STQA

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Unit-6 Testing framework.

* Software Quality

→ The degree to which a system, component or process meets specified requirement

→ meet User need or exceptations.

Quality Factor.

1. functionality
2. Reliability
3. Usability
4. Efficiency
5. Maintainability
6. Portability

* Software Quality Dilemma

1) focus on deadline or quality
2) Bad quality no will buy and Very high quality which mean high cost and no one will buy it.
3) fast delivery or risk.

Cost or Risk

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Software Quality Assurance.

* The function of software quality that assures that the standard, processes, and procedure are appropriate for the project and are correctly implemented.

Objective

1) To provide Mechanism for Measuring and report defect.
2) Reduce cost
3) To provide Multi testing Strategies
4) Reduce risk
5) Security
6) Satisfy all quality factor.

SQA Element

1. Standards → must adopted by company
2. Review and Audits →
3. Testing
4. error / defect Collection and Analysis
5. change Management
6. education
7. Vendor Management.
8. Security Management
9. Safety
10. Risk Managment

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Goal, Attribute and Metrics.

Goal	Attributes	Metric
Requirement quality ↓ All requirement are stated	(a) Ambiguity	no. of ambiguous modifier
	(b) Completeness	no. of TBA, TBD
	(c) Understandability	no. of Sections / subsection.
	(d) volatility	no. of change Per requirement time
	(e) Traceability	no. of requirement not traceable
	(f) Model clarity	No. of UML model.
Design quality ↓ (t matching requirement	(a) Architectural integrity	Existence of architectural model.
	(b) Component	
	(b) Interface Complexity	no. of component having complex structure
	(c) Pattern.	no. of pattern used.
Code quality ↓ Good	(a) Complexity.	Cyclomatic Complexity.
	(b) Maintainability	Design factor
	(c) Understandability	no. of comments.
	(d) Reusability	no. of reused component
	(e) Documentation.	~~Rat~~ Reability Index.
QC effectiveness ↓ planned use	(a) Resource allocation	Staff hour Percentage per activity
	(b) Completion Rate	Actual Vs. budgeted time
	(c) Review	See review Metric
	(d) Testing Effectiveness	no. of error, bug,

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Formal Approaches of SQA

(a) Define Quality
(b) Measure Quality
(c) Improve Quality

Statistical SQA – follow

4 steps

(I) Information about Software error & defect is collected & categorized

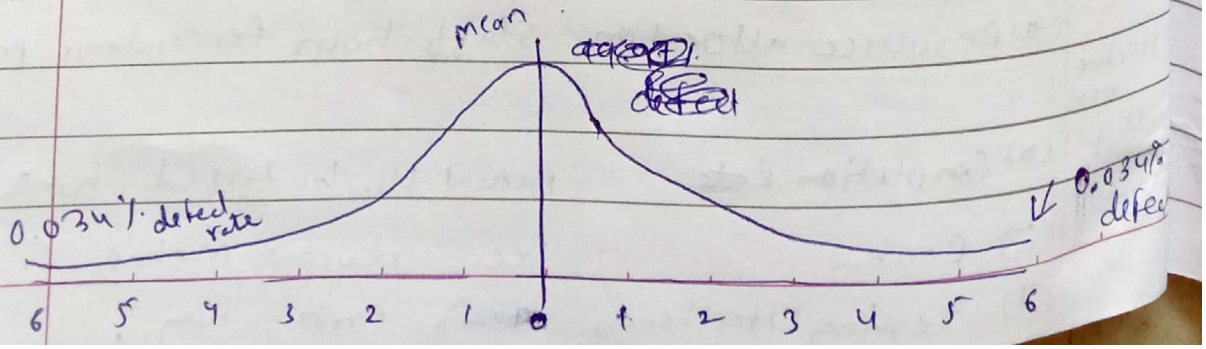
(II) An attempt is made to trace each error & defect to its underlying cause.

(III) using the pareto principle (80% of defect can be traced to 20 % of all possible cause), isolate / solve the 20% defect first

(IV) Slowly start solving 20%. & you will end up solving all.

Six Sigma (6σ)

* Process of improving quality by identifying and eliminating the cause of defect and reduce variability in manufacturing and business process.



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*characteristics

1. Statistical quality control => uses 6, Standard deviation.
2. Has 2 method DMAIC, & DMADV.
3. fact and Data-based approach
4. project and objective based focus.
5. Customer focus.
6. Teamwork process.

Methodologies.

