Six Sigma Yellow Belt – Part I

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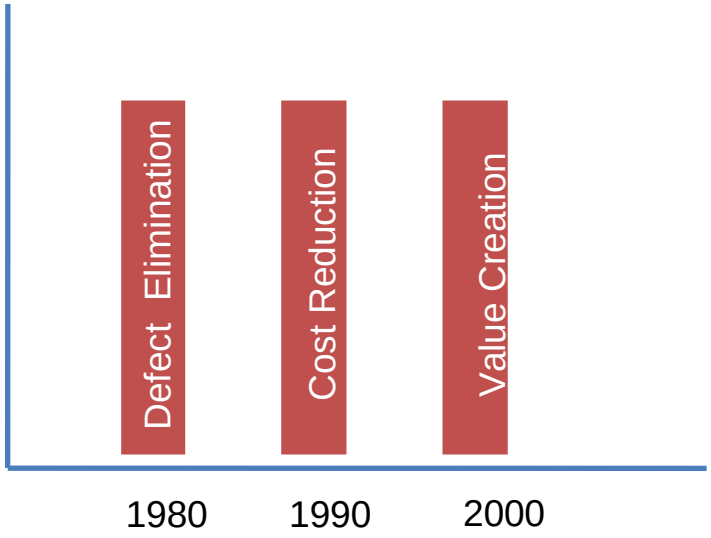
Evolution of Six Sigma

- The concept of Six Sigma evolved progressively over a period of two decades in step with the concerns of the organizations worldwide for quality, value-creation and customer delight. The phases of this evolution can be identified as being concurrent with emphasis on some of the critical business parameters. The timelines can be approximately summarized as follows:



What is Six Sigma?

- Six Sigma is a data driven, customer focused, and result oriented methodology which uses statistical tools and techniques to systematically eliminate the defects and inefficiencies to improve processes.
- Six Sigma methodology has the following characteristics:
  - Customer centric
  - Process focused
  - Data driven/ factual
  - Breakthrough performance gains
  - Structured improvement deployment
  - Validation through key business results

Goals of Six Sigma

- Reduction in variation
- Elimination of defects
- Improvement in yield
- Enhancement in customer satisfaction
- Strengthening of the bottom line

- Example: GE's Medical System division (GEMS) used Six Sigma design techniques to create a breakthrough in medical scanning technology. Patients can now get a full body scan in half a minute, versus three minutes or more with previous technology. Hospitals can increase their usage of the equipment and achieve a lower cost per scan, as well.

Six Sigma Approach

- Six Sigma approach is to find out the root causes of the problem, symbolically represented by Y = F(X).
- Here, Y represents the problem occurring due to cause (s) X.

Why do Organizations Adopt Six Sigma?

- Organizations embrace the Six Sigma way as this methodology systematically and measurably enhances the value of the organizations by making them competitive, quality-conscious, customer-centric, and forward-looking. Some of the benefits that the organizations derive from the Six Sigma initiatives are:
  - Waste prevention
  - Defect reduction
  - Cycle time reduction
  - Cost savings
  - Market share improvement

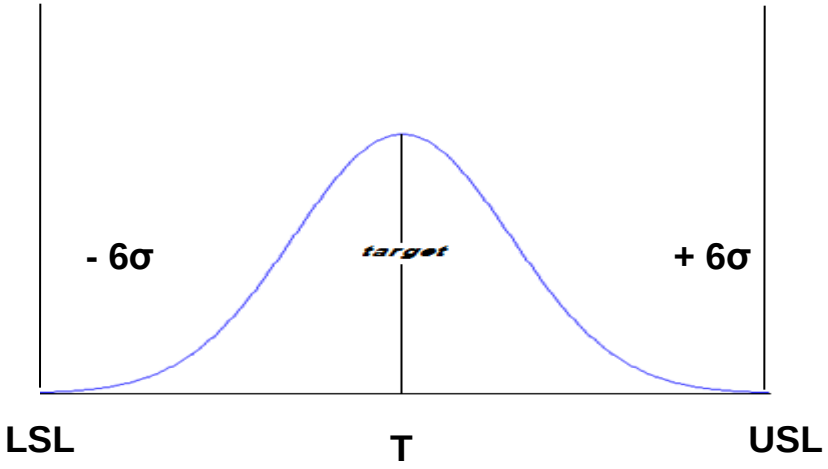
Six Sigma – Mathematical Interpretation

- Sigma, represented by the Greek alphabet ‘σ’, stands for standard deviation from the ‘mean’. ‘Six Sigma’ represents six standard deviations from the mean*.

