

— BUSINESS CASE

Efficiency, Opportunity Cost, and Lean Production at Boeing

50%

Reduction in time to build one airplane (1999–2005)

60%

Reduction in parts kept in storage (inventory)

In January 2020, Boeing launched a new airplane called the 777X. This airplane was built using a method called *lean production*. Lean production is a way of making goods that reduces waste and improves efficiency. Boeing had been developing this method for over 20 years.

Lean production was created by **Toyota Motors of Japan**. The idea is simple: parts arrive at the factory only when they are needed. Workers do not need to walk across the factory floor to search for tools or materials — everything is organized and in the right place at the right time. This reduces wasted time, lowers costs, and uses less factory floor space.

Boeing first used lean production in 1999 to build the **737**, its most popular airplane. By 2005, after years of improvement, Boeing cut the time needed to build a plane by 50% and reduced the parts it stored by 60%. To go even further, Boeing hired top engineers from Toyota to help apply lean methods to new technologies, including robotics.

HOW LEAN PRODUCTION SPREAD

Toyota's methods became so successful that they changed manufacturing around the world. In the 1980s, large American car companies controlled the U.S. market. However, Toyotas became popular because of their high quality and lower prices. Eventually, Toyota built factories inside the United States, bringing lean production techniques with them. Other industries quickly adopted these methods.

Today, lean production is used in factories, hospitals, restaurants, and many other industries. The core goal is always the same: use scarce resources — time, space, materials, and labor — as efficiently as possible.

QUESTIONS FOR THOUGHT

1. When a worker walks across a factory floor to search for tools or parts, they are not building the airplane. What is the **opportunity cost** of this lost time? Explain your answer.
2. Lean production reduces wasted materials and wasted worker time. Using what you have learned about **efficiency in allocation**, explain how lean production can make a company — and an economy — more efficient.
3. Boeing faces **scarcity** of factory floor space, parts, and worker time. Choose *one* of these scarce resources and explain how lean production helps Boeing use it more carefully.
4. Between 1999 and 2005, Boeing made very large improvements using lean production. Do you think Boeing can keep making improvements of the same size every year? Use the idea of **diminishing returns** to support your answer.

KEY VOCABULARY

Lean production

A method of making goods that reduces waste and organizes workers and materials more efficiently.

Efficiency in allocation

Using resources (land, labor, capital) in a way that produces the most value with the least waste.

Inventory

The supply of parts or goods that a company stores and has ready to use.

Opportunity cost

The value of the next-best choice you give up when you make a decision.

Scarcity

Resources are limited, but people's needs and wants are unlimited.

Diminishing returns

When adding more of one input produces smaller and smaller gains in output over time.

