6σ Sigma Green Belt

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Lean Six Sigma Green Belt

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ANEXAS EUROPE

Lean Six Sigma Master Black Belt

Certificate

Certified
Master Black Belt

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Awarded to

DR. KHALID ABU ISSA

for successfully completing
Lean Six Sigma Master Black Belt
certification on May 2020, passing the exam
and demonstrating adequate competence
and skills as Six Sigma Master Black Belt.
He is a certified Lean and Six Sigma Trainer
and Master Black Belt in good standing.

Anexas Europe
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Amitabh Saxena
CEO

May 25, 2020

Certificate No. MBBKSA200520/1599/13

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M.O. Health

Q&P. Safety Conference

KSU – Medical College

P.Noora Univ

KAUH - JOUF

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P.M.N Hosp - Jizan

BURAIDAH HOSP

6σ

Certified Green Belt

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ANEXAS EUROPE

Lean Six Sigma Green Belt

Certificate

Awarded to

YASIR ABDELAZEEM ALKHALIFA

for successfully completing Lean and Six Sigma Green Belt during Feb 2021; passing the examination conducted by Anexas Europe and getting certified as Green Belt by demonstrating adequate competence in application of Lean Six Sigma tools and techniques.

Anexas. EUROPE

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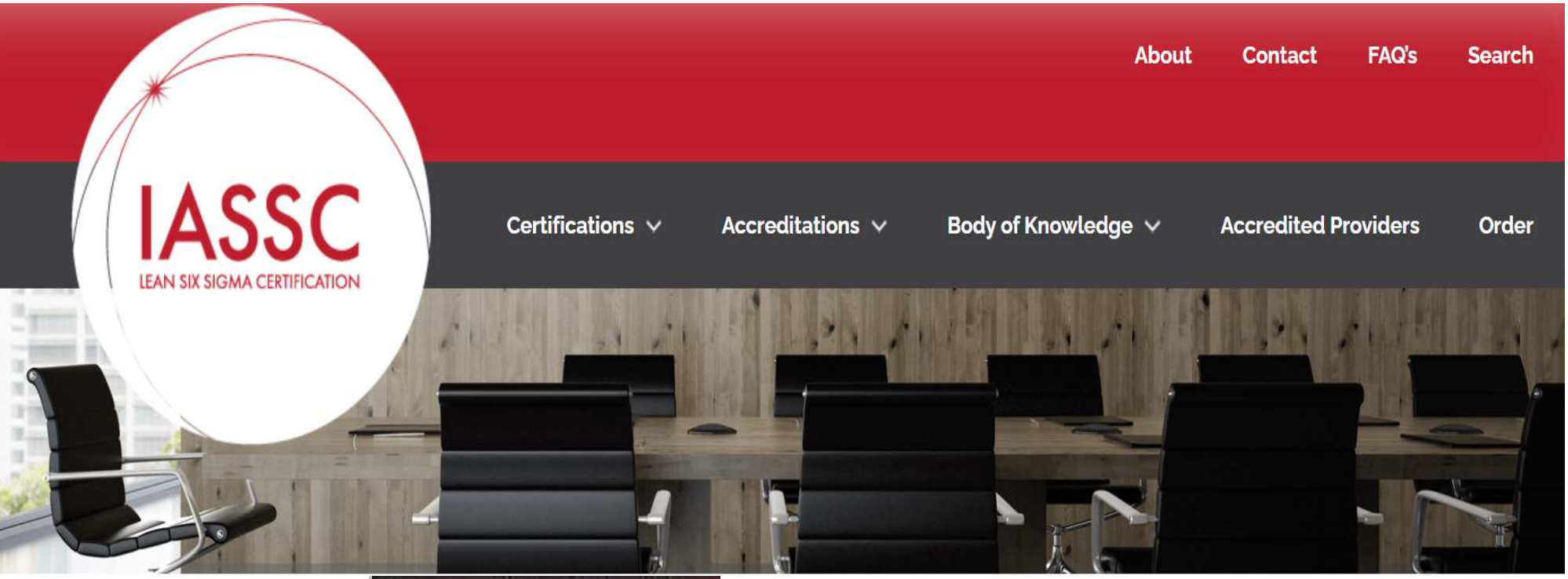
Amitabh Saxena
CEO

Feb 13, 2021

Certificate No. GBKSA120221/1810/08



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Accredited Training Organization of International Association of Six Sigma Certification (IASSC)

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Course Topics

- Understanding Lean Six Sigma
- History and the 8 Waste of Lean
- History Of Six Sigma
- Six Sigma Methodology & Tools
- Roles and Responsibilities
- How you can use Six Sigma

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LEAN SIX SIGMA IS Platform , Open Source

لين 6 سيقما هي منهجية لا تعتمد على قطاع معين و ممكن العمل بها في أي مجال.