• USL - Upper specification limit for a performance standard. Any deviation above this is a defect.

• LSL – Lower specification limit for a performance standard. Any deviation below this is a defect.

• Target – Ideally, this will be the middle point between USL and LSL.



Mean: It is the simple average of data.

Standard deviation: It is a measure of variability of data.

* Details will be provided in our Six Sigma Black Belt and Green Belt course.

Six Sigma – Mathematical Interpretation

- Process standard deviation (σ) should be so minimal that the process performance should be able to scale up to 12σ (6 Sigma each on either side of the origin on the X-axis) within the customer specification limits*.

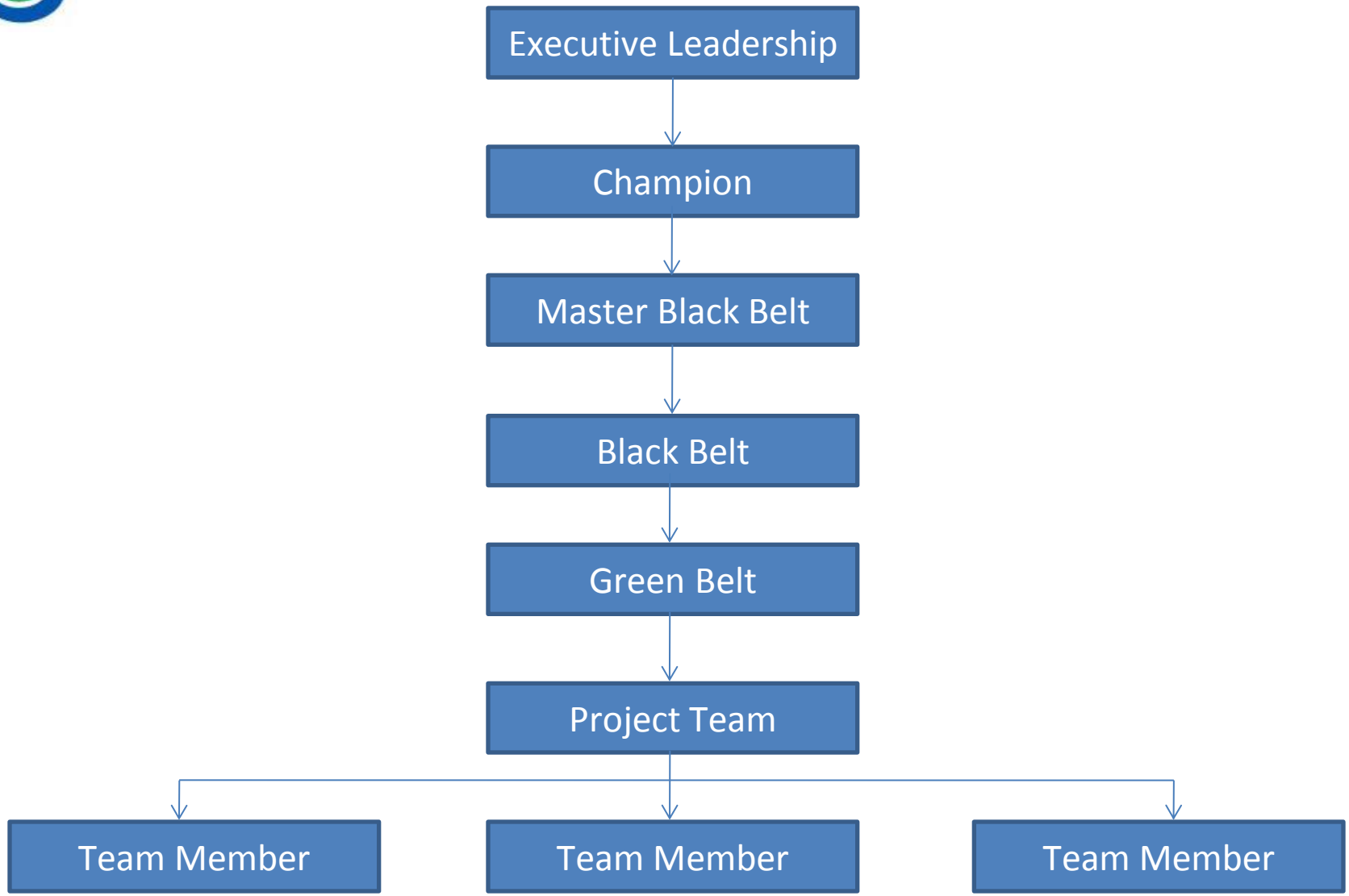
* Details will be provided in our Six Sigma Black Belt and Green Belt course.

