# Study Guide: Introduction to Lean Six Sigma


This course will provide a foundational understanding of Lean and Six Sigma. You will gain a perspective of their histories and how they have evolved into the powerful disciplines that companies across industries use today.

## The History of Lean

Lean Thinking can be traced back to the 16th Century.

The first historical example of Flow Production comes from the manufacturing of boats by the Venetian army.

In 1908, Henry Ford introduced Flow Production in the manufacturing of the Model T. This was enabled by the introduction of interchangeable parts, process standardization, and the moving assembly line

In 1926, the term "mass production" was introduced while adding product variety to the mix.

During the 1930s W. Edward Deming introduced the concept of Continuous Improvement with the PDCA cycle. After World War II, Deming introduced the PDCA Cycle, the quality of statistics, and other management principles to Japanese

companies. This significantly contributed to Japan's reputation for innovative, high-quality products.


Throughout the 1960's Toyota developed what is now known as the Toyota Production System. Taiichi Ohno lead the effort of turning TPS into an integrated framework of problem-solving, leadership, production operations, supplier collaborations, product and process development, and customer support. Ohno visited the US in 1956, where he observed the customer-focused approach of the supermarkets. It was a format driven by customer demand and not manufacturing.

In 1990, the term "Lean" was coined by Jim Womack in his book, The Machine that Changed the World. The book demonstrated the superiority of the Japanese system compared to the US and European systems.

Lean has expanded beyond manufacturing to healthcare, government, and service organizations.

## The History of Six Sigma

Six Sigma was developed by Mikel Harry in the late 1980s at Motorola.

The principles of Six Sigma stem from the quality management methods introduced by W. Edward Deming.

Motorola used used Six Sigma methods to generate 200 fold improvement and saved as reported $2.2B in the process.

Another early adopter was Allied Signal in the early 1990s, making Six Sigma more than just a system for measuring production quality.

Jack Welch, CEO of General Electric, made Six Sigma a central component of his management strategy in 1995 to drive growth and cost reduction. In 1999, they attributed benefits of $2B net income to Six Sigma.


Six Sigma combines an array of tools and techniques, put together in a systematic way to get results.

## What is Lean Six Sigma?

Lean is an approach to projects and process management with the intent to deliver customer value and eliminate waste.

Muda is a Japanese term used to describe process waste. It most accurately describes wasting time.

Muda, or waste, can be broken down into 8 categories and can be remembered using the acronym: DOWNTIME

- Defects
- Over production
- Waiting

- Non-utilized talent and ideas
- Transportation
- Inventory
- Motion
- Excessive processing


Lean has been successfully applied across industries.

Six Sigma is a data driven process designed to develop processes to produce as few defects as possible.

DMAIC is an acronym used to describe the Six Sigma project management process.

- Define
- Measure
- Analyze
- Improve
- Control

Lean Six Sigma combines the benefits of both Lean and Six Sigma to simultaneously reduce waste and defects. These disciplines yield the best results when applied together.

Lean Six Sigma is a Continuous Improvement process that is facilitated by the PDCA process, or Plan, Do, Check, and Act.

