



Università degli Studi di Trento
Dipartimento di Ingegneria e Scienza dell'Informazione
Corso di Laurea in Ingegneria Informatica, delle
Comunicazioni ed Elettronica (ICE)

Organizzazione e Gestione Aziendale

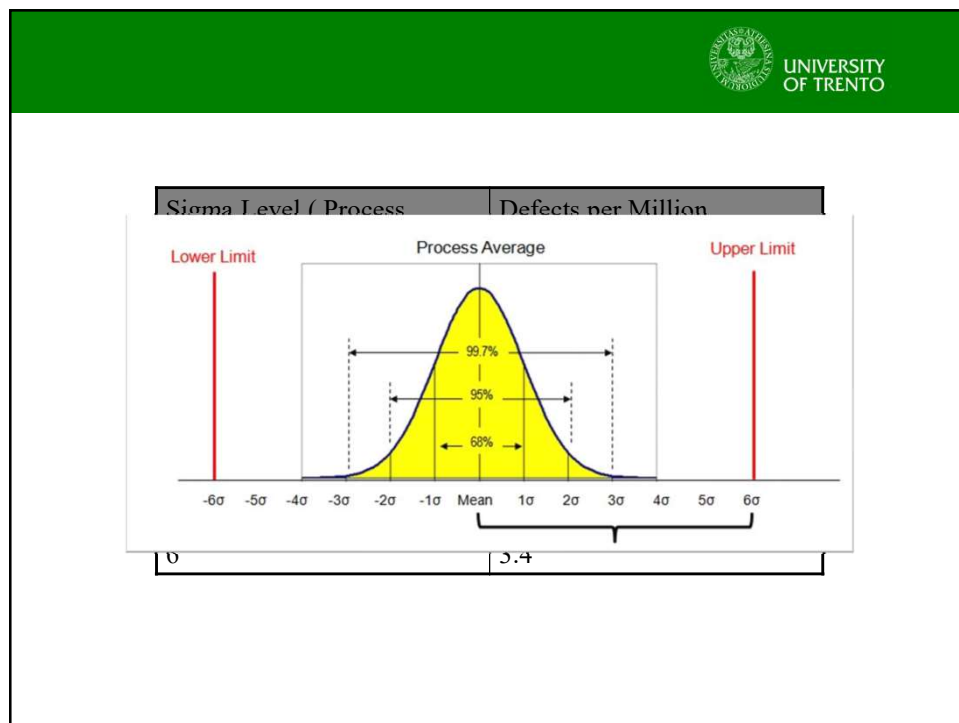
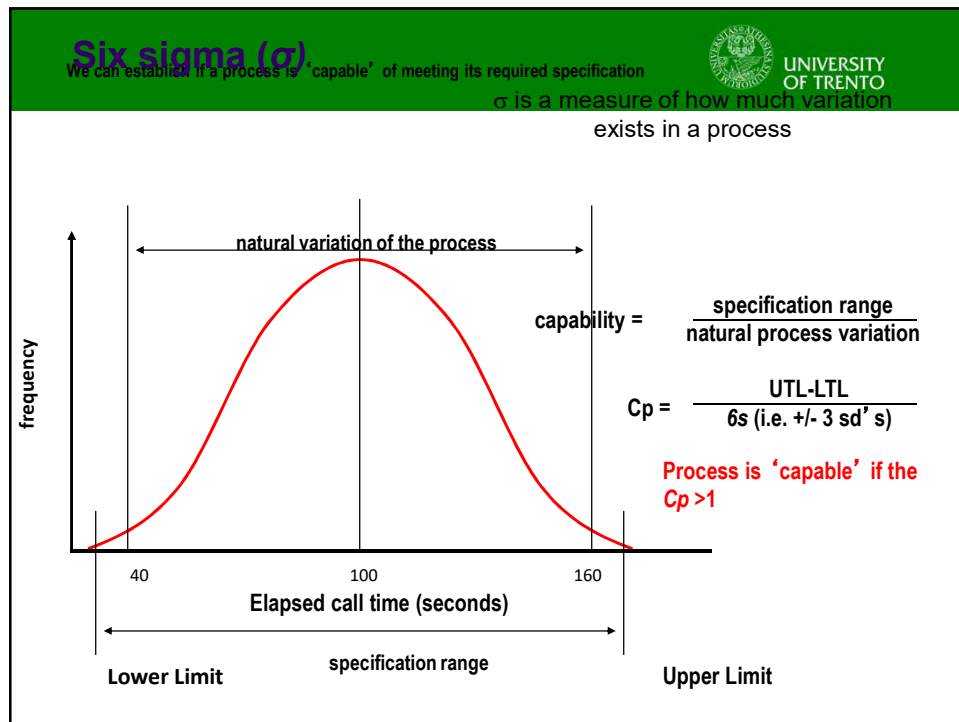
Six Sigma

Prof. Marco Formentini
Università degli Studi di Trento

Six sigma



- A **Vision** and **Philosophical** commitment to consumers to offer the highest quality, lowest cost products
- A **Metric** that demonstrates quality levels at 99.9997% performance for products and processs
- A **Benchmark** of our product and process capability for comparison to 'best in class'
- A practical application of statistical **Tools** and **Methods** to help us measure, analyze, improve, and control our process



Using Six Sigma to find and solve problems

A collection of 'tried and tested' improvement techniques together with a disciplined approach to organising improvement

Includes.....