① DMAIC → used for existing ~~business process~~

(a) Define - (a) Determine what issue you are facing
(b) customer requirement.

(b) Measure : ~~How the Sofi~~ (a) Measure the problem
(b) no. of defect etc.

(c) Analyse : cause of defect.

(d) Improve : make change in product to eliminate defect.

(e) Control : create control plan to keep an improved process at its current level.

② DMADV - used for new product design

(a) Define : define problem.

(b) Measure : Measure customer needs.

(c) Analyze : Analyse the process to meet customer need.

(d) Design : It design a process

(e) verify : It can verify the design performance.

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ISO-9001 Quality standard.

- International organization for standardization; 9000 is the set of standard related to software quality.
- quality management & quality Assurance.
- help company to ensure the quality & product

Quality Management principle (QMP)

1) Customer focus :- Company should understand customer requirement and aim to exceed customer expectation.

2) Leadership :-> Lead the team, proper direction.

3) Engagement :- Employee at every level should be involved.

4) process :- Manage all the activities and related resources as a process that will bring result.

5) Improvement :- Should improve the performance

6) Evidence based decision Making -
   -> Analysis & data and info leads to effective decisions

7) Relationship Management :- Should establish good relationship with Supplier, partner, etc.

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Advantage of ISO Standard.

→ It has the effect on business
→ work efficiency increase
→ customer satisfaction.
→ Increase the confidence of stakeholder, and consumer

Limitation of ISO Standard.

→ Certification doesn't mean good quality
→ High time, cost of Certification.
→ No gaurantee of Success.

* **SQA plan :**

→ It is a document that specifies the process to be followed in each step of the software development.
→ template of all activities.
It include
(1) project planning
(2) Model of data, classes & object, design architecture
(3) SRS
(4) Test plan for testing SRS
(5) User Manual, online help
(6) Audit & review.

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Total project Quality Management (TQM)

It is a Management approach that seeks to provide long-term sucess by providing unparalleled customer Satisfaction through the Constant delivery of quality IT service.

T = Total (overall)
Q = Quality (fitness for purpose)
M = Management (directing, controlling etc).

PDCA follow

Plan - planning
DO - execution
Check - checking
ACT - Action on detect.

- It is Management for Continuous Improvement in product.

* Key element

(a) Total Employment involvement
(b) customer focus.
(c) leadership
(d) engagement
(e) process
(f) Improvement
(g) Decision making
(h) Relationship Management.

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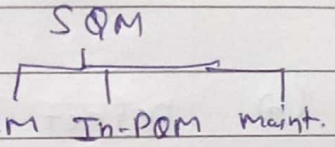
Benefits of TQM
→ Market image ↑
→ Improve Customer Satisfaction
→ Total quality improved
→ Reduce defects
→ enhance share holder.
→ Increase loyality of customer.

product Quality Metrics



→ It describe the characteristic of the product such as size, complexity, design feature
→ Measure Excellence of a product and its feature.
It include
(a) Mean Time to failure.
→ time b/w failure.
(b) Defect density
→ defects relative to Software size
→ LOC, function point.
→ It measure Code quality per unit
(c) Customer problem.
→ It measure the problem while using product as user.
→ Problems per User-Month (PUM)
(d) Customer Satisfaction
→ Very satisfied, Satisfied, Neutral %
Dissatisfied, very dissatisfied. %

In process Quality Metrics

→ tracking defect arrival during formal Machine testing for some company.

It include

(a) defect density during Machine Testing
- → defect rate in field
- → KLoC or function point.

(b) Defect arrival pattern during Machine Testing
- → It give more info.
- → By time interval. (eg. week).
- → pattern of valid defect arrival
- → pattern of defect backlog overtime.

(c) phase based defect removal pattern
- track the defect at all phase.
- inspection coverage Metrics & Inspection effort metrics.

(d) Defect removal effectiveness

$$DRE = \frac{\text{defect remove in each develop. phase}}{\text{defect latent in product.}} \times 100$$

- high indicate good product.

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Maintenance Quality Metrics

-> During Maintenance :

(a) fix blacklog and ~~b~~backlog Managment indix.

$$BMI = \frac{\text{no. of Problem closed in month} \times 100}{\text{no of Problem arrived in Month.}}$$

(b) fix response time and fix responsiveness.
→ mean time to close problem.

(c) Percent delinquent fixes.

$$= \frac{\text{no. of fixes that exceeded the response time by Ceverity level} \times 100}{\text{no. of fix derived in specified time.}}$$

(d) fix Quality.
- no. of defective fixes.
eg. → not fix reported prblem
eg. → fix create another prblem.

