Six Sigma and its Applications

Understanding Methodologies and Industry Impact

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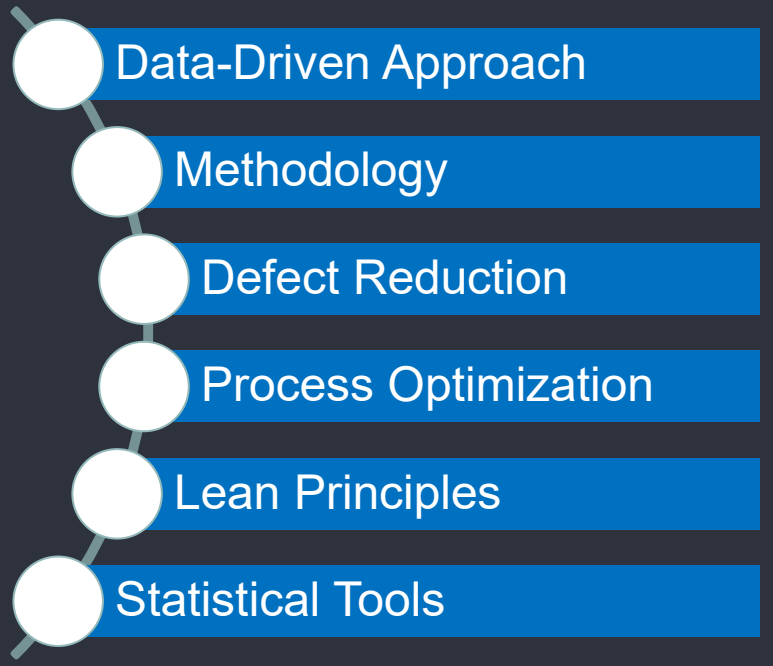
What is Six Sigma

Six Sigma is a methodology used for quality improvement and process optimization, aiming to reduce defects and variation in processes to achieve near-perfection. It's a structured approach that uses data and statistical tools to identify and eliminate the causes of defects and minimize variability.

The goal is to achieve a defect rate of 3.4 defects per million opportunities, which is the statistical foundation of Six Sigma.



Key Facts about Six Sigma

Origins and Early Development

•1920s: Walter A. Shewhart, known as the "father of statistical quality control," created the control chart, establishing the basis for modern quality improvement.

•Post-WWII: W. Edwards Deming and Joseph Juran built on Shewhart’s concepts, promoting statistical quality control in Japan, which contributed to its manufacturing revival.