لنفترض أنني أعمل الآن في مجال الرعاية الصحية ، وأرغب بعد فترة بالإنتقال إلى وظيفة أخرى في مصنع او شركة او بنك او في عمل خاص بك ، فإنه يمكن استخدام 6 سيقما ، فالمنهجية واحدة ولكن الإختلاف فقط في طريقة العمل؛ لأن كل منظمة لديها عمليتها و طرقها الخاصة بها.

بالتالي 6 سيقما مصدر مفتوح ممكن استخدامها في أي مكان حتى في تطوير ذاتك

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What is Six Sigma?
ماهي سته سيقما؟

Six Sigma is a business statistical strategy to identify defects removing them from the process of products to improve quality

سته سيقما هي استراتيجية احصائية للعمل للتعرّف على الخلل و استبعاده من عملية المنتج لتحسين جودته

A ***defect*** is defined as any process output that does not meet customer specifications

الخلل يعرّف بأي نتاج للعمليه لا يلتقي مع مواصفات العميل

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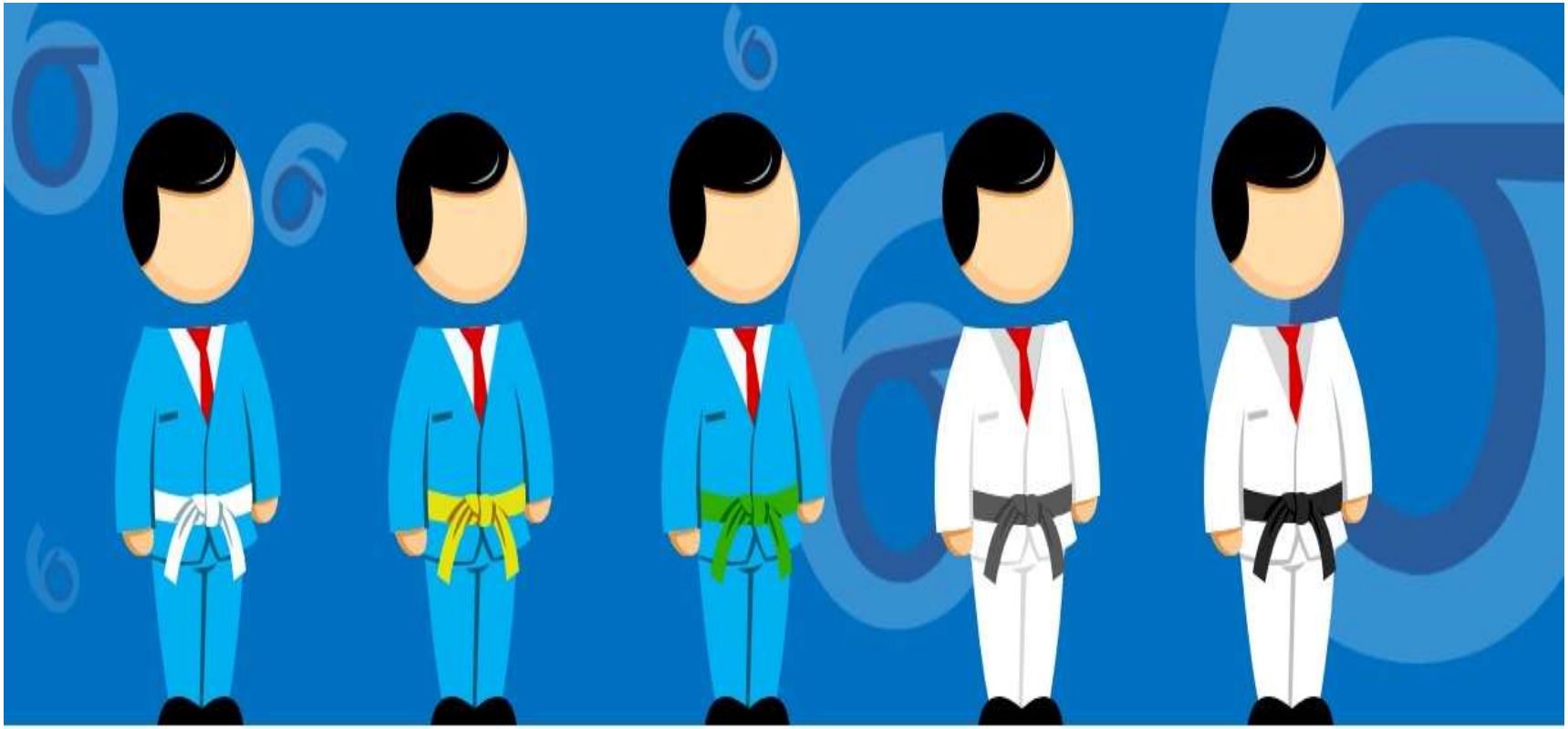
Six Sigma Belts