- Customer driven objectives
- Structured improvement cycle
- Process redesign
- Evidence-based problem solving
- Structured training and organisation of improvement



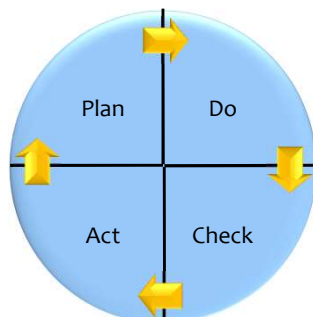
Master black belts

Black belts

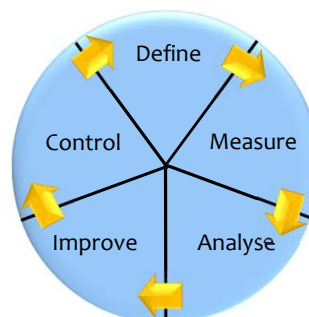
Green belts

Two improvement cycles

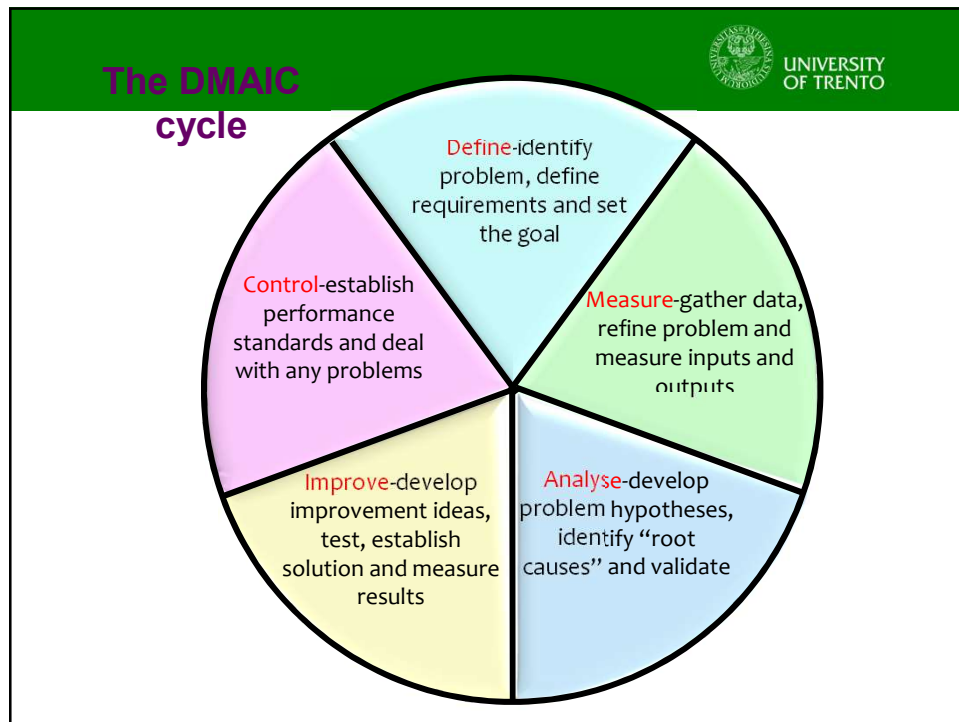
The plan-do-check-act, or "Deming" improvement cycle, and the define-measure-analyse-improve-control, or DMAIC improvement cycles



Mainly associated with TQM and 'Continuous Improvement'