Formalisation at Motorola

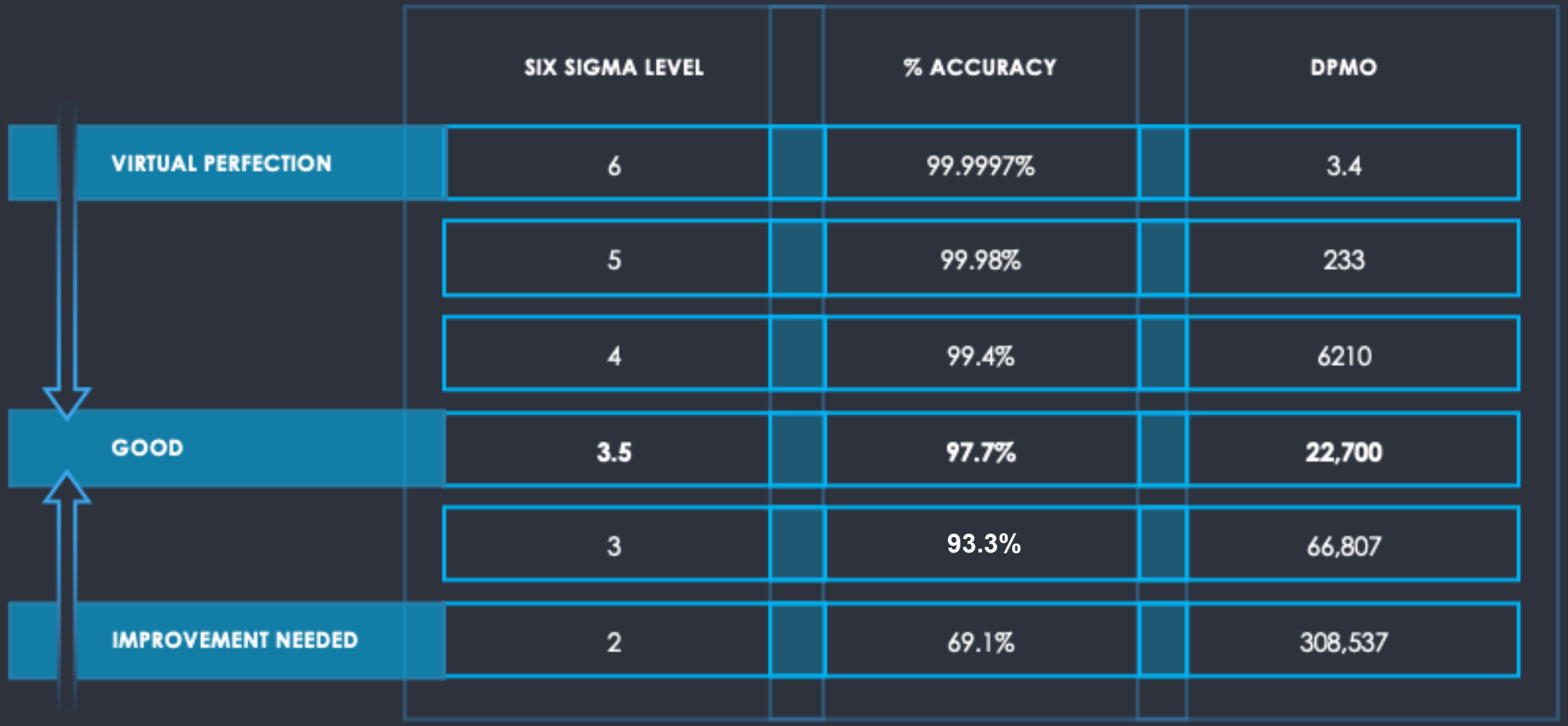
•1986: Bill Smith introduced Six Sigma at Motorola to tackle manufacturing quality issues, aiming to limit defects to under 3.4 per million opportunities. Motorola trademarked the term in the early 1990s, reporting over $17 billion in savings.