Six Sigma – Mathematical Interpretation

Sigma Level	Defect %	Resultant Situation for different industries
3	6.6807%	7 hrs of no power supply/month 15 minutes of unsafe drinking water/month
4	0.6210%	500 in-correct surgical operations/week 20,000 in-correct medical prescriptions/year
5	0.0233%	1 wrong landing of airplane/month 200 of mails lost/day
6	0.00034%	1 minute of unsafe drinking water supply every seven month 1 hour of no power supply once in 34 years 1.7 in-correct surgical operations/week 68 in-correct medical prescriptions/year 10 mails lost/month

Please note: As the sigma level increases, the defect percentage decreases, which improves the efficiency of the process.

Roles in Six Sigma Organization



Roles in Six Sigma Organization

- **Executive Leadership** - Executive Leadership includes project sponsors and process owners. They create the Six Sigma vision for an organization. They are responsible for ensuring that everyone in the organization understands the vision and all work with unity of purpose to realize it.
- **Champions** - Champions are selected by Executive Leadership or Senior Champions. They organize and direct the initiation, deployment, and implementation of Six Sigma throughout the organization. They ensure that Six Sigma is properly implemented in all the business activities of the organization. Champions can be either Deployment Champions or Project Champions.

Roles in Six Sigma

- **Master Black Belts** - Master Black Belts are in-house experts selected by Champions. They manage project selection and human resource training with the help of Champions. They train Black Belts and Green Belts in Six Sigma implementation.

- **Black Belts** - Black Belts are those who apply the tools and techniques and knowledge of Six Sigma principles to a given project of an organization. They are responsible for accomplishing the tasks entrusted to them by Champions and Executive leadership. They dedicate all of their work hours on Six Sigma implementation.

Roles in Six Sigma

- **Green Belts** - The Green Belts are those employees of an organization who implement Six Sigma while discharging their other assigned duties. Green Belts have fewer Six Sigma responsibilities compared to Black Belts and Master Black Belts. They dedicate only a part of their work hours on Six Sigma implementation.

- **Project Team** - They are the employees who work on the Six Sigma project. It includes the Project Manager as well. Project team members need not be a Green Belt or Black Belt.

Key Stakeholders

- Customers – they are very important stakeholder whose requirements have to be considered.
- Employees – they are the people involved in the six sigma initiative in the organization.
- Suppliers - they are people who provide inputs to the process.
- End users – they are people who actually use the product or service. End users can also be customers.