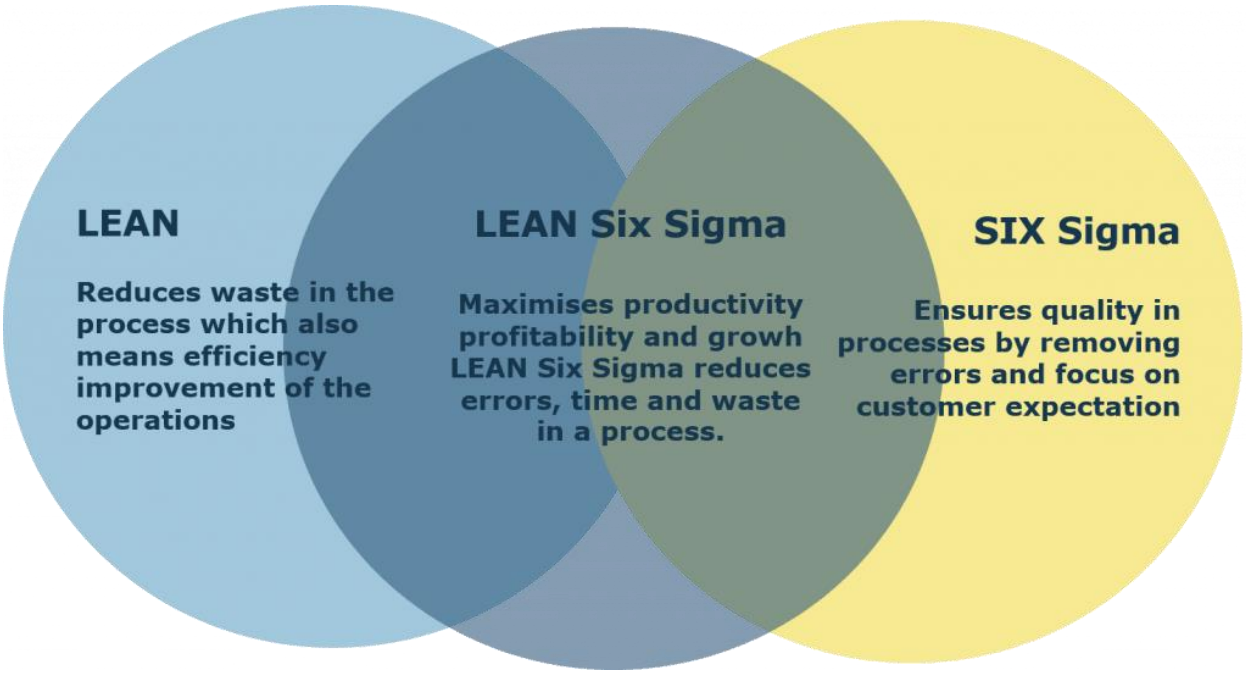
Lean Six Sigma is used to increase a company's competitive advantage. It is built on effective management, employee support, and its continuous effort to improve customer satisfaction.

## Why Combine Lean and Six Sigma?

Lean and Six Sigma are two of the most widely recognized philosophies for business improvement in the industry.

Lean and Six Sigma view waste in completely different ways

- Lean recognizes waste as any activity that does not produce value
- Six Sigma recognizes waste as process variation




Lean and Six Sigma work best when used together. By applying Lean methods, processes can be stabilized, and the flow of work is established and followed by the workers. Constraints are identified and the work is balanced. Once the process is stable, Six Sigma tools can be used to drive the elimination of defects by establishing operating parameters and using control tools.

By using Lean methods to establish stability and minimize time wasted, then using Six Sigma to eliminate defects, organizations gain more benefits than using one of the methods alone. Benefits include improved quality, reduced cost, and faster delivery times.

## Advantages of Lean Six Sigma

The goal of Lean Six Sigma is to streamline business processes to increase profits.

**Removing waste from the process:**

Lean helps to remove the 8 wastes from the process such as Over production and Defects. Toyota uses Just-in-time manufacturing to minimize storage costs.

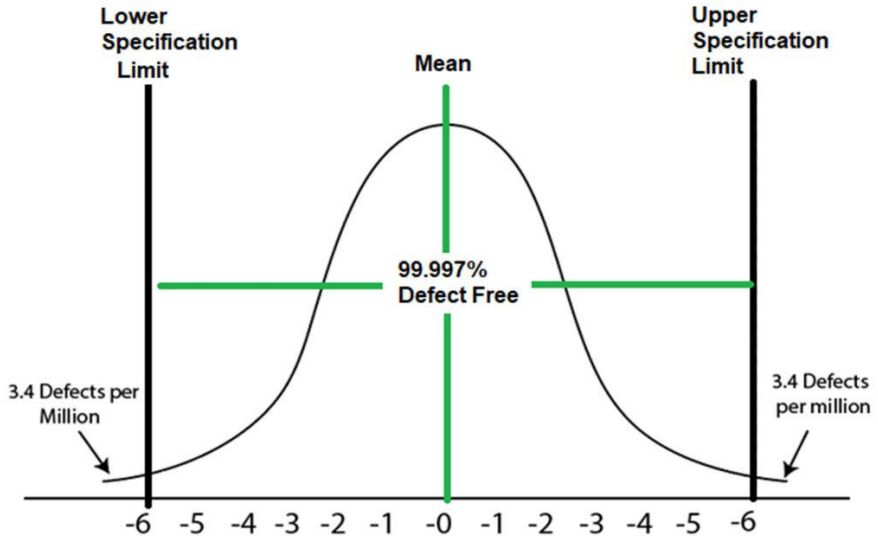
Decreasing waste from a process results in increased savings and increased company profits.