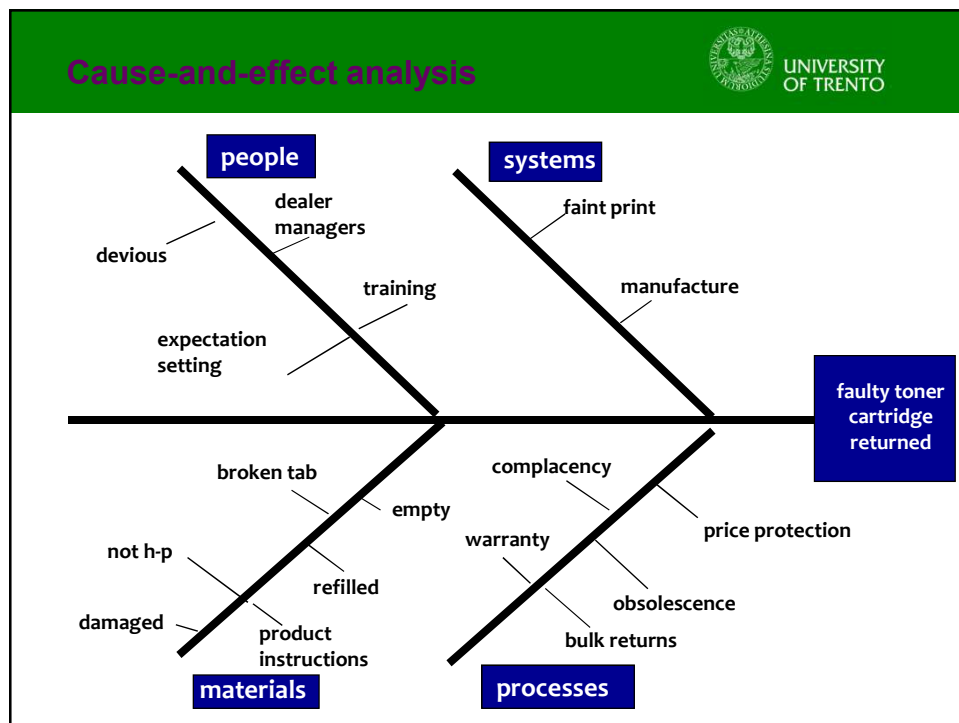
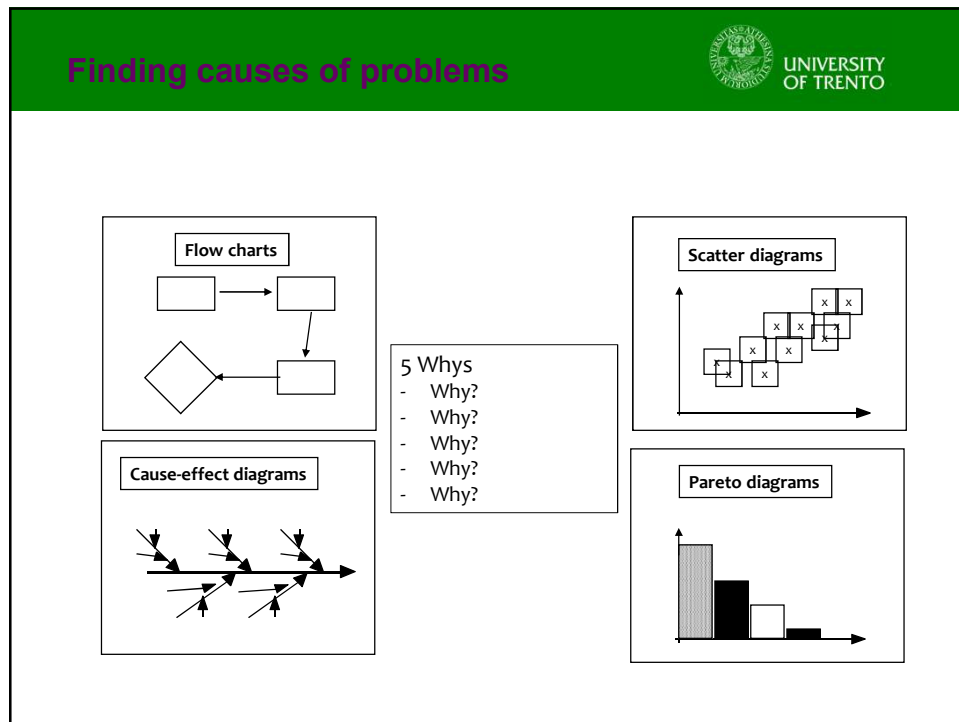