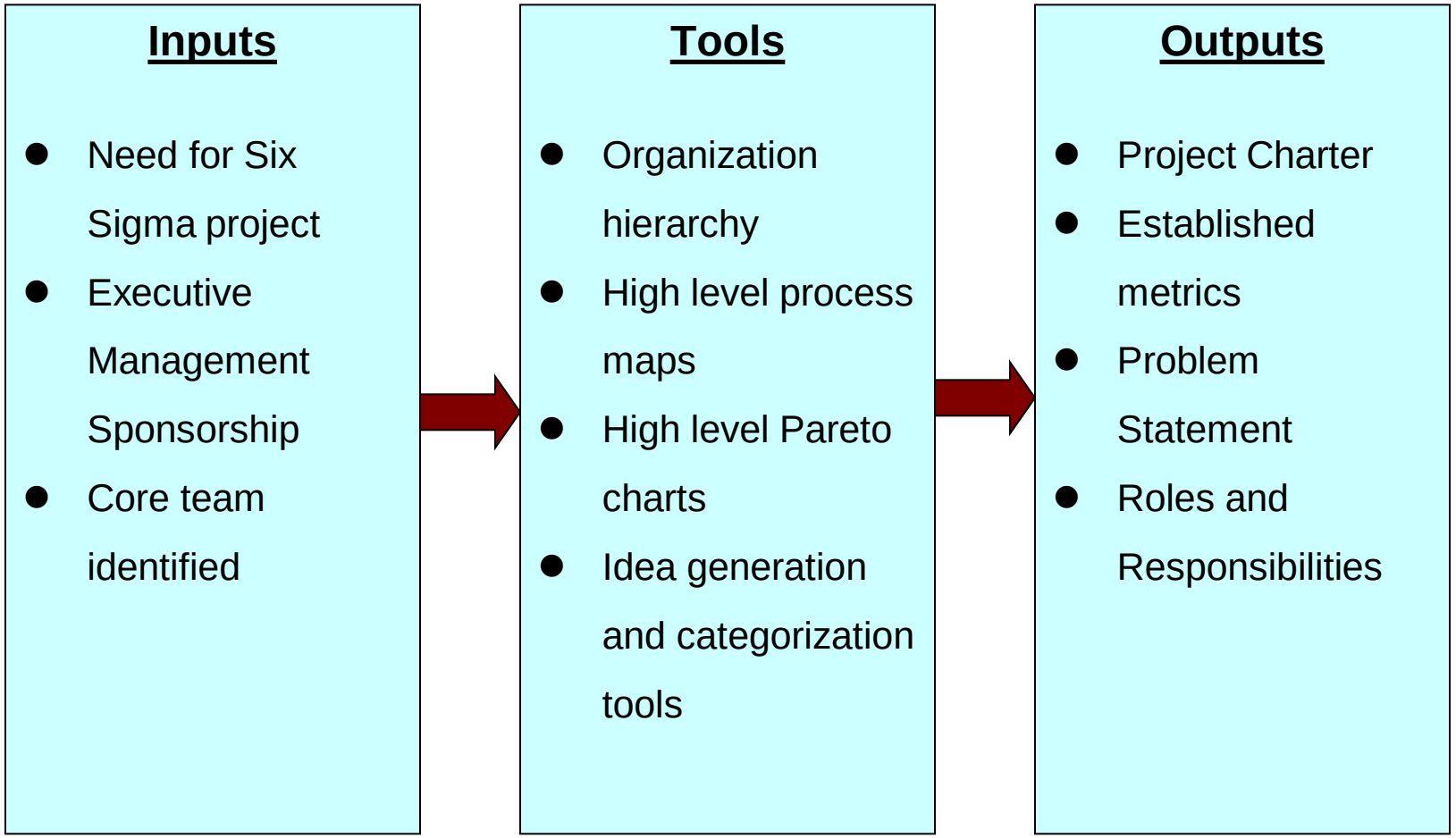
DMAIC Overview

- DMAIC is a data-driven Six Sigma methodology for improving existing products and processes.
- The DMAIC process should be used when an existing product or process requires improvement to meet or exceed the customer's requirements. This initiative should be consistent with the business goals of the organization.
- Companies using DMAIC Methodology: GE, Motorola, etc.
    - GE – Reduces invoice defects and disputes by 98%, speeds up payment, and creates better productivity.

