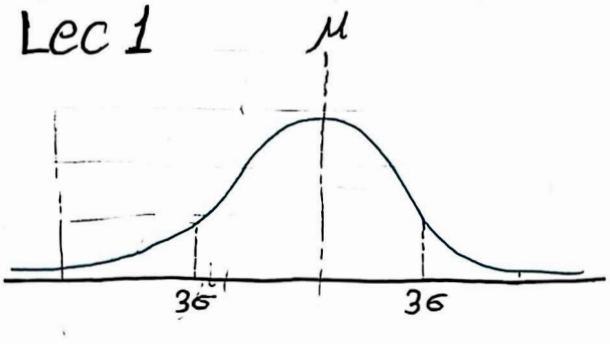
Lec 1



* my goal is to ↑ the σ level using defined steps ∴ as a result ↓ the outputs outside #SL's

6σ methodology : is a process of lessening the variation ∴ as a result an overall process improvement ∴ problem solving , moreover it's considered as a statistical concept ∴ "Data driven".

The process that applies 6σ (level) is called a "perfect" process

* variation → errors → defects (product/service) → lower customer satisfaction

* lower the σ level higher the unsatisfied customers

Ex: 51.4 million surgeries/year

applying 5σ ⇒ 11,976 error/year ⇒ 230 error/week !

" 6σ ⇒ 174 " / " ⇒ 3 " / " 3 !

So in 5σ patients are experiencing errors 68 times more than 6σ, so 1 σ levels affect the process dramatically (drastic diff in levels)

+ Amazon.ex. page 10

DpMO: defect per million opport

ratio btw σ level & DpMO isn't linear

How to find σ level? 1) yield → 2) abridged σ table

$$\text{yield} = \left(\frac{\#\text{ of opportun.} - \#\text{ of defects}}{\#\text{ of opp}}\right) * 100$$

Ex: marketing dep. letters page 12

* side note: "avarged" means that we assume 1.5 σ shift from the mean

VOC: vioce of customer, it matters in choosing the project & defining the problem

→ might be stakeholders, interal cust.... not necesrly the end cust

Value stream mapping:
a tool to understand the process

* 6σ deals with each problem as a project

Cycle of conti. improvement

Waste : non adding value thing (process, people ...) (lean managment focuses more)

equipping people : 1) process improvement team

DPI

Define plan implement

2) equip the people (employees) to monitor & maintain imp.

The challenges from the book

lec. 3 . Ch. 5

Variance is the root of many errors

Ex: calle cooking

* removing variation alone doesn't ensure quality

So to ensure improvements:
1) process is functional (intended outputs) >> 2) improve to remove variation

variation ⟺ Std dev ⟺ σ

Std dev equations:

1) $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$, when talking the whole population

(# of data; x_i: each element; μ: mean; variance)

2) $S = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$, " " a sample of

($\bar{x}$: sample mean)

* Marks ex , std points the problem

- Pareto , 80/20
  20% of causes has 80% of the effects

Ex: defect type freq
I cant determine only by looking at data . some tools might be helpful : Bar chart. Pareto chart diagram
rank , cumu decending , %

VOC ; tools to captures focused groups , interviews , surviies,...
Beta tests

Lec 4

VOC is critical before, during & after

* Beta tests : when there's a new sys / idea / product we propose it to a group of people or apply it to one process in a controlled enviroment to get feedback & so on to reduse waste & defects ...,

* VOC campaign → General feedback
→ specific feedback

1) General : overall satisfaction, tools : forms, Complaint records
-grocery store ex. social media

* to design a strong campaign we need to understant our critical to quality factors CTQ's , usually are measured

* General feedback is an indicator (alarm) , further investigation is required

2) Specific : in depth, tools : Beta test....,

* Comparison table for tools in terms of cost, benifits , disadv - page 59

(feedback is biased for dissatisfied people , social media biased for fans)

* likert scale 1 2 3 4 5

Lec 5

* Basic metrics

- DpMO
- Rolled Throughput yield
- Defects per unit
- First time yield

- gives indication of how many defects

1) DpMO = $\frac{\#\text{ of defects in a sample}}{\#\text{ opportunities. For a defect in the sample}} * 1,000,00$

Ex: mail order

2) DpU = $\frac{\#\text{ of defects found}}{\#\text{ of units in the sample}}$

Ex: publisher

?* Defects / Defected / sometimes to call something as defected it might have many defects

* means how many defects per item in avg not how a defected items

* pareto for which one, this repeated more (defect)