Mainly associated with Six Sigma

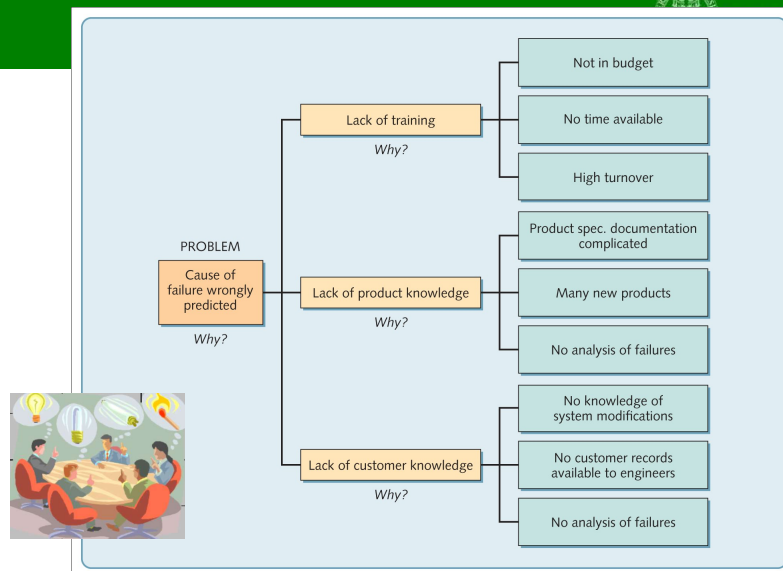
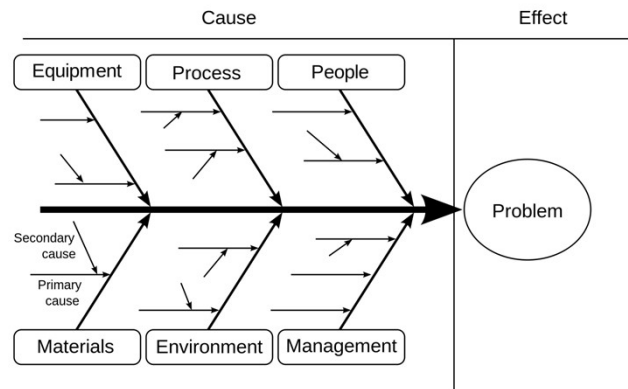


Variation and the customer


- Customers complain when they believe the package they receive differs from their expectations – when there is **variation**
- Variation has many faces:
 - Missing functionality/actions
 - Faults
 - Delivery delays
 - Lateness
 - Timetable/schedule errors
 - Asset reliability
- Variation kills businesses - 99% is not good enough!
- '6 sigma' equivalent to 3.4 defects for every million opportunities that exist to create a defect OR 99.99966%





Tool: Cause-effect diagram
aka Ishikawa diagram



Why-why analysis for 'failure wrongly predicted'

<div>  <div>UNIVERSITY OF TORONTO</div> </div>		
Summary of Key Learning Outcomes Lean Manufacturing vs. Six Sigma		
	Lean Synchronization	Six Sigma
Origin	Toyota	Motorola
Purpose	<p>No waste; whether of time, resources or effort</p> <p>Source of Waste (Ohno 1988)</p> <ol style="list-style-type: none"> 1. Overproduction 2. Waiting 3. Inessential handling 4. Non-value adding processing 5. Inventory in excess of immediate needs 6. Inessential motion 7. Correction necessitated by defects 	Implementation of measurement-based process improvement through variation reduction

<div>  <div>UNIVERSITY OF TORONTO</div> </div>		
	Lean Manufacturing	Six Sigma
Best known attributes	<p>Lean synchronization has three underlying principles:</p> <ol style="list-style-type: none"> 1. Eliminate all waste <ol style="list-style-type: none"> 1.1 Streamline the flow, so that no unnecessary time is spent in moving people or materials (Level Production) <ol style="list-style-type: none"> 1.1.1 Examine the shape of process flow 1.1. 2. Ensure visibility (Improving Visibility of Performance) 1.1. 3. Use small-scale technology (Cellular Layout) 1.2 Match the demand exactly (Demand Pull, Use of Safety Capacity) 1.3 Increase process flexibility (Cellular Layout) 1.4 Reduce variability (Standardization of Work and Practice) 2. Involve everyone (Employee Involvement, Supplier Management, Quality at the Source) 3. Continuous improvement (Quality at the Source, Employee Involvement, Standardization of Work and Practice) 	<ol style="list-style-type: none"> 1. DMAIC Cycle: <p>DEFINE: The first is define to quantify the problem and state the goal.</p> <p>MEASURE: The second is measure to detail the as-is process and collect different types of data whose analysis.</p> <p>ANALYZE: This phase is to analyze the process and the data to determine the causes of variation.</p> <p>IMPROVE: The project team makes recommendations in the improve phase next.</p> <p>CONTROL: Finally, the team recommends various controls on the process as part of the control phase to lower the process variation and to ensure that the improvements are actually taking place.</p> 2. Organizational Structure with Master Black Belts, Black Belts and Green Belts

 UNIVERSITY OF TRENTO		
	Lean Manufacturing	Six Sigma
Criticism	Its relation to the Japanese culture	Application to small companies Creative Industries
Tools (apply to both)	Pareto Analysis Fishbone Diagram Why-Why Analysis Scatterplots For Lean: PDCA (Plan-Do-Check-Act) cycle	