Expansion and Popularisation

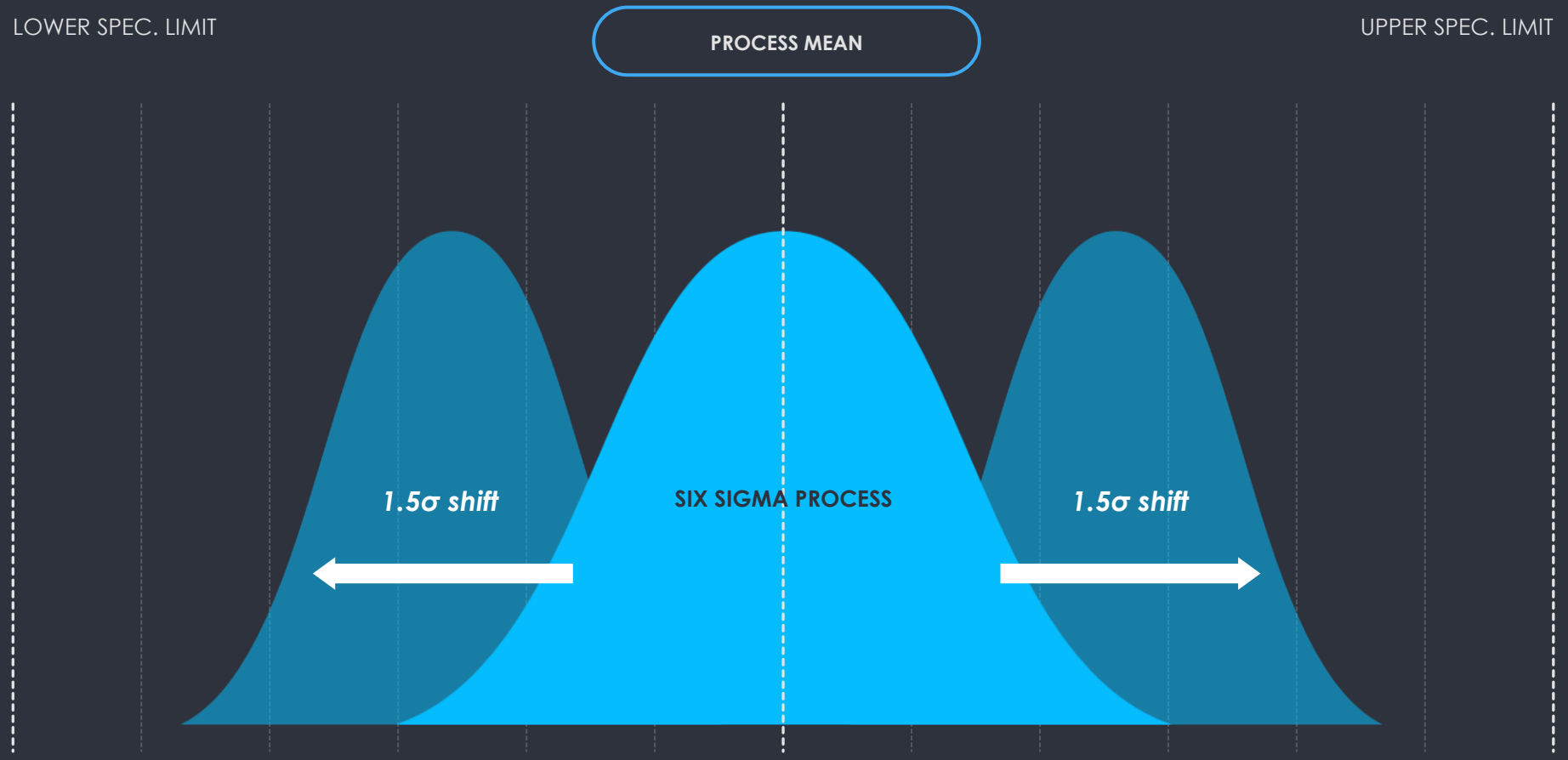
•1995: General Electric, under CEO Jack Welch, implemented Six Sigma as a core business strategy, enhancing its visibility and credibility.

•Other early adopters like Honeywell and IBM expanded the methodology into services, finance, and healthcare.