White belts Yellow belts Green belts Black belts Master black belts

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IS LEAN SIX SIGMA

ONE OR TWO

METHODOLOGIES

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Lean

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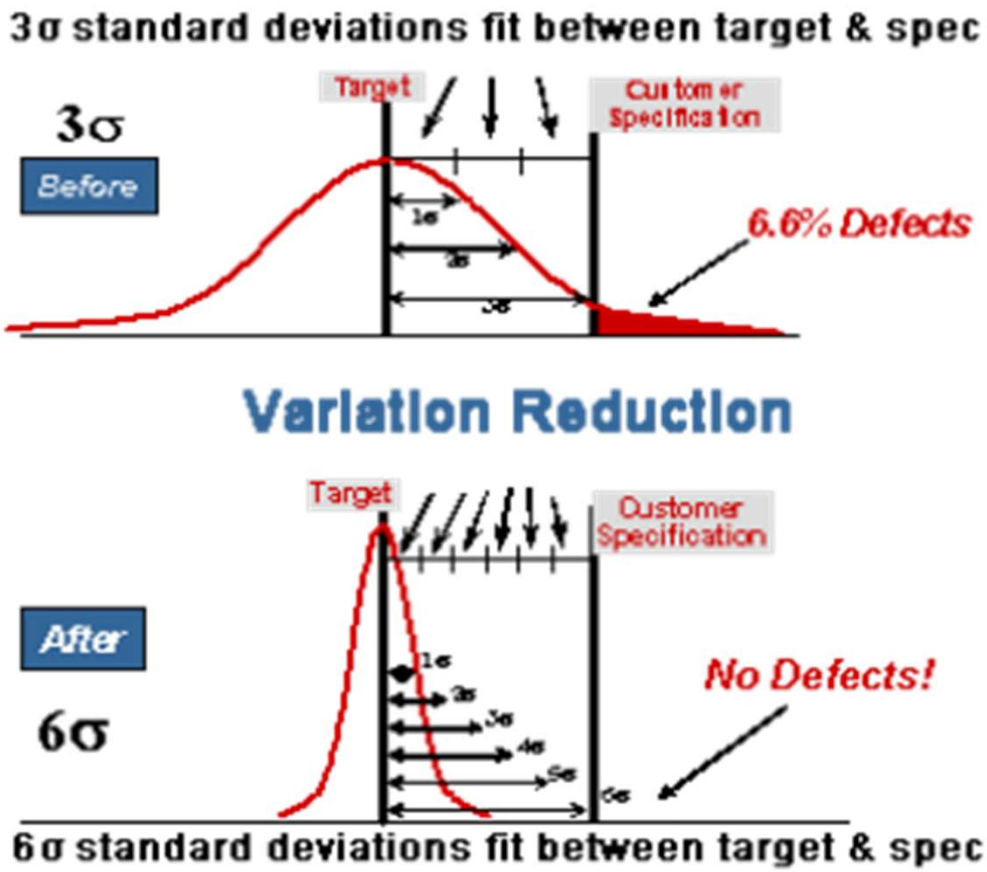

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Lean Six Sigma is one Methodology

