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Understanding Lean Six Sigma 4.0 through Golden Circle Model

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Abstract

Industry 4.0 renders a factory smart by using sophisticated information and communication systems, as well as forward-looking technologies. This paper analyzes the incompletely understood link between Industry 4.0 and lean manufacturing, and explores whether Industry 4.0 is capable of lean implementation. Industry 4.0 is a cost-intensive process that is met with resistance from a number of manufacturers.

Keywords: TQM, LEAN, SIX SIGMA, LEAN SIX SIGMA INDUSTRY 4.0

Type of Study: Review Paper

1. Introduction

Manufacturing in Germany is predominantly powered by small and medium-sized enterprises (SMEs), many of which are family-owned companies. Such medium-sized companies, some of which are world market leaders in their sectors, employ lean manufacturing along with technical expertise to succeed as effective global trade players (Venohr & Meyer, 2007). Nevertheless, numerous obstacles and roadblocks hamper the successful journey towards lean achievement. Many enterprises tried in vain, or with only partial success. It is therefore important to find a way to solve these problems and in a non-traditional and employee-friendly way to help the industries. And the answer comes with Industry 4.0 in its name. Industry 4.0 is a recent project of the German Government.

Industry 4.0 makes a factory smart through the application of advanced information systems and forward-looking technologies. Today, thanks to the application of the most innovative digital technologies offered by the new Industry 4.0 paradigm, a significant "evolution" of many Continuous Improvement methodologies is emerging in this Fourth Industrial Revolution

Industry 4.0 new techniques:

The five main stages of Lean Six Sigma incorporates and is paired with Industry 4.0 Innovations as a hypothesis of how progress can be accomplished: [1]

Defines process:

Defines the manufacturing question can we solve the right problem?

Measurement:

Process Measure the industrial problem can we trust the data?

Industry 4.0 Improves;

Data volume and efficiency sensors (IoT) Industrial machinery will communicate between them in real time inside the smart factory 4.0, which further improves the interactions advantage.

The other hand, due to the heavy integration of technology and the increase in autonomy Relation to human involvement, industrial processes under the dynamic factory 4.0 rely heavily on embedded technology.

Golden Circle Model:-

This article provides concrete explanations of the Golden Circle, created by Simon Sinek. After reading you'll understand the fundamentals of this powerful tool for strategic management and leadership. Why is it that some companies can sell more products even if their rivals are equally good? Why are some leaders more powerful than others?

Simon Sinek, an ex-advertising executive and author, researched the performance of the world's leading and successful leaders and found the key to success in thinking, acting and interacting these organizations and members.[3]

The idea or the model of thought developed by Simon Sinek is known as the Golden Circle. Simon Sinek says most companies have no idea why consumers want their products. However, successful companies require their customer approach to be guided by three questions which make up the Golden Circle

1. WHY or the core question.
2. HOW
3. WHAT

Simon Sinek finds most businesses come in from the outside, that's from the WHAT issue. You need to consider what that means to understand the Golden Circle. The Golden Circle WHAT ring reflects the goods or services that a company sells. The HOW is a description of what the business does. In this Golden Circle ring,[2] the company discusses why they manufacture their goods/ Are stronger or differentiate themselves from rivalry. The WHY is about what a company believes in, not about profit making? Inspired and successful companies also operate from the inside out rather than outside in.

Therefore, the research explicitly indicates that by adopting Industry 4.0, companies are able to become lean without the need to sustain deliberate and consistent' strive-for-lean' efforts. The design, service, and maintenance of a manufacturing industry are dramatically improving across Industry 4.0 technologies. With sophisticated communication and information systems in operation, and as per the conventional aspects of lean manufacturing, it's a well-accepted fact that when a factory becomes lean, the flow increases, and the non-value-added activities or' waste' decrease.[3] Reducing waste often means reducing prices. So any attempt to reduce this waste pays off in terms of operational cost reduction. Now this initiative comes from digitalization and resource incorporation Thus, while cost-intensive, the enforcement of Industry 4.0 is worth the investment for its unforeseen benefits, and research affirms that reluctant industries can make a positive contribution to this fourth industrial revolution.