3) FTy = $\frac{\#\text{ of good units produced}}{\#\text{ " units entering the process}}$

ratio of good outputs related to what was supposed to be good

never more than 1

Overall FTy, (when there's multi processes)
we don't sum we multiply each process FTy

never higher than FTy ~~Rf~~ ~~tho~~

* doesn't show any rework done in FTy
↳ rework is a type of waste

4) RTy = $\frac{\#\text{ of units entering} - (\text{scrap} + \text{rework})}{\#\text{ " " " the process}}$

- RTy solves this problem

- never higher than FTy

overall RTy = multiplication of each process RTy

Lec. 6

problems { complex → formal prob statement
simple → basic prob statement

* 5 why's tool to find the root cause
- hamburger example

Formal problem statement
provides enough info that a busy executive is convinced & understands what issue & why improvement needed

◇ brief with enough elements

- where & when
- magnitude measure
- description
- notation about metric
* great if i link it with the cost

⚠ * prob st. doesn't talk about solution or many details ++ it doesn't provide the root cause
@
- California ex., weak ex.

Lec 7

Problem st examples

& how to write obj due to the statement

* scope & scope creep

↳ what is included & what's not in the improvement project

scope creep: when I aim for a perfection for the process, I'll never deliver the result or end, also setting an unrealistic goal is a cause for creep

SQL: o level

Lec 8, Ch. 7

Process: collection of steps, activities - performed in order to deliver end product, services, ideas...

There are many processes within processes

Process chara.

↳ 1) steps: phy, mental, idology ~~cal~~?, has to be clarified thro instructions (SOP) or visual dia. (process map)
- ex of SOP & process maps

↳ 2) processing time: since I always have my ultimate goals to ↑quality ↓time ↓cost, so I have to know the time, so we gather data.

→ 3) Interdependencies & since I have many processes they have to be related
- → process related
- → Resource "
- → Information "

- swim lane flow chart ex. , goal to see interdep.

Why I must be aware of interdep.?
1) we might need help from upstream
2) my improvement might impact downstream

→ 4) Resources & Assignment
- Human
- capital
- material
- equipment

Lec 9

- ex : pizza shop

* elements

1) Inputs : anything enters process

* why we want to know the element ?
to link it with my ultimate 3 goals & improve

2) outputs : product or service used by the customer
- we care about it a bit more than inputs in 6σ

* doing the right thing effectivness outputs
" things " efficiency inputs

3) Events : predefined action that when begins the process begins

4) Tasks : the heart of the process, turns inputs to outputs, physical / automated / computerized actions
- examples of tasks ...

5) Decisions : super related to 4 or 4 itself, usually governed by a set of rules. formally

all 5 are related & 6σ team has to understand it thro measuring, observing, ...

5' * process owners ...

+) Data

Defining process Components:

Tool: SIPOC

Lec 10: missed it

Lec 11:
SIPOC

1) process name
2) the process steps (don't include the main process)
3) outputs
4) customers
5) inputs (Data is part of the input, oven temp for ex) ← or any sys like (SAP)
6) suppliers (for each input there must be a supplier to cover it)

* it's helpful to detect the problem laber on using details provided by this tool. it also helps in identifying the stake holders

Lec 12:

verification Vs validation
cust del

Ch. 8

Quality: degree to which the characteristics are fullfig the requirments

Requirments (expectations) → implied
→ stated → obligatory
→ not

(Cust expectations[1], Brand expectations[2], Complience or regulatory rules[3])

- Critical to Quality Chara (CTQ's)

for example, the board's erasor, CTC is grib size, while CTQ is width since it delivers the CTC

tex & pants, choco bars

CTQ: are internal concerns
CTCs overall. usually not measured
sometimes ctQ is ctc like amoul of sugar . . .

Assignment
choose a product & determine CTQ & CTC

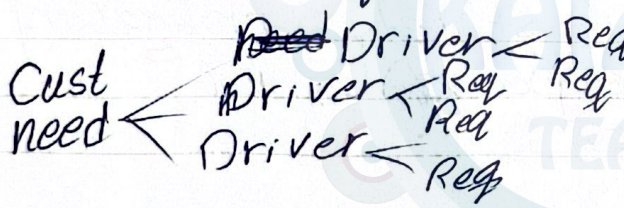
Fine → CTC : tissue softness & ability to ~~handle~~ absorb wetness
CTQ : Kaymene & softners dozage chem like used & ?.

Lec 13 :

Why identify CTQ's ?

80/20 to focus on what matters. so resources are used on what is imp

CTQ Tree :
tool to know & convert cust needs into measurable requirments. (each need has a tree)



- ex: HVAC service call

- steps from the book

Lec 14:

Cost of poor Quality ...