**Increase the Product Quality:**

Six Sigma can help identify where quality is being lost in a process.

6 Sigma uses the Define, Measure, and Analyze steps in the DMAIC process to identify opportunities to improve quality. Then the Analyze and Control steps are used to rectify issues.

The goal of 6 Sigma is for 99.999% of products to be defect-free. This equates to 3.4 parts out of every 1 million produced. It is a data-driven process designed to drive defects and process variation to within 6 standard deviations between the mean and the near specification limit.




Six Sigma Curve

**Increase Customer Loyalty:**

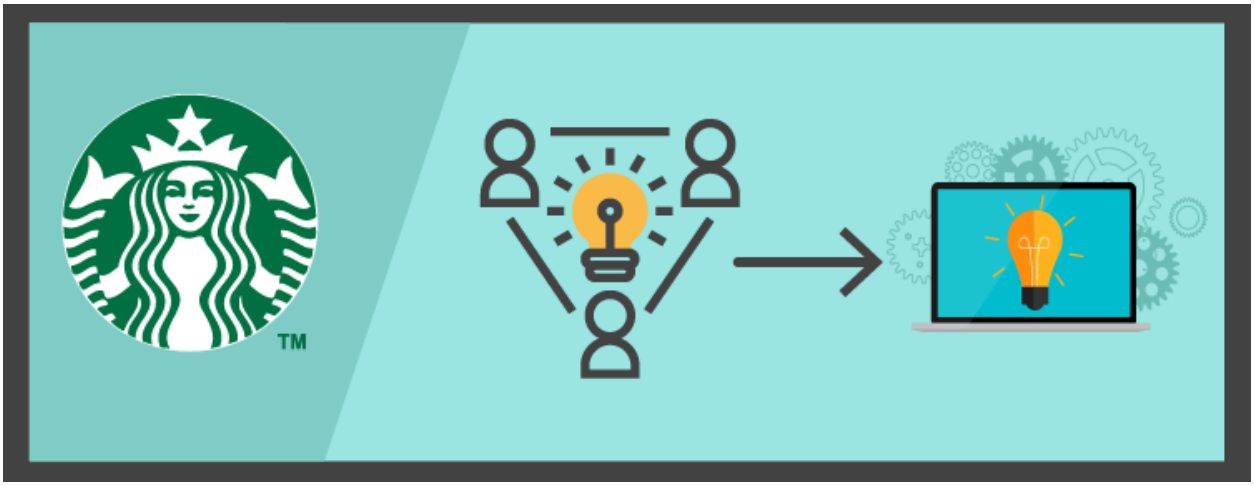
One of the main reasons customers leave is because of dissatisfaction with the value of the product or service delivered. Lean helps to deliver great products at a good price and Six Sigma helps identify opportunities to improve the product or service.

## Examples of Lean Six Sigma at Work

Some say that Lean must take place first to get the most out of Six Sigma. The key is to pick and choose what's best for the company from both toolkits.

**Starbucks:**

Starbucks speeds up their ordering process by utilizing their mobile app. Customers can pre-order their drink using the mobile app so it's ready to pick up at the store when they arrive.



Senior management should be involved in project selection knowing which projects could benefit most from the application of Lean Six Sigma.

Employees should also fully understand each toolkit so they can apply the right tool for a given problem.

**Amazon:**

Senior management is required to work in the customer service department for at least one day per year. This promotes a collaborative environment where management understands the day-to-day challenges of frontline workers.


Customer services reps use an "andon cord" to pull any product from the website in order to address customer issues. An andon is a signal that indicates an issue with the process. An andon cord allows any employee to "stop the process" to address quality issues.

Amazon uses its internal process improvements to reduce prices, which leads to happier customers.