2. Literature Survey

2.1 Why: we need LSS4.0

Quality 4.0 is an Industry 4.0 comparison. The First (real) Industrial Revolution represented three radical changes: manufacture of machinery, steam power and transition to city life for citizens who had previously been farmers [4]. During the Second Industrial Revolution the cost of consumer and industrial goods was significantly reduced by the assembly line and by mass manufacturing. Right now around us there is the Fourth Industrial Revolution. It extends the third revolution's digital impact and merges it with the physical and natural worlds. This was activated by the crucial improvements in technology described in the intro, including advances in data, analytics, networking, scalability and collaboration. As the Fourth Revolution takes root, all that we do will impact.

The convergence of both the Lean Manufacturing and Industry 4.0 worlds is an important field of research that needs to be explored thoroughly. With the introduction of computer-integrated manufacturing, there was a possibility [6] that future factories would run autonomously without human operators ' requirements. Though such a statement proved to be infeasible in a practical scenario, it gave rise to the idea of lean manufacturing, where robotics and automation technology are used to achieve lean output. The Toyota Production System of Taichii Ohno is based on two pillars: On time and autonomy (Ohno, 1988). Autonomisation refers to the automation to include inspection of manual processes; Equipment should stop automatically when a problem occurs, and should not allow defects to proceed through the line. A human intervention would only be needed when a defect is found. [5]Automation in production therefore has played an important role right from the beginning of lean manufacturing, and Industry 4.0 can be seen as progress in this area.

The ten dimensions of lean manufacturing from the four grouping factors according to Shah and Ward (2007) are explored in the following sections and how Industry 4.0 technologies and principles function as enablers to these dimensions are evaluated.

In summary, Lean Six Sigma and Industry 4.0 complement each other as:

(1) Industry 4.0 helps in gathering more data in real-time throughout the entire value chain with assistance from Lean Six Sigma software.

2) Lean Six Sigma empowers process managers / stakeholders.

3) The IoT has allowed various processes to feed a cognitive algorithm in real-time.

Industry 4.0 makes a factory smart by applying advanced information and communication systems and future-oriented technologies. [5]This paper explores the incompletely perceived relation between Industry 4.0 and lean manufacturing, and examines whether Industry 4.0 is capable of implementing lean. Industry 4.0 is a cost-intensive process and is hesitant to perform some goods.

2.2 How –LSS4.0

A Quality 4.0 approach is an excellent opportunity for the corporate strategy to realign quality. Many manufacturers have strategic objectives related to Big Data and Industry 4.0, often with use cases for improving the output. Only 16% of the current market sees a clear and compelling link between [8] quality and corporate strategy, making it an excellent opportunity to change both perceptions.

Defining the aim of this phase is to clearly pronounce the business question, target, potential resources, and scope of the project and timeline of the high level project. Usually, this detail is captured inside the project charter text [6]. Write down what you know, right now. Seek clarification of the reality, set goals and shape the project team. Defines the following: A Customer(s), SIPOC problem

Measure: The aim of this phase is to provide objective basis for progress with the current baselines. Its aim is to create baselines on process performance. At the project's conclusion, the performance metric baseline(s) from the Measure process will be compared with the performance metric to assess objectively whether substantial changes have been made.

Analyze: This step has the function of defining, validating and selecting the root cause for removal. A large number of potential root causes of the project problem[9] are identified through root cause analysis the top 3-4 potential root causes are selected for further validation using multi-voting or other consensus method.

Control: Improve this step has the task of defining, testing and implementing a solution to the problem; in whole or in part. That depends on the case. Identify innovative ways to remove the root causes and address process challenges and avoid them.