DMAIC Overview

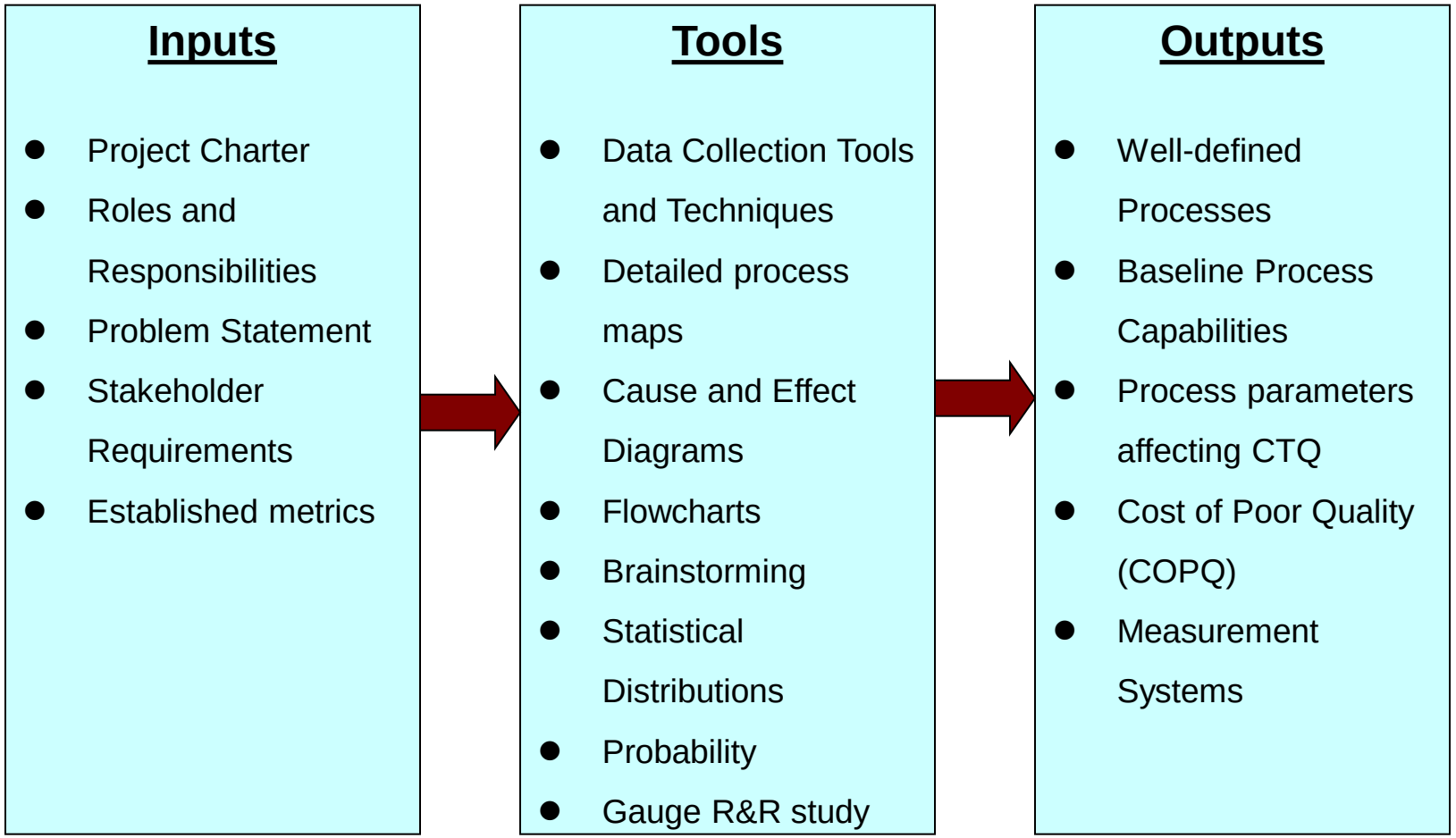
- D – DEFINE the problem
- M – MEASURE the outcome (Y) to determine the current process performance (baseline) and validate the measurement system
- A – ANALYZE, identify X's (root causes of the defects, variation sources)
- I – IMPROVE the process by eliminating the defects
- C – Control X's for sustained performance