Ishikawa's 7 Basic Tools

→ useful for planning or controlling project quality

(1) Checklists.
- collecting and organizing measured or counted data.
- left hand side problem and Right hand side frequency.

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~~error qu~~

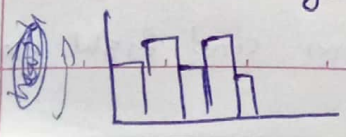
Benefit → collect the data in a systematic and organized manner.
→ determine source of problem

error		total
Er1	|||| |||| ||||	12
Er2	||||	4
Er3	|||| |||	7
er4	|||| ||	7

(2) Pareto diagram.
- purpose :→ prioritize problems.
→ Combination of bar and line graph.
- value by bar
- percentage by line

Benefit :) ① What to do first
② graphical representation.

(3) Histogram.
- range of value in time period.
→ easy to get the area of improvement



Class interval :) frequency = height

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Benefit

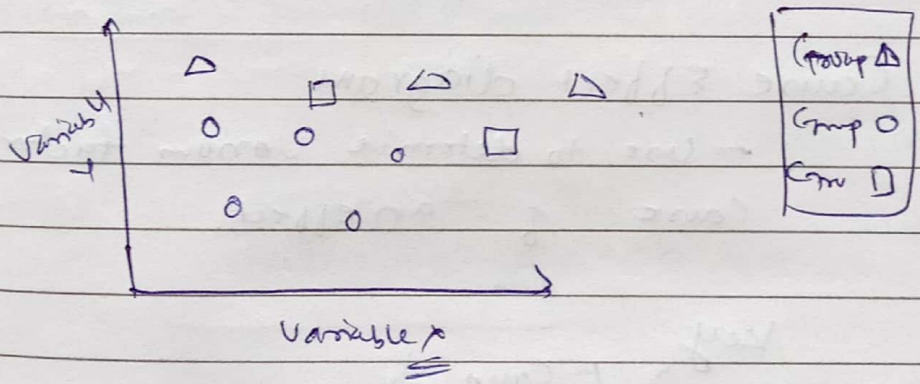
→ show process behaviour
→ Starting point of Improvement.
→ determine the spread or variation of data.

④ Run Chart.

Stratification: taking data set and breaking it down into categories.

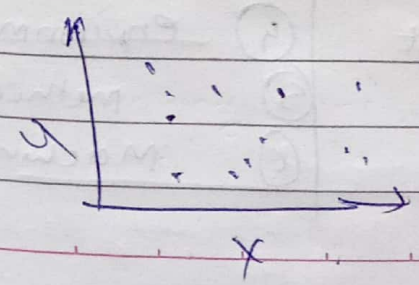
→ ~~Same data is~~ It help you to determine the cause that might not visible in together.

It is graph that display observed data in a time sequence



⑤ Scatter Diagram.

- relationship blw 2 variable
- Cause and Effect relationship.
- dob.

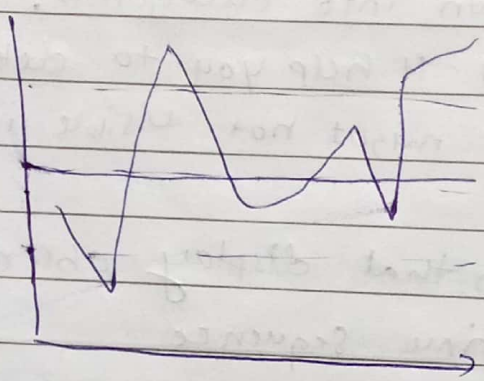


(6) Control chart.

→ Track the value of a process over time.

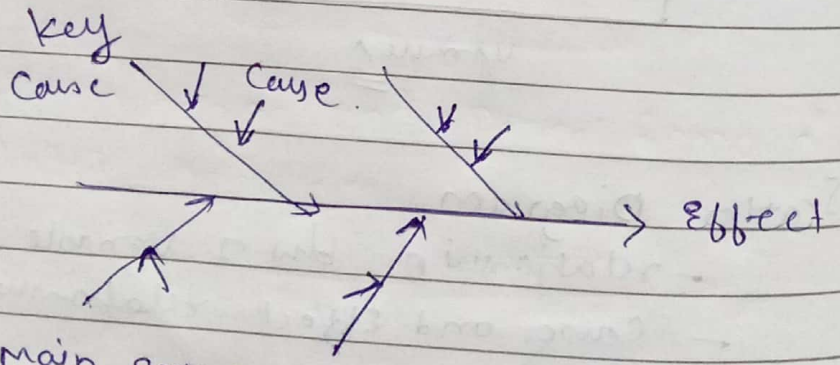
- It consist of a central line represent average or mean, and 2 parallel line that represent upper & lower control limits.

