4.0 manufacturing ambient there will be smart production lines & intelligent devices which can interact with each other in real time and can take effective decisions.

Lean Manufacturing is a traditional method that the manufactures are using for several decades for creating a value-oriented production process by removing all non-value activities. But with increasing complexity of the operations, lean management is not well enough for fulfilling the challenges. Here comes the Industry 4.0 which by its sets of advance digital technologies can boost and improve the production while dealing with greater complexities. In this regard the combination between Lean method & Industry 4.0 approach (Lean Industry 4.0) can bring the manufacturing process the next excellence level. Recent studies show that successful implementation of lean industry 4.0 can improve conversion cost approximately 40%. In five to ten years. In this study the interplay of Lean Manufacturing & Industry 4.0 will be discussed.

On the other hand, lean six sigma which is a statistical approach to improve quality which deals with the variation in the manufacturing processes. This approach, which analyzes systematically manufacturing processes through DMAIC (Define, Measure, Analyze, Improve & Control) Phases and eventually improves product quality. The result, which is less than 3.4 defective parts per million, has made significant improvements and cost savings in many companies. Six sigma is a data driven methodology, which means data measurement is the foundation for decision. The success of six sigma depends on collection of big data and extraction of useful information from it. Industry 4.0 manufacturing solution will generate huge amount of data. This massive data sets collected by industry 4.0 technologies should be mined with powerful data analysis methods. Effective decisions can be then made by utilizing these analysis methods in each step of six sigma cycles. This study will show the application of six sigma to deal with big data of I4.0 to make faster, reliable and satisfied decisions.

Industry 4.0, Lean & Six sigma could be integrated & aligned. Together these paradigms can help manufacturer maximize efficiency & process improvement. The goal of this study is to analyze & discuss the implementation and usefulness of the traditional tools like Lean & Six sigma within I4.0 reality to make it more robust, quality oriented & confront the upcoming challenges of the future manufacturing excellence.