Levels of Six Sigma

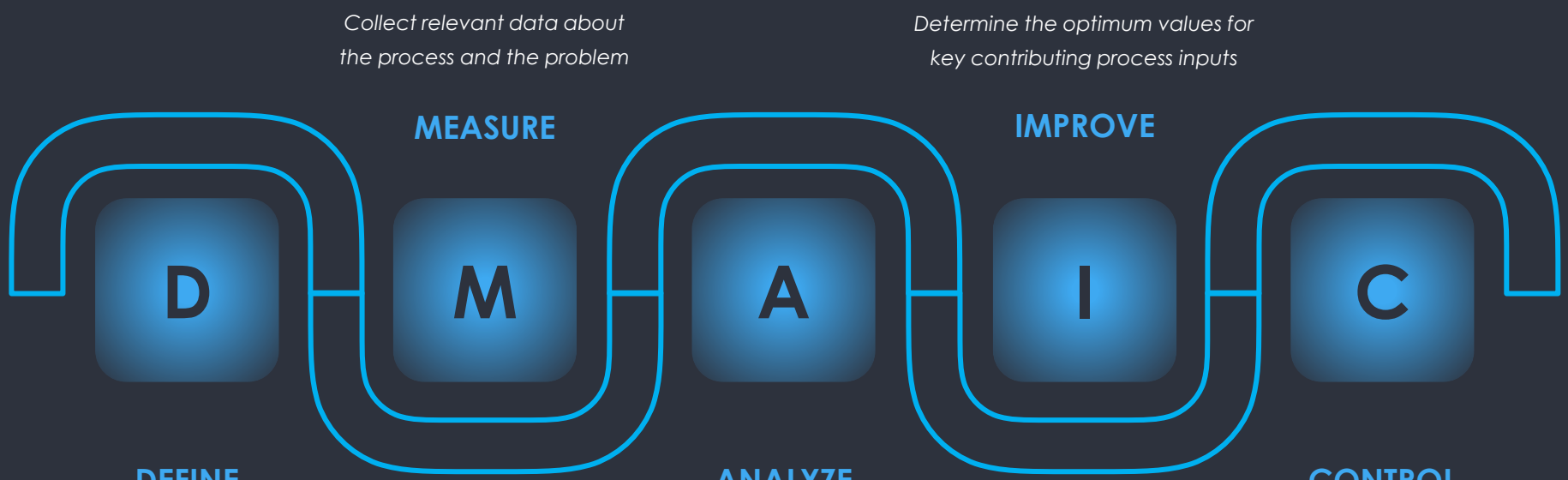


Six Sigma: Statistically Visualized



6σ 5σ 4σ 3σ 2σ 1σ 0 1σ 2σ 3σ 4σ 5σ 6σ

Six Sigma Methodology - DMAIC



The 5 Phases of DMADV

DEFINE

- Project team or determine project charter
- Determine objective & scope of project
- Interface to other processes/define sector & provide resource

MEASURE

- Identify & segment customers
- Identify & analyze customer req.
- Compare existing product with internal/external benchmarking
- QFD for CTQ's

ANALYZE

- Implement customer req. into design concept
- Rate design concept (QFD, TRIZ…)
- Evaluation under application of FMEA (target costing…)

DESIGN

- Create detailed design
- Develop robust design with optimal target value/cost benefit ratio
- Apply DOE

VERIFY

- Review performance of the new product of the process (piloting)
- Implementation of work preparation & production
- Continuously monitor results of new process

Six Sigma Roadmap

SIX SIGMA IMPROVEMENT

- Define
- Measure
- Analyze
- Improve
- Control

SIX SIGMA DESIGN (DFSS)

- Define
- Measure
- Analyze
- Design
- Verify

Design for Six Sigma (DFSS)

Lean vs Six Sigma

Similarities Between Lean and Six Sigma

Feature	Similarities
Process Improvement Focus	Both aim to improve business processes and enhance performance.
Customer-Centric	Each methodology prioritises delivering value to the customer.
Data-Driven	They rely on data and metrics to identify issues and measure success.
Continuous Improvement	Both promote a culture of ongoing refinement and learning.
Cross-Functional Collaboration	Implementation typically involves teams across departments.

Lean vs Six Sigma

Key Differences

Feature	Lean	Six Sigma
Primary Goal	Eliminate waste and maximise value	Reduce variation and defects
Origin	Toyota Production System (1950s–1980s)	Motorola (1986)
Focus Area	Process flow and efficiency	Process accuracy and consistency
Tools & Techniques	5S, Kaizen, Value Stream Mapping, Kanban	DMAIC, DMADV, Statistical Process Control (SPC)
Approach	Visual and intuitive	Analytical and statistical
Speed of Implementation	Often quicker due to simplicity	Can be slower due to data collection and analysis
Training Levels	Less formalised	Structured belt system (Green, Black, Master Black)