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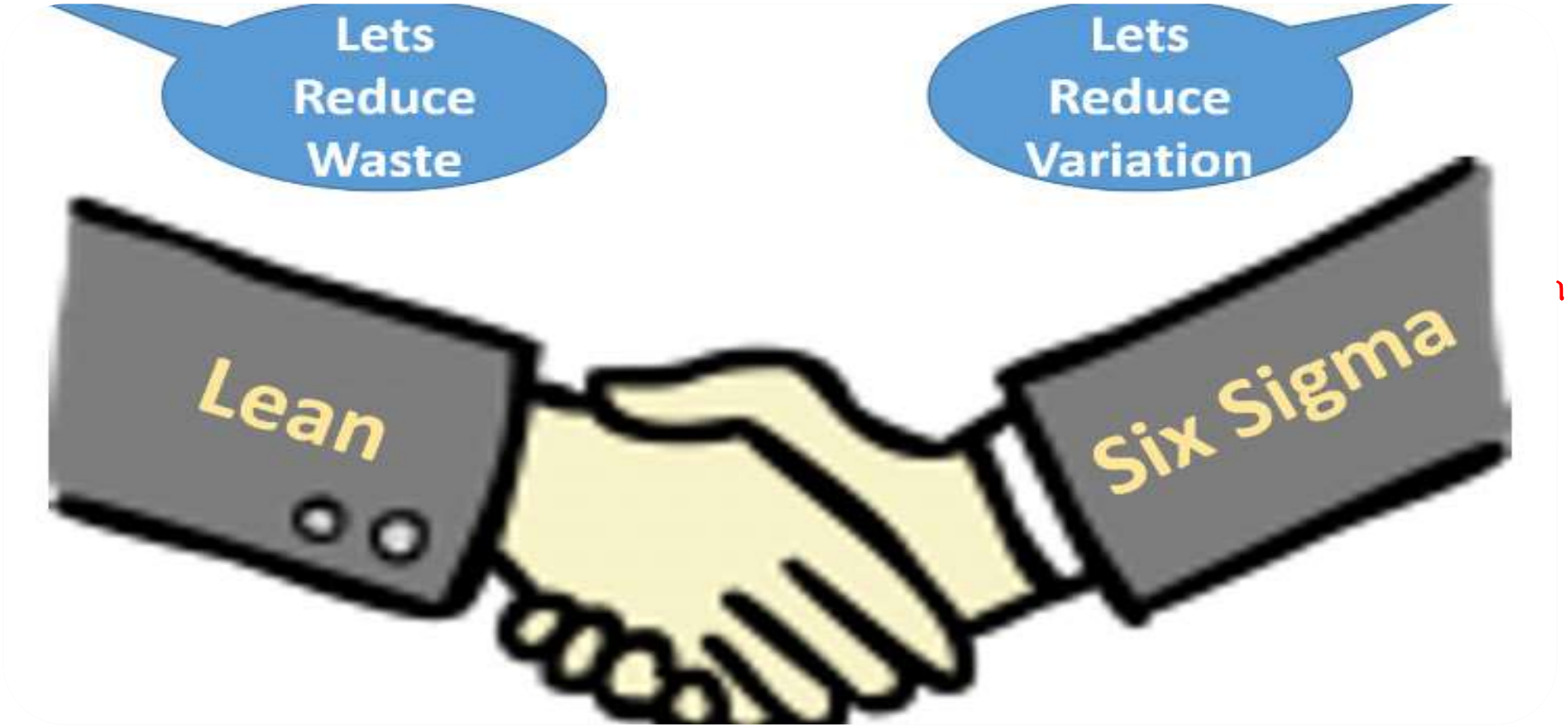

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لين 6 سيقما وعلاقتها بالجودة

هي عباره عن منهجية معينه لحل المشكلات و تطوير جودة الاعمال داخل المؤسسة

الهدف الأساسي من هذه الدورة هو تمكين الافراد من تطوير العمليات داخل المؤسسة و استكشاف الأخطاء وتقليلها لأقصى حد ممكن

ويقوم نظام 6 سيقما على تعريف المشكلات و قياسها ومن ثم تحليلها للتعرف الى أسبابها ومحاولة حلها

فهناك علاقه قوية بين لين 6 سيقما و الجودة و تطويرها

What Is *Quality*?

To do a Right thing at the Right Time and from the First Time

