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Six Sigma and Lean Overview

Six Sigma

Six Sigma is a structured process and data driven approach to continually improve process quality, productivity, and bottom line profitability. The Six Sigma tools are focused on reducing variation and delivering near defect-free products and services. Six Sigma is used to:

- Reduce costs and improve productivity in manufacturing processes (Six Sigma).
- Eliminate errors and improve customer satisfaction in business processes (Transactional Six Sigma).
- Develop nearly defect-free new products that delight customers (Design for Six Sigma).

The Six Sigma process utilizes the DMAIC approach:

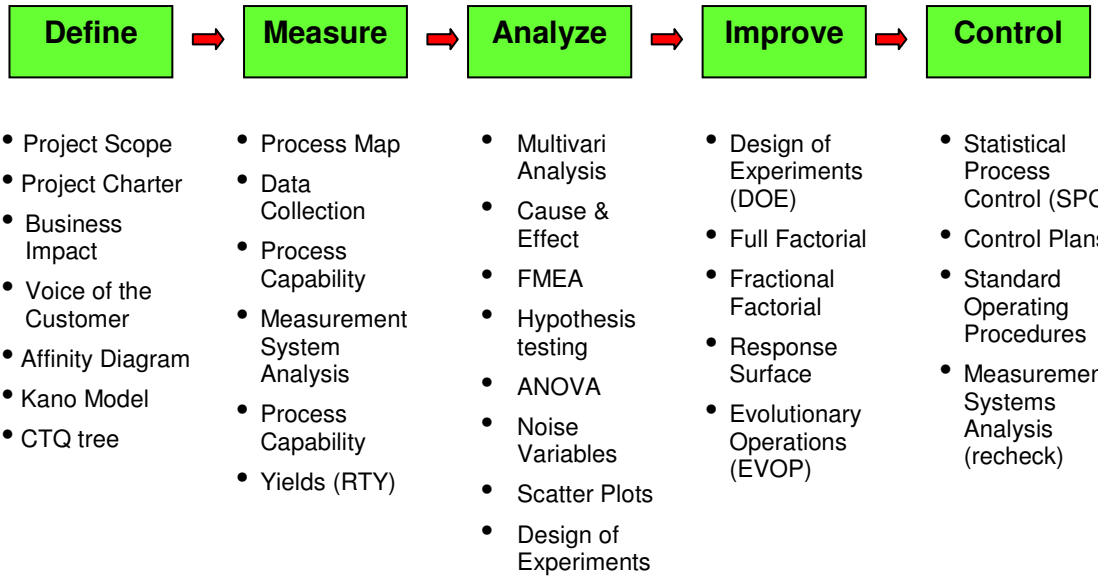
Define: Select the appropriate customer-focused defect or problem. Document the business impact and the project deliverables in the project charter.

Measure: Measure and document the current process (process mapping), identify key response variables (cause and effect matrix, failure mode and effects analysis), and evaluate the measurement systems and tools (gage R&R). Use a statistical approach to data analysis and measurements.

Analyze: Identify root causes of defects or sources of variation. Extensive use of statistical analysis is employed (confidence intervals, hypothesis testing, analysis of variance, etc.)

Improve: Eliminate the root cause of defects or reduce sources of variation using Design of Experiments (DOE), response surface analysis, and evolutionary operations (EVOP)

Control: After improvements are implemented, institute statistical process controls (SPC) and procedures to sustain the improvements.



Six Sigma was developed at Motorola and has been successfully deployed AlliedSignal (now Honeywell), and General Electric with reports of total savings in the billions of dollars. The key to the success is top management buy-in and involvement in driving for results. Deployment of Six Sigma at all levels of the company requires strong leadership and a commitment to continuous improvement. The tools and techniques were originally developed for complex manufacturing process optimization, but can be modified for use on all types of business process improvement projects.

Projects are typically led by Black Belts who are highly trained in the DMAIC process. The typical black belt training involves a minimum of 160 hours of classroom instruction. Master Black Belts are highly experienced practitioners of the Six Sigma approach and serve as coaches and mentors for Black Belts. Green belts have approximately 80 hours of training with significantly less emphasis on the statistical tools.

Reasons for Six Sigma success include:

- Achieves bottom line results
- A disciplined approach is used (DMAIC)
- Short project completion times (3-6- months per project)
- Clearly defined measures of success
- Customers and processes are the focus
- A sound statistical approach is used

In summary, the Six Sigma toolkit provides a disciplined and structured roadmap to eliminate defects and delight customers, leading to a measurable bottom line impact.

Lean Manufacturing

Lean manufacturing is a systematic approach to identifying and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer. Value-added activities transform or shape raw material or information to meet customer requirements. Non-valued-adding activities take time, resources, or space but do not add market form or function (value) to the product. Typically about 95% of all manufacturing lead time consists of non-value-added activities that should be eliminated, reduced, or simplified.

Tools used in Lean Manufacturing:

- Value Stream Mapping
- 5S system (Sort, Set in Order, Shine, Standardize, Sustain)
- Standardized work
- Visual Controls
- Point of Use Storage
- Batch reduction
- Quick Changeover
- Pull/Kanban
- Cellular/Flow

Lean Production is a way of manufacturing that, when compared to mass production, takes "half the human effort in the factory, half the manufacturing space, half the investment in tools, half engineering hours to develop a new product in half the time." From, "The Machine that Changed the World" (Womack, Jones and Roos, 1990). The book also says that Lean Production means less than half the inventory on site, fewer defects and the ability to produce a greater variety of products.

Lean Manufacturing is based on the Toyota Production System, a manufacturing system that Toyota has been using and improving for over 50 years. Representatives from companies around the world have traveled to Toyota's facilities in Japan and in the U.S. to learn about the Toyota Production System.

Benefits of implementation:

- Higher productivity
- Less equipment downtime
- True just-in-time capability
- Shorter process time
- Lower production costs
- Improved labor utilization
- Decreased inventories and work-in-process