# Customer – Focused Quality


Minggu – 7, 8

# Outline

1. Definisi Kualitas,
2. Total Quality Management (TQM),
3. Six Sigma,
4. Statistical Process Control (SPC),
5. Employee Involvement and Quality Ownership.

# Quality – Lean ?

Hubungan **Kualitas** dengan konsep ***Lean*** ?

**Quality of Product**
**≠/<**
**Customer Requirements**

**Product**

**Customer**

**Products & Process Evaluation**

**Continuous Improvement**

*to achieve high **quality** products

# Definisi Kualitas

1. ***Customer's Perspective***

   Perspektif konsumen terhadap (kualitas) produk,

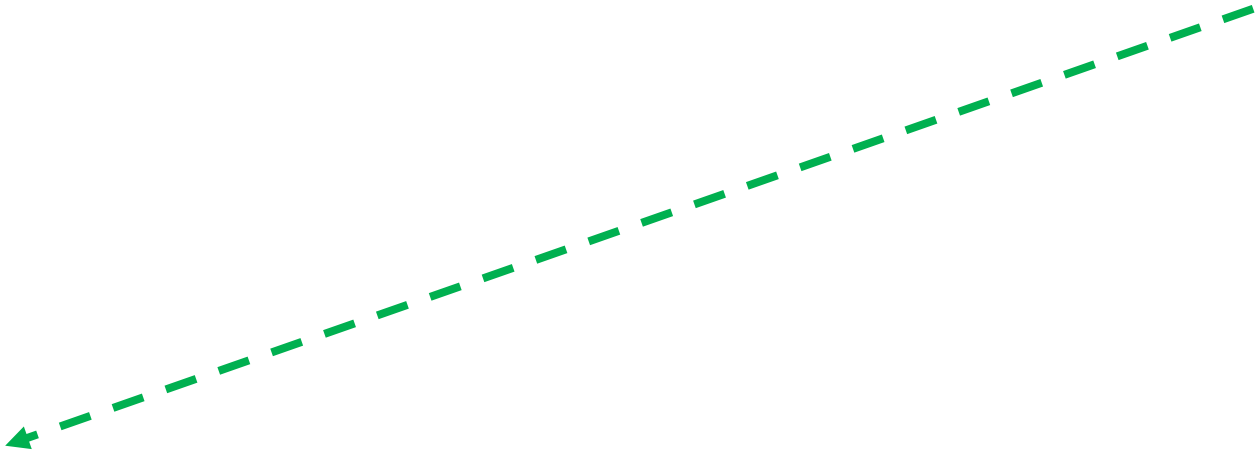
2. ***Producer's Perspective***

   Perspektif produsen terhadap (kualitas) produk,

# Definisi Kualitas

## ***1. Customer's Perspective / (Customer – Focused Quality)***

Cara konsumen memandang/merasakan sebuah **produk**



Dipengaruhi dari bagaimana produk itu didesain dan diproduksi (manufaktur), dan bagaimana pelayanan yang diberikan setelah pembelian produk (*after sales*)

# Definisi Kualitas – cont.

## *1. Customer's Perspective / (Customer – Focused Quality)*

***Customer*** ?

1. Product designer,
2. A worker on the production line building the product,
3. Distributor or retailer selling the product,
4. **A person / company who purchases the product**

**Most Important** Customer (by W. Edwards Deming)

# Definisi Kualitas – cont.

## *1. Customer – Focused Quality*

Dari perspektif **konsumen**, kualitas adalah seberapa baik produk tersebut jika dibandingkan dengan apa yang mereka ekspektasikan (harapkan) dari produk tersebut – **Fitness for Use**

**8 Dimensi Kualitas (David Garvin):**

1. *Performance,*
2. *Features,*
3. *Reliability*
4. *Conformance,*
5. *Durability*
6. *Serviceability,*
7. *Aesthetics,*
8. *Perceived Value*

**Additional Dimension:**

**9. Service Quality:** Product availability, support offered by the manufacture after product is purchased (aftersales), knowledge and courteous sales and support staffs.

# Definisi Kualitas – cont.

## 1. Customer – Focused Quality

1. Performance: Operating characteristics such as speed, comfort, and ease of use; most products have multiple performance characteristics and customer preference determines their relative importance (e.g., high acceleration versus high gas mileage).
2. Features: Extras, add-ons, or gimmicks that enable a customer to somewhat customize a product.
3. Reliability: Likelihood the product will perform as expected (not malfunction) within a given time period.
4. Conformance: Degree to which the product satisfies or conforms to preestablished standards.
5. Durability: Length of time or extent of use before the product deteriorates and must be replaced; durability is a function of the product's operating environment and reliability.
6. Serviceability: Speed, ease, and convenience of getting or making repairs, and the courtesy and competency of repair people.
7. Aesthetics: Look, feel, taste, sound, or smell of the product based on personal taste; though subjective, some aesthetic judgments tend to be universal.
8. Perceived value: Opinions about the product based on images or attitudes formed by advertising and/or the reputation of the producer.

# Definisi Kualitas – cont.

## *2. Producer's Perspective*

Dari perspektif **produsen**, kualitas adalah:

1. ***Quality of Design* (QoD),**
   Kemampuan sebuah desain produk untuk memuaskan/ memenuhi kebutuhan konsumen (*customer requirements*).
   Desain tersebut juga harus memperhitungkan *market,* serta kemampuan dan posisi kompetitif dari produsen.

2. ***Quality of Conformance* (QoC).**
   Kemampuan proses produksi untuk menghasilkan produk secara konsisten, dengan mengikuti rancangan produk yang telah dibuat sebelumnya.
   Dua sisi QoC: *Defect Detection & Defect Prevention* ***(mistake-proofing)***

# Total Quality Management (TQM)

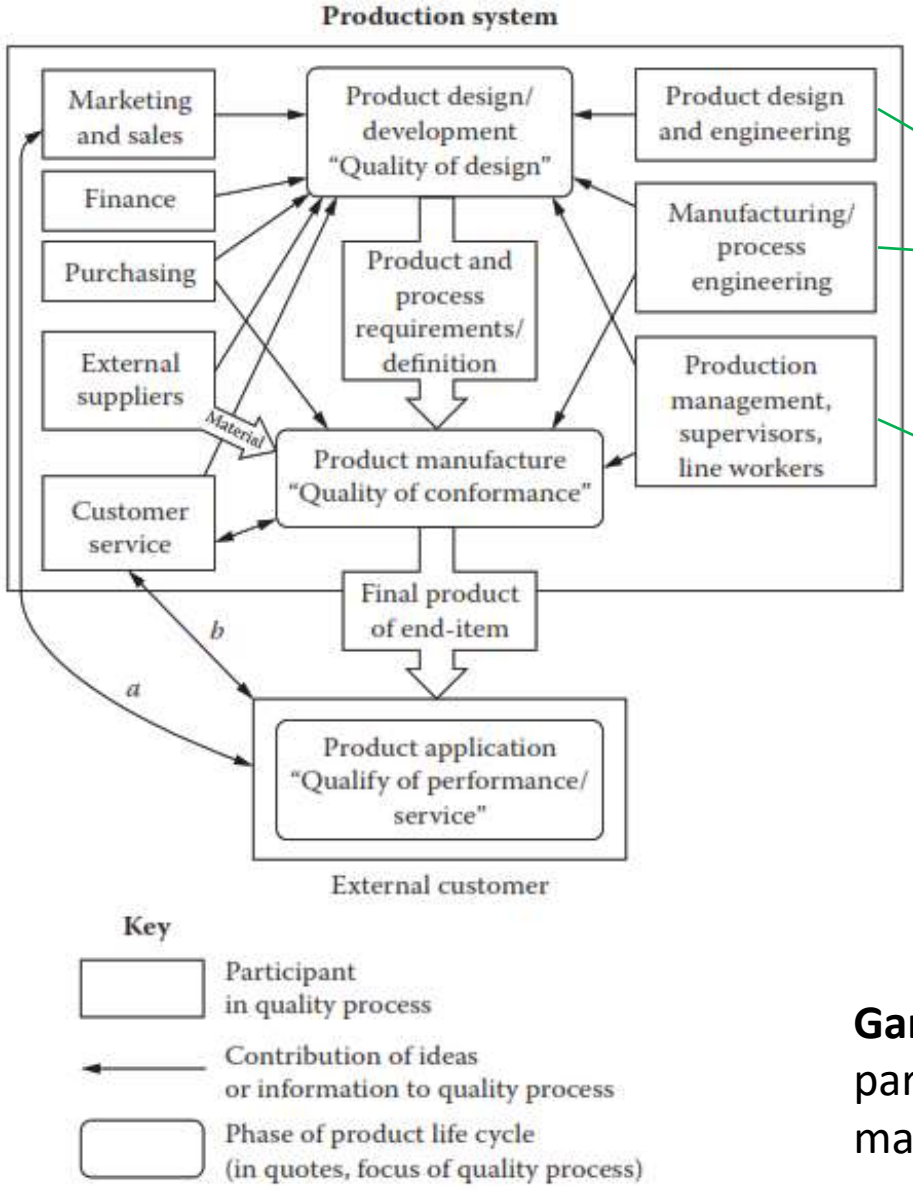
## TQM:

Management approach that focuses all functions and levels of the organization on **quality and continuous improvement**

## Kenapa TQM:

1. Persaingan/kompetisi tidak “duduk diam”, kompetitor akan selalu berkembang & meningkatkan kualitasnya,
2. Ekspektasi konsumen selalu berubah-ubah secara kontinyu,
3. Tidak ada tingkat kualitas yang dapat dipertahankan sendiri, harus ada usaha berkelanjutan *(continuous effort)*.

# Total Quality Management (TQM) – cont.




**Pendekatan:**

1. Concurrent Engineering,
2. Design for Manufacture and Assembly (DFMA)

Statistical Process Control (SPC)

**Gambar 1.** Kerangka TQM: participant pada quality product design, manufacture, and service

# Six Sigma

## Six Sigma:

- Metodologi tentang konsep **statistik dan peningkatan kualitas** *(quality improvement).*
- **Six Sigma** memberikan arahan dan prioritas dalam peningkatan kualitas dan sering dikombinasikan dengan metode **Lean** – **Lean Six Sigma**
- Fokus Lean Six Sigma:

  Pelanggan, pengurangan variabilitas, kinerja produk dan layanan, kinerja keuangan, dan kemampuan untuk memenuhi *quality-requirements*

# Six Sigma – cont.

99% quality → pretty good

*Namun, (contoh) dari 200.000 produk, **defect** masih sebanyak **2000** produk.

99,9% quality → **10x** lebih baik daripada 99% quality

* (Contoh) dari 200.000 produk, **defect** hanya sebanyak **200** produk

**Lalu, standar *Good Quality* itu seperti apa?**

Berdasarkan konsep **six sigma**, ***Good Quality*** adalah*:*

**99,99966% quality**

**=**

**3,4 error/sejuta kejadian**

**(3,4 DPMO – Defect per Million Opprtunity)**

Thousand times better than

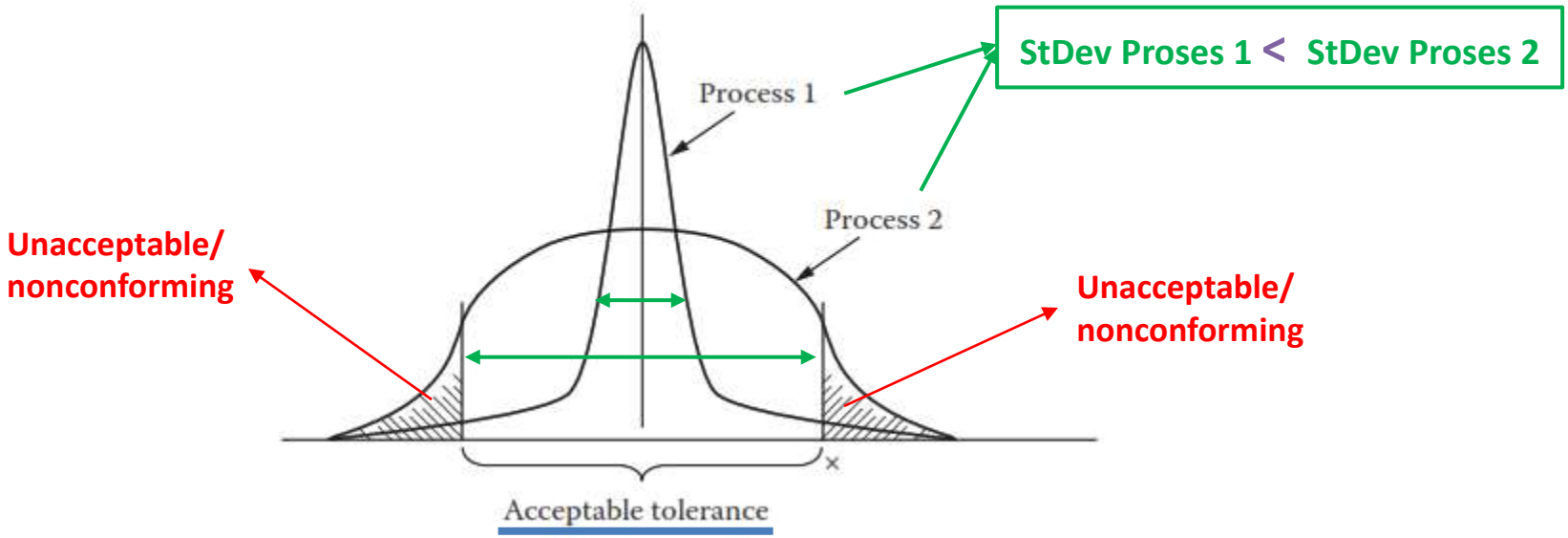
**99% quality**

# Six Sigma – cont.

## Sigma → standar deviasi (stdev)

*standar deviasi: perbedaan **output aktual** dan **target**

*Semakin kecil stdev, semakin mirip output dengan target, dan sebaliknya

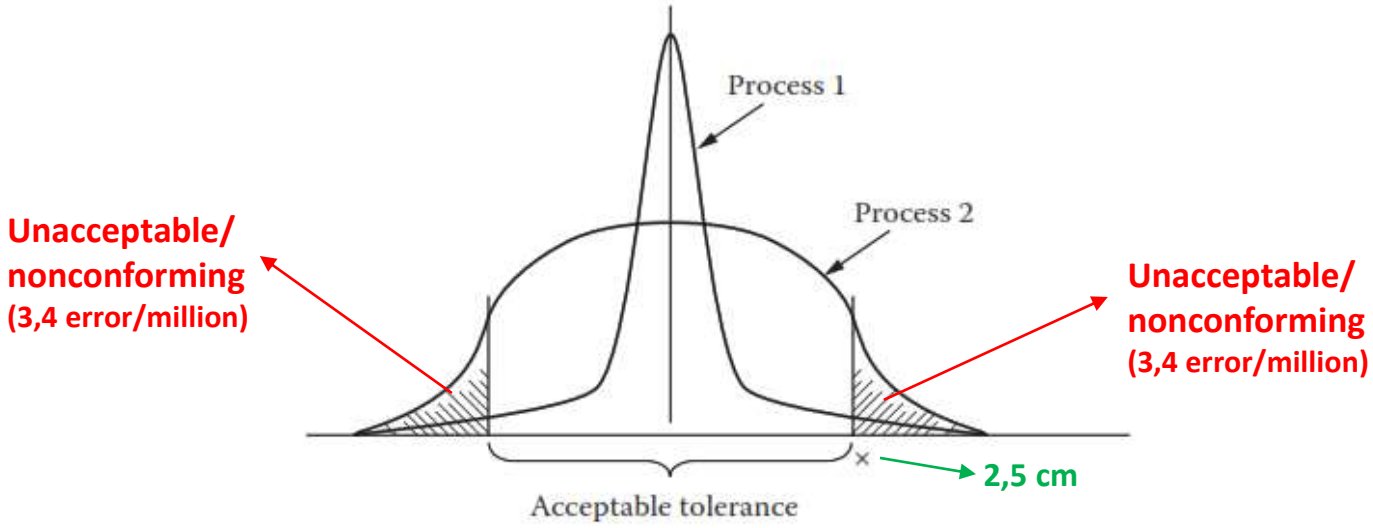



**Gambar 2.** Distribusi Output dari 2 Proses Berbeda

# Six Sigma – cont.

**Example 1: Standard Deviation and Acceptable Output**

Suppose a process makes machined shafts and that the maximum allowable diameter of the shafts is 2.5 cm. Any larger diameter is considered nonconforming and unacceptable. Suppose $x$ in Figure 4.3 represents 2.5 cm and anything to the right of $x$ is unacceptable. The shaft can be made in either process 1 or process 2, but the number of unacceptable items for process 2 is much greater than for process 1. The reason for the difference is because the standard deviation in process 1 is *much smaller* than the standard deviation in process 2. In statistical terms, this says that in process 1 $x$ falls more standard deviations away from the mean than it does for process 2. In a Six Sigma process, the standard deviation is so small that results beyond $x$ (unacceptable) are *6 standard deviations* away from the mean. The number of items beyond $\pm 6$ standard deviations is just 3.4 per million. [7]



# Six Sigma – cont.

## Six Sigma, dapat diterapkan dengan DMAIC:

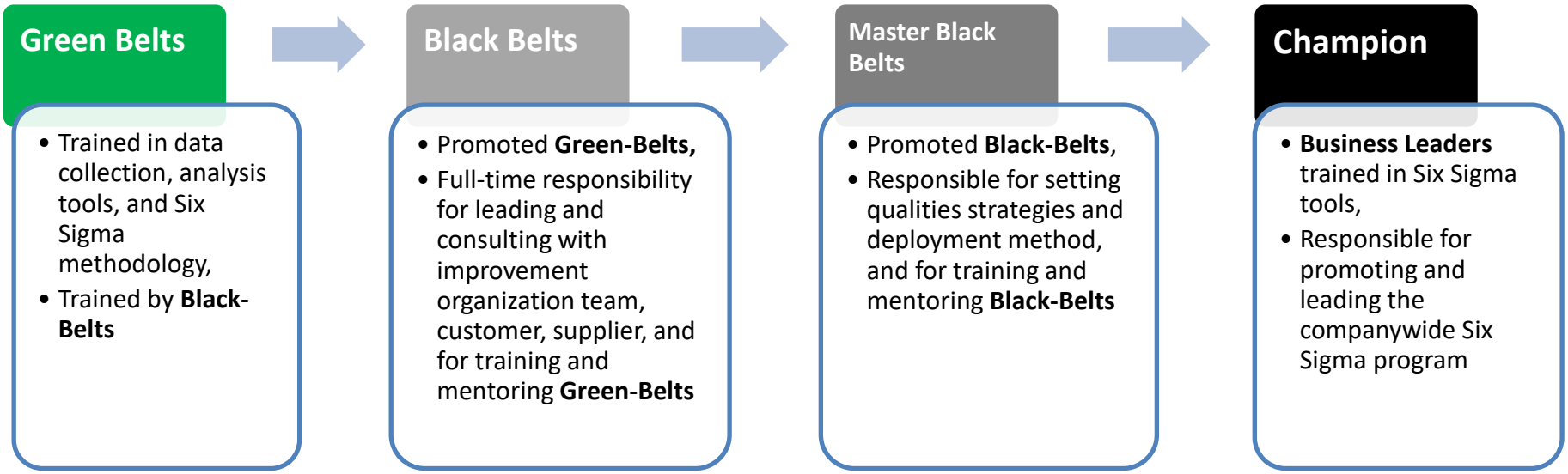
- **Define (D):** define the problem and **critical-to-quality (CTQs)** attribute

  *CTQs: kriteria yang dianggap paling penting oleh konsumen

- **Measure (M):** identify the processes that influence the CTQs and measure their performance,
- **Analyze (A):** determine the causes of **problem/poor performance**,
- **Improve (I):** Confirm the impact of the key factors on the CTQs, determine methods for measuring variation and to make process acceptable, the maximum acceptable range of variation
- **Control (C):** ensure that process stays within the acceptable range of variation (stDev).

# Six Sigma – cont.

## Sertifikasi DMAIC dan *Belts* :



# – CONTINUE WEEK 8 –

# Statistical Process Control

## Definisi:

- Metodologi untuk membangun dan menjaga output (produk) berkualitas tinggi
  - ✓ *High quality products* → *variability* prosesnya sangat kecil

- **Termasuk *tools* dan prinsip untuk:**
  - ✓ Menentukan apakah proses stabil,
  - ✓ Memonitor sebuah proses, terkait adanya kemungkinan perubahan perilaku proses,
  - ✓ Menilai apakah sebuah proses mampu memenuhi *requirements*.

# Statistical Process Control – Cont.

**Sub Topics:**

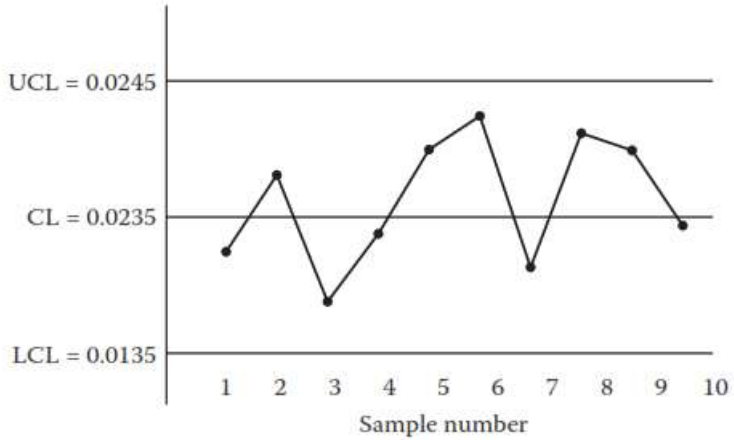
1. Peta Kontrol (*Control Chart*),
2. Stabilitas Proses (*Process Stability*),
3. Kapabilitas Proses (*Process Capability*),
4. Non-Statistical Process Control

# Statistical Process Control – Cont.

## 1. Peta Kontrol (Control Chart)

- *Tools* untuk memonitor sebuah proses terhadap potensi perubahan/ *abnormalities.*

**Gambar 3.** Inspeksi Output oleh Assembler

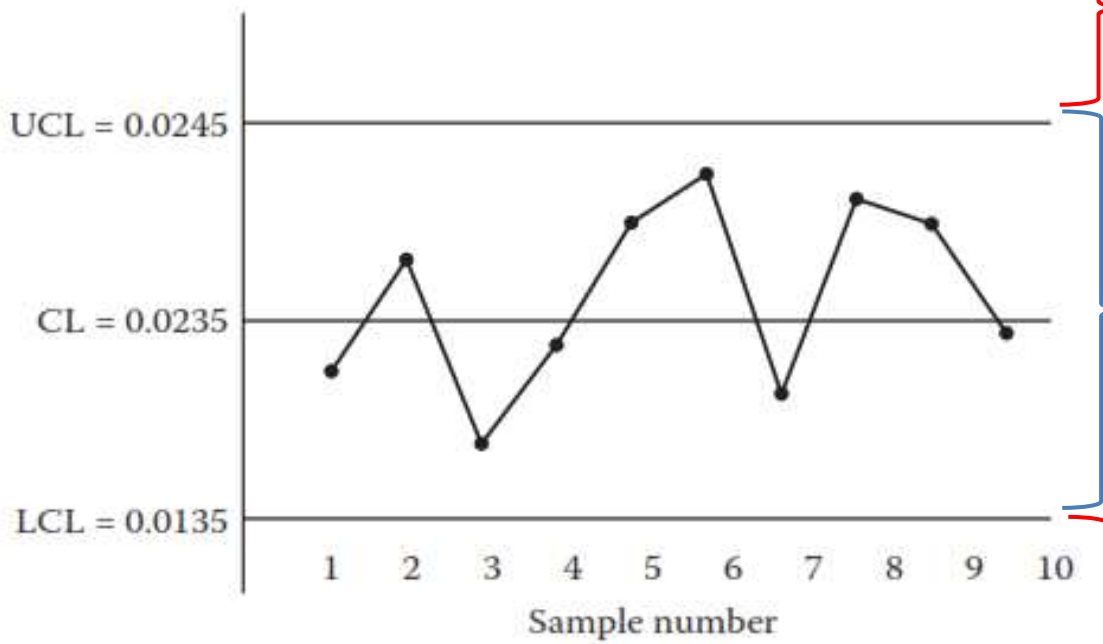



**Gambar 4.** Contoh Peta Kontrol

*Misal pekerja assembly melakukan *performs tests* setiap jam, dengan sampel 10 unit output proses. Hasil tes kemudian diplot pada Peta Kontrol seperti pada Gambar 3.

# Statistical Process Control – Cont.

## 1. Peta Kontrol (Control Chart)




**Out-of-control:**
**Proses abnormal/**
**proses tidak stabil**

**In control:**
**Proses normal/**
**proses stabil**

**Out-of-control:**
**Proses abnormal/**
**proses tidak stabil**

*Good Process → *mean* & *variability* (stDev) sesuai/mendekati *product/process requirements*

# Statistical Process Control – Cont.

## 2. Stabilitas Proses (*Process Stability*)

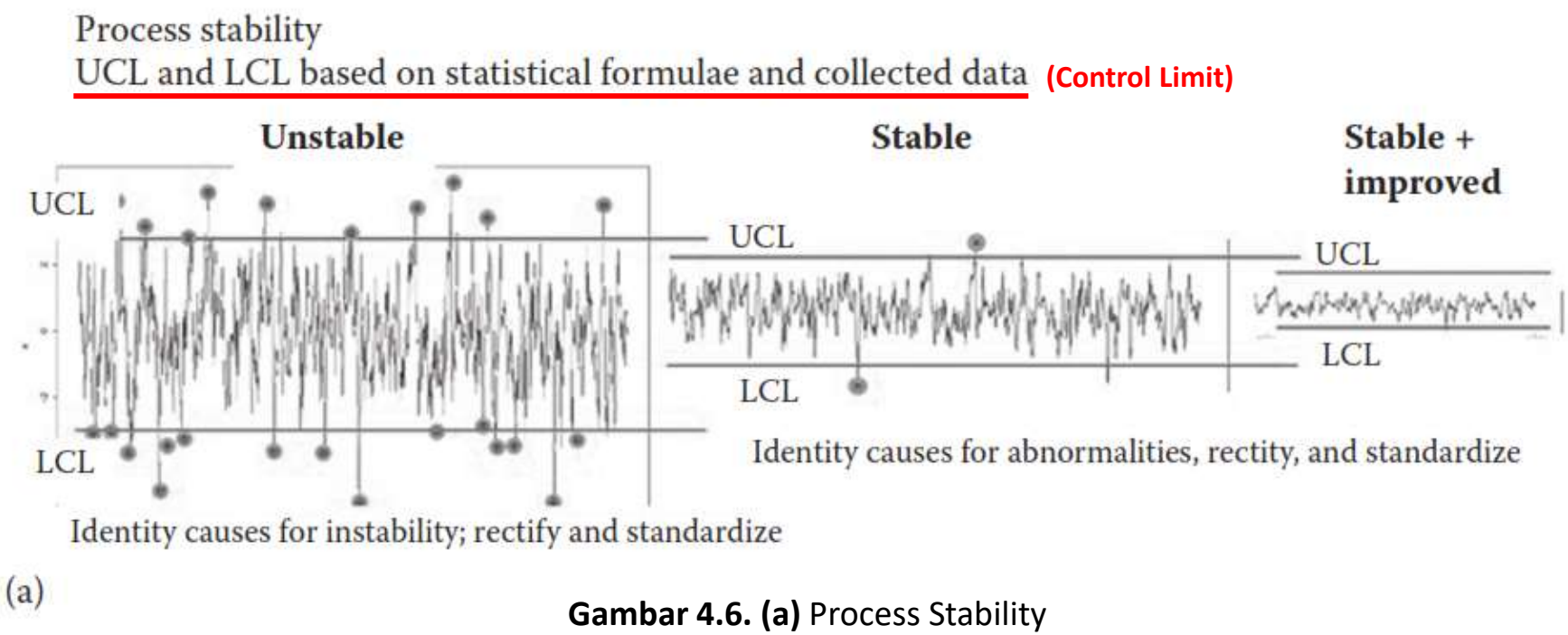
- Mencapai stabilitas proses merupakan salah satu tujuan ***Lean Production***.
- Tanpa Stabilitas, sebuah proses tidak akan bisa melakukan apa yang seharusnya

**Example 2: Using Control Charts to Stabilize a Process**

To assess process stability, suppose a process is sampled 200 times and the resulting 200 data points are used to compute the upper and lower control limits. The control limits—UCL and LCL—and 200 data points are plotted on a control chart—the leftmost plot in Figure 4.6a. Because there are so many abnormalities—points outside the control limits, the process is obviously unstable. To improve the process stability, the causes for each of the points lying outside the control limits (outliers) are identified and the process rectified to remove them, at the same time modifying the standard work procedures so as to incorporate the solutions and preclude those causes in the future. By repeating this procedure, the process eventually stabilizes—the middle plot in Figure 4.6a. (Notice the control limits have changed because the data used to compute them is different.) But even in a stable process, outliers will occur, and whenever they do the sources are identified and rectified, and solutions are implemented and standardized. In this manner, the process improves—the rightmost plot in Figure 4.6a.

# Statistical Process Control – Cont.

## 2. Stabilitas Proses (*Process Stability*)




**Gambar 4.6. (a)** Process Stability

Tahap awal sebelum menggunakan Peta Kontrol untuk memonitor proses → **pastikan proses Stabil**. Jika belum, identifikasi sumber ketidakstabilan tersebut (prosedur, peralatan, pekerta, material,, dll.), dan lakukan perbaikan.

# Statistical Process Control – Cont.

## 3. Kapabilitas Proses (*Process Capability*)

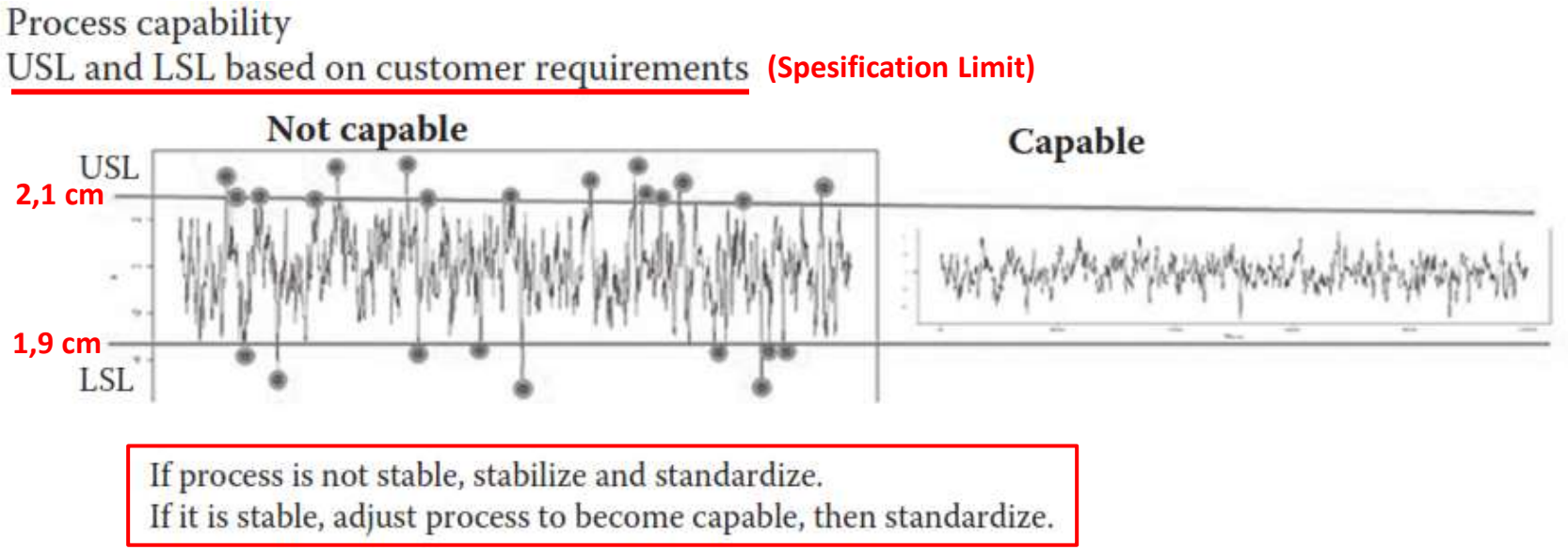
- ***Capable***: Suatu proses mampu menghasilkan output sebagaimana mestinya,
- **Indikator:** jumlah produk *nonconformities/ unacceptable* pada proses tersebut sangat kecil

**Example 3: Using Control Charts to Assess Process Capability**

Suppose the requirement imposed on a part is 2 + 0.1 cm., which means a part is acceptable only if it is 1.9–2.1 cm. These values represent the **upper specification limit (USL)** and the **lower specification limit (LSL)** (the tolerance range mentioned earlier). If the process produces parts that virtually all fall within this range (i.e., are conforming), the process is considered capable. Suppose 300 parts are sampled and plotted versus the USL and LSL. If the plot appears as Figure 4.6b, left, the process is not capable (i.e., has many nonconforming parts). If the plot appears as Figure 4.6b, right, (virtually all conforming), it is capable.

# Statistical Process Control – Cont.

## 3. Kapabilitas Proses (*Process Capability*)




**Gambar 4.6. (b)** Process Capability

*Nb. : Pahami penggunaan ***Control Limits*** vs **Spesification Limits**

# Statistical Process Control – Cont.

## 4. *Non-Statistical Process Control*

Contoh *non-statistical process control* yang digunakan dalam **Lean Production** → **Visual Management**

**Puts data and information in the open for everyone to see – TRANSPARANCY.**

Contoh:

- Material diletakkan di lantai dan rak, petunjuk standar kerja (SOP), setup, *preventive maintenance* dipasang di mesin dan stasiun kerja,
- Grafik *tracking* progress/ kinerja vs target dan *requirements* dipasang/dicantumkan pada area/stasiun kerja, agar lebih mudah untuk mengetahui dan melaksanakan standar dan kebutuhan kerja, serta mengetahui *abnormalities* pada proses yang akan menyebabkan *defect* pada produk dan *waste* lainnya

# Employee Involvement and Quality Ownership

## 1. Frontline Worker Responsibility,

"***if you want to eliminate a defect, you have to go to the source of the defect***"
The frontline associates, operators and assemblers on the shop floor and the service workers – people who directly add value to products and service.

## 2. Process Orientation,

**Tim *Improvement*** pada organisasi disusun berdasarkan proses, yang artinya setiap tim terdiri dari pekerja dan staff pendukung untuk menyelesaikan masalah pada proses yang sama. Kerja tim berorientasi pada Proses *(process oriented).*

## 3. Quality Training and Education.

Untuk mempromosikan agar semua orang bersedia untuk berpartisipasi dalam menjaga Kualitas, edukasi terkait QC harus tersedia untuk setiap pekerja, dari level *top management* hingga *assembly-line worker* – (by Kaoru Ishikawa)

# Referensi

Nicholas, J., Lean Production for Competitive Advantage: A Comprehensive Guide to Lean Methods and Management Practices, 2nd ed., CRC Press, 2018