Define*



***The Inputs, Tools and Outputs are covered in more detail in our Six Sigma Green Belt and Black Belt course.**

Measure*



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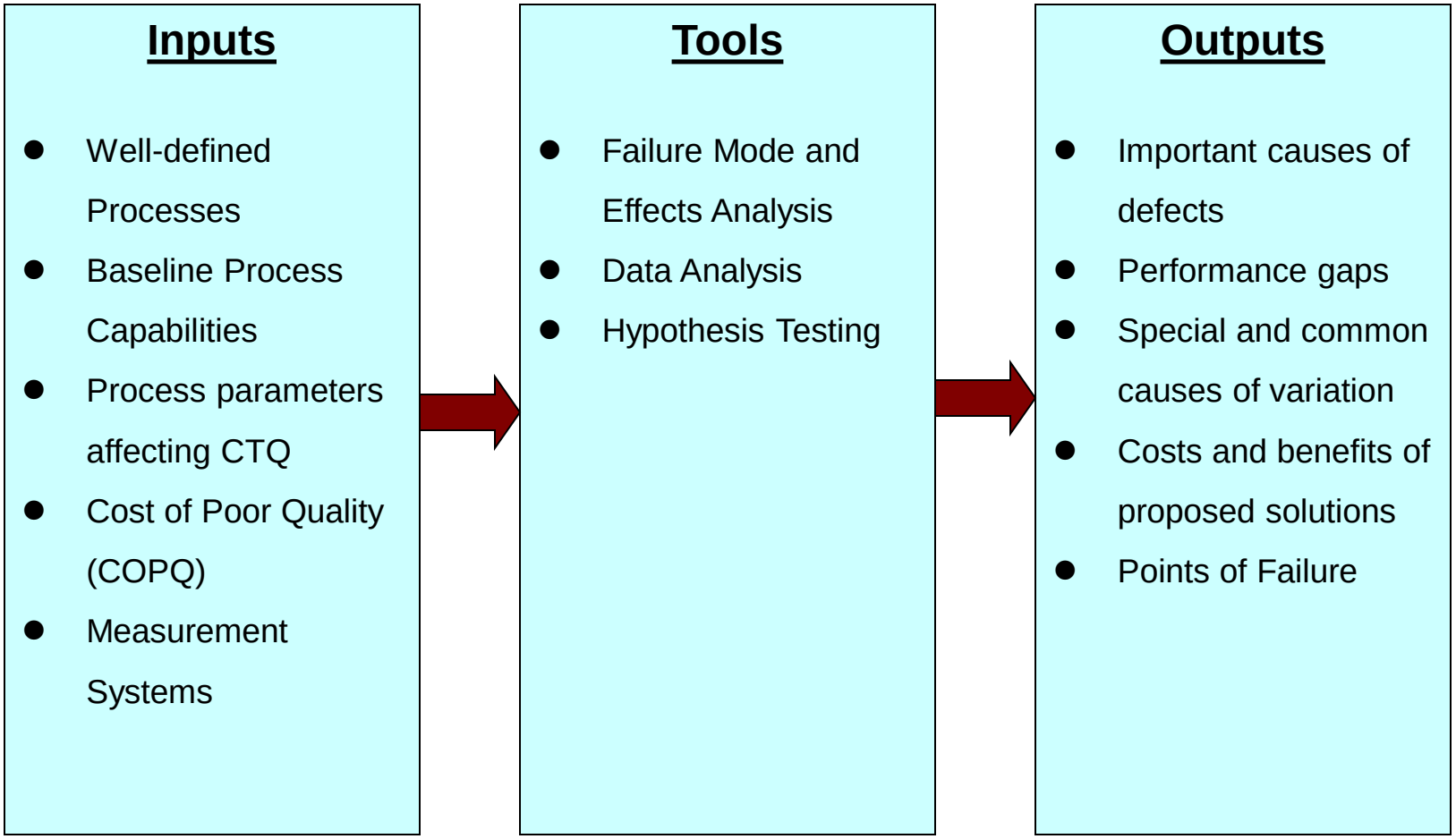
Analyze*