Phase	Descriptions	Sample activities
Define	Defines the aim of the six sigma project and its scope	Define why the project should be done
		Better contact systems
		Define the market requirements
Measure	Measure to consider the current situation	Select the output parameter
		Assess the performance specifications
		Establish the initial process capability
Analyze	Analyze and evaluate the actual causes for enhancing processes	Analyze the current process performance
		Monitor the potential Critical to Process (CTP)
		Analyze what resources will be needed for improvement
Improve	Improve the cycle by removing unnecessary triggers, eliminating the problem or reducing the impact of the problem	Modify idea
		Identify optimal operating conditions
		Decentralized decision making
Control	Control the modify process performance	Determine the process capability for CTPs
		Implement the process controls
		Document what you have learned
Design	Build a new process alongside consumer needs	Develop design to meet customer needs
		Design analyze model
Verify	Confirm the module of designed model	Create a plan for full implementation
		Validate to model

2.3 What LSS4.0

LNS Research has shown that the pioneers in innovation have embraced Quality 4.0 and achieve differentiated results.[10] Within the analysis such use cases are discussed. However, many quality teams are unfamiliar with the technology and do not engage in technology-related corporate strategies.

While the research helps to build a Quality 4.0 strategy, it also acts as a reference guide to technology, capturing the technology's fundamentals, as well as how the technologies were applied to quality. Review the checklist below and evaluate your state of the art:

Scope of LSS 4.0:-

Optimization: The main benefit of Industry 4.0 is the optimization of production. A Smart Factory with hundreds or even thousands of Smart Devices capable of self-optimizing production will result in nearly zero downtime in production.[8] This is particularly important for industries that use costly high-end fabrication equipment such as the semi-conductor industry.

Customization: developing a customer-oriented competitive market would help meet the needs of the population quickly and smoothly. This would also ruin the distance between the manufacturer and the consumer. Communication is to take place directly between the two. Producers do not have to connect internally or externally (to customers). This addresses production and distribution processes.

Pushing Research: The adoption of Industry 4.0 technologies will push research into various fields such as IT security and, in particular, impact education.[14] A new industry demands a new set of skills. Education and training will therefore take on a new form that will provide such an industry with the skilled labour needed.

3. **Conclusions & Discussions**

   -Challenges before LSS4.0 [11, 15, 17]

   Security: The IT protection danger is probably the most daunting dimension to introducing Industry 4.0 techniques. This online incorporation gives room to breaches of security and data leaks. Cyber theft must always be taken into account.

   Capital: Such transformation will require considerable investment in a new technology that doesn't sound cheap. The decision to make such a transition will need to be at the level of CEO. Even then, the risks have to be measured and taken seriously.

   Job: While speculation on employment conditions remains early with the global implementation of Industry 4.0, it is fair to assume that employees will need to learn specific or a whole new set of skills.

   Privacy: It affects not just the consumer but also the suppliers. Producers in such an integrated industry need to collect and analyze data. This could appear to the customer as a challenge to his privacy. This is not just for customers.

Conclusion of LSS4.0 Papers

Worldwide, companies are striving to achieve lean manufacturing, but not every company is effective in fully adopting and understanding the benefits. While initially conceptualized for manufacturing industries,[20] lean theory is even being adopted by the service and maintenance sectors. This paper set out a detailed overview of lean implementation obstacles and challenges Perspective and evaluation of how lean manufacturing can be achieved using Industry 4.0 technologies. The shortcomings in traditional approaches can be solved by means of integrated information and communication systems to increase efficiency and reduce wastes. It implies that industries now have the combined benefits of real-time integration of the entire factory. Along with minimum waste generation guarantees.[23] The research alludes to SMEs in Germany being able to commit positively to

Industry 4.0 with the prospect of leaning their shop-floors in development. However there is a need for further work to highlight the importance of continuous improvement over lean manufacturing measurements. Improved processing power and decreased performance in sizes. Improvements or modifications of the evolution of these new technologies must be examined about their effect on lean growth. Furthermore, some Industry 4.0 work was primarily theory-oriented, not readily adaptable to an application. Application-oriented research on the requirements for implementing lean manufacturing needs to be established.

The word 4.0 is used not only from the technical point of view but also from the economic, sociological and political point of view to describe the new industrial revolution. Thanks to a range of enabling technologies, [26]offered today by the new Industry 4.0 model, there is a major "evolution" of many Continuous Improvement methodologies in this Fourth Industrial Revolution; Customer engagement becomes even more relevant given the IoT supported continuous feedback (social networks, etc.). Customer reviews are gathered and have a profound impact on manufacturing real-time modification, product design tailoring and post-sales feedback.

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