→ help to determine whether the process is stable or not.



(7) Cause Effect diagram.

- use to determine various factor or cause of an effect.



Six main group.

1. Measurement
2. Material
3. Personnel
4. Environment
5. Method
6. Machine.

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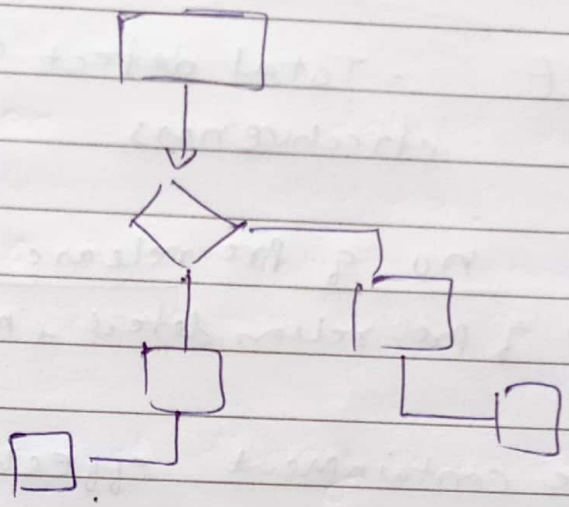
Benefit ① easy to find the cause of defect
② Road map for process.

Bonus: flowchart
- Sequence of step in a process.



Defect Removal Effectiveness.

→ It measure the Defect Removal efficiency.

→ DRE = $\frac{\text{Defects removed}}{\text{Defect latent in the product}} \times 100\ \%$

Some definition

① Error detection Efficiency = $\frac{\text{Error found by inspection} \times 100}{\text{Total error.}}$

② Removal efficiency = $\frac{\text{Defect found}}{\text{Defect found + Defect not found}} \times 100\%$

③ Early detection percentage: $\frac{\text{no. of major error}}{\text{no. of error}} \times 100\%$

④ Effectiveness Measure

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$E = \frac{\text{no. of faults found by activity}}{\text{no. of fault by activity} + \text{no. of fault found by subsequent activity}}$

Metrice for DRE

(1) TDCE : Total defect Containment effectiveness

$\Rightarrow \frac{\text{no. of Pre release defects}}{\text{no. of pre-relase defect} + \text{no. of post relase defe}}$

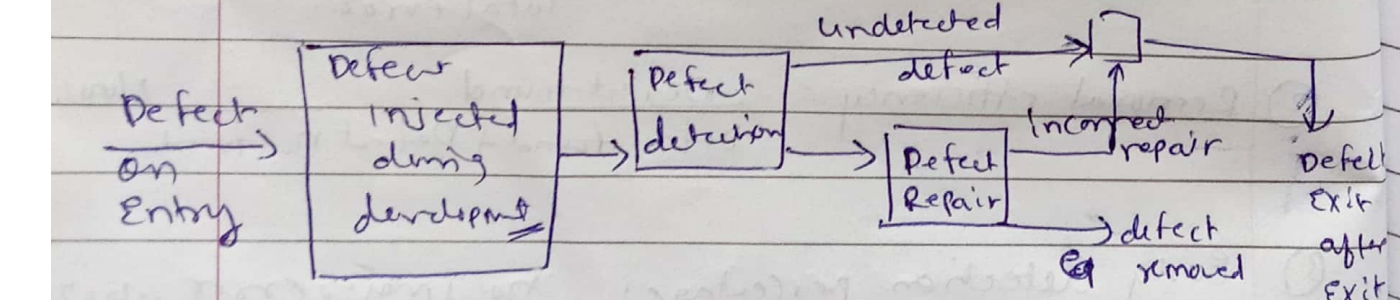
(2) Phase containment effectiveness (PCE)

$\Rightarrow \frac{\text{no. of Phase i error}}{\text{no. of phase i error} + \text{no. of Phase i defe}}$

↓ during development

↓ After development

Defect Injection and Defect Removal Related Activities.



$DRE = \frac{\text{Defects removed}}{\text{Defect on entry} + \text{Defect during development injected}}$