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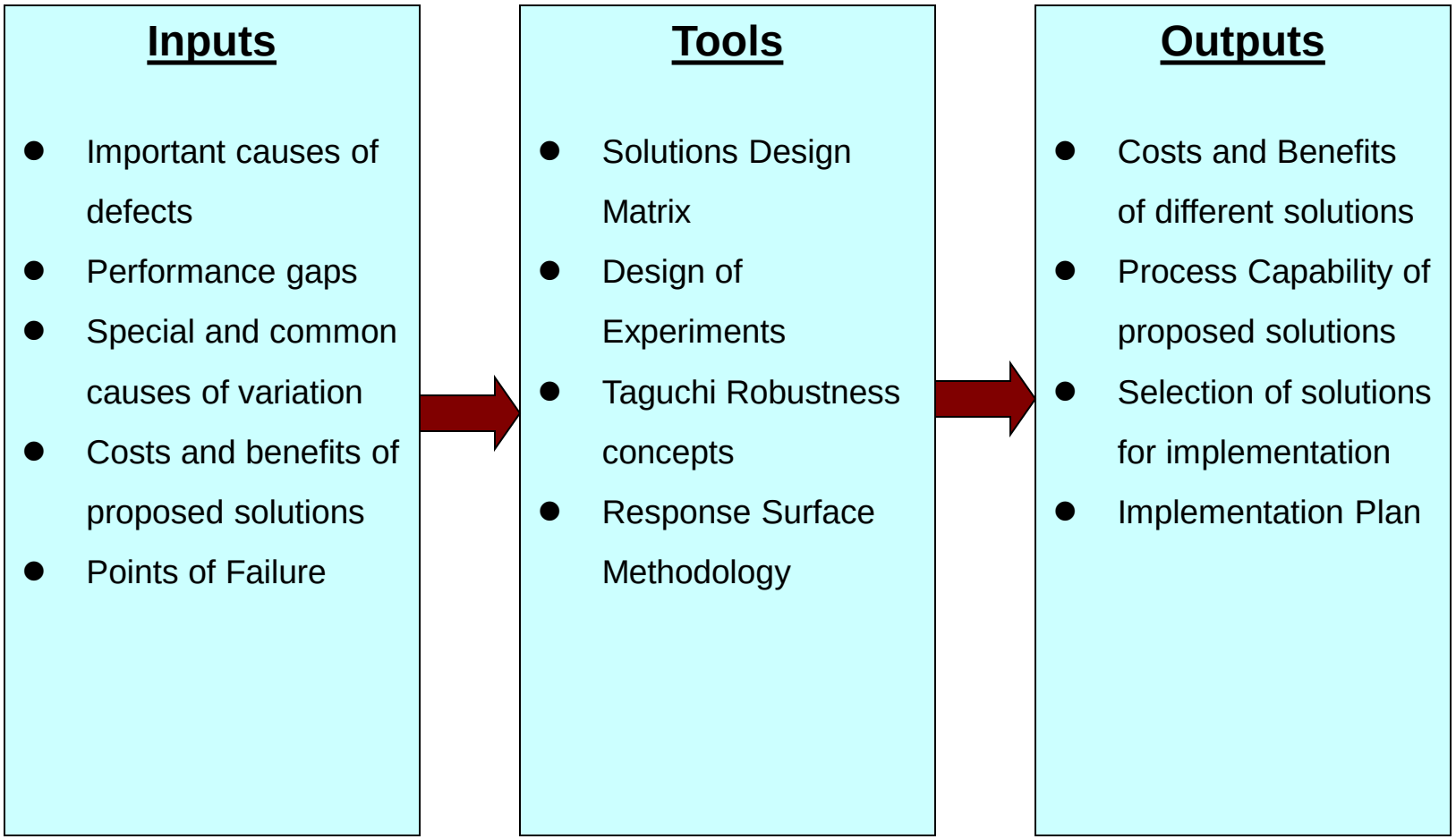
Improve*



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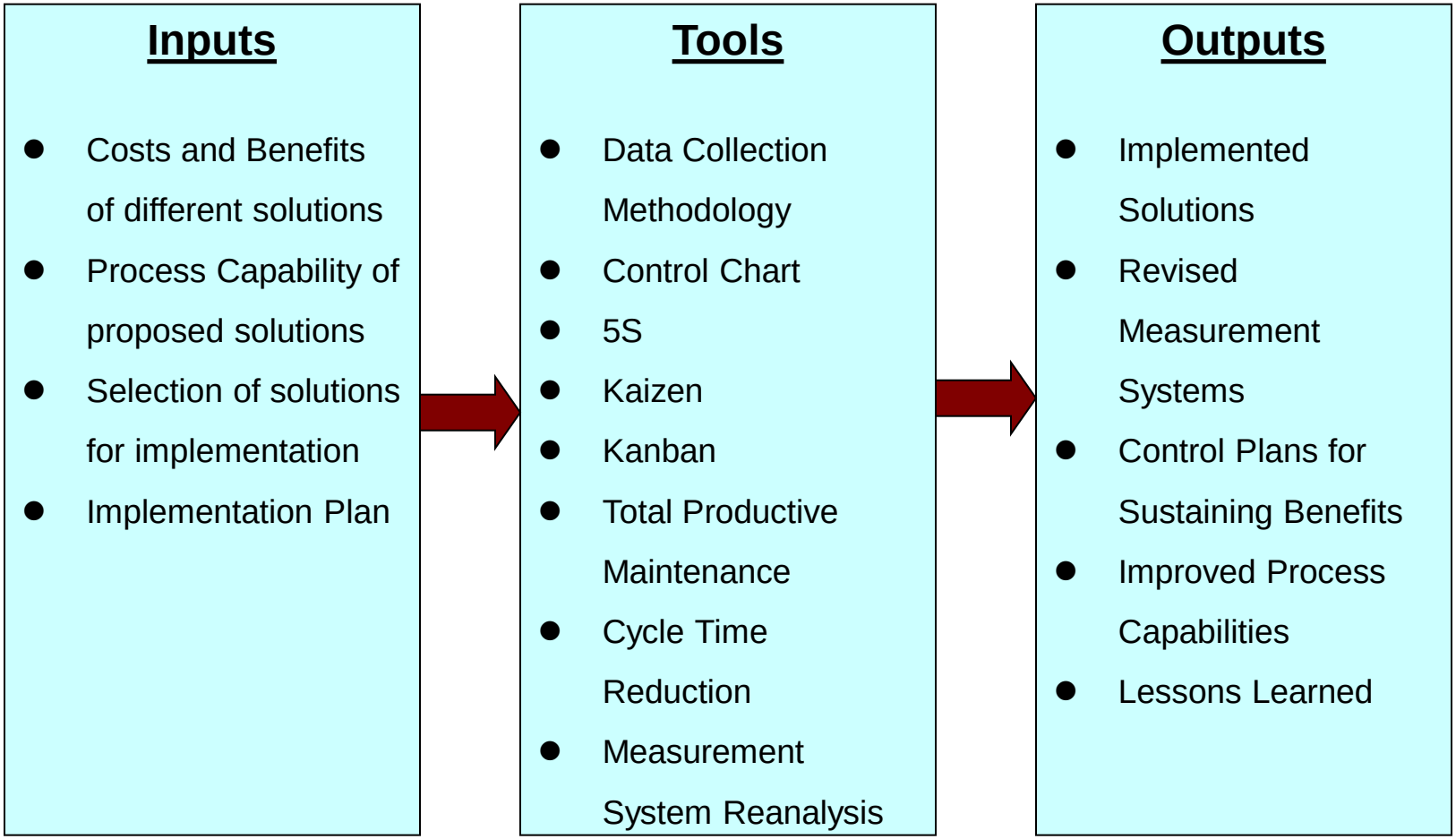
Control*



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Define Phase

- The Define Phase is used to identify the areas of improvement and define goals for the improvement activity and ensures that resources are in place for the improvement project.
- The Define Phase will focus on a customer requirement and identify project CTQ's (Critical to quality). A CTQ is a product or service characteristic that satisfies a customer requirement or process requirement

Measure Phase

- The Measure Phase evaluates the process to determine the current process performance, that is, the baseline.
- It uses exploratory and descriptive data analysis to help in understanding the data. The Measure phase allows you to understand the present condition of the process before you attempt to identify improvements. The inputs to the measure phase are the outputs of the Define phase

Analyze Phase

- The Analyze phase is used to identify few vital causes from a list of potential causes obtained from the Measure phase, actually affecting project outcome using six sigma methodologies. The data collected in the Measure phase are examined to determine a prioritized list of the sources of variation.

Improve Phase

- The improve phase of Six Sigma is used to improve the system to do things better, cheaper or more rapidly by finding optimum solution for Y, implement the new approach and validate using statistical methods. The main objective of the improve phase is to improve the process by eliminating defects.

Control Phase

- The control phase of Six Sigma is used to develop and implement process control plan to ensure sustenance of the improved process. The major activities in the control phase are to validate measurement system, verify process improvement and develop control mechanism. So far we have identified the best settings for each of the vital ‘X’. The key now is to ensure that the X’s don’t fluctuate away from the targeted setting. Process control is an important tool to ensure that the Six Sigma project delivers lasting benefits.