Ideal

External failures: after the product is delivered it happens was good before

Why we do this? to know the cost of poor quality $ is it worthy to work on its improvement

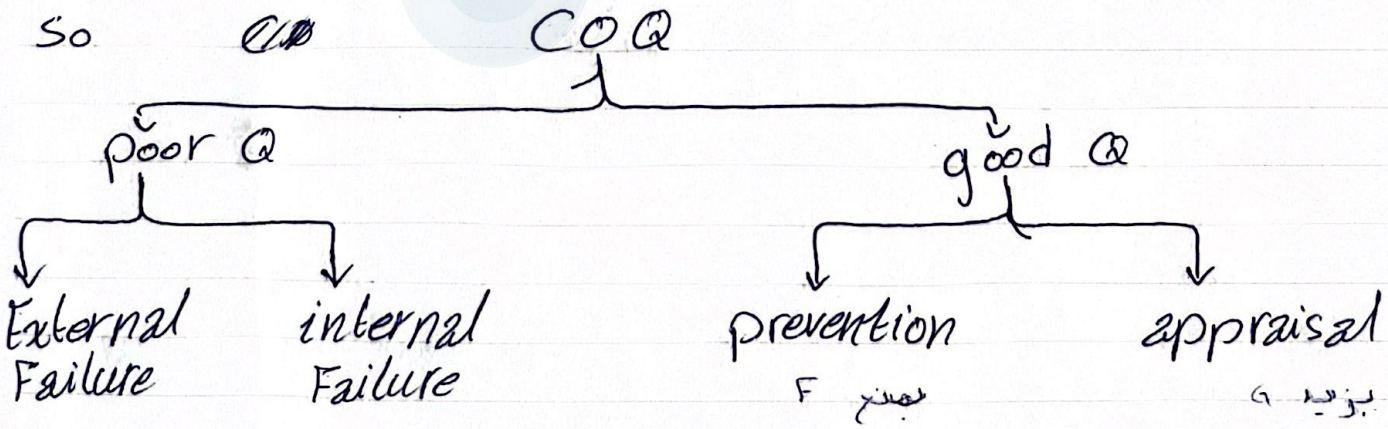
*Calculating the cost of poor quality (COPQ)
- examples

COPQ = CO Ext failures + CO internal failures

* There are hidden costs, usually estimated

- Cost of good quality (of conformity) → prevention, appraisal

So COQ



* definitions & ex. of. each

The thing is as 6σ team we want to have a good Q product from the beginning, & as defects reduces drastically the cost does as well (poor Q cost)

σ leve	COQ as % of sales

to min Costs, we start with COPQ then go to COQ

Lec 15

* Juggling the right amount of projects

- How many & projects?

- regarding the project an organization can:
  - fund
  - support with resources
  - manage

* Exculive, decision matters, & experts identify imp opp & launch project since they know the firm strategy, goals & resources

* 5 steps procedure to identify viable & proj.

1) Data Base review of current state of org: by high level checking:
   - internal resources (complaints, reports)
   - external
   - there questions should be asked

2) Brain storm & potential projects description
   - 5 why's

3)

4)

5)

Lec 16

The project viability model

Viable = worthy of 6σ project

15 criticia points

* based on potential opp we created a list of 11 projects previously, so now we score the projects

1) sponsorship
2) Corporate alignment
3) Data
4) Definition of defect (well defined prob
5) Stability (process stable with no overhauled
6) Customer
7) Benefits (cost benifit ratio)
8) timeline (short)
9) solution (if clear no need for a proj
10) Implimintation
11) Required investment
12) Avilable 6σ R (Black & green belt)
13) Inputs can be controlled (
14) Redesign (no need for a complete redesign(
15) process quality is improved (no -ve impact

The ones responsible for the selection process are high level (green & black bel

* we transform the criteria into a

| criteria | weight 1-5 | 1 | 2 | 3 | 4 | 5 |

for each project

Weight

1 → 0.43
2 → 0.7
3 → 1
4 → 1.3
5 → 1.7

* so after answering the No → yes with 1, we transform it according to weight, then column totals, the we take each total & multiply by No → yes, then sum the then sum of the totals without multiplication, then devide & get the score to check with via model scores

Lec 17

in case I have multiple projects, weight should be the same

* pic 15/4, in class assignment & it is viable

Lec 18 : Ch-10

selected the project → now selecting team

teams
- 1) enterprise wild level
- 2) team level

1) managment, decision makers, & experts
* their roles

2) selecting this team members is by 1, the team contains
- regular (attend all things)
- ad hoc (just when needed)
- non-regular resource (" ")

* not all members of the team will serve consistently thro the entire project life

* more details about the team. minimum. members. role

Lec 19 :

* Team members Roles & details from the book

- six segma leader is the one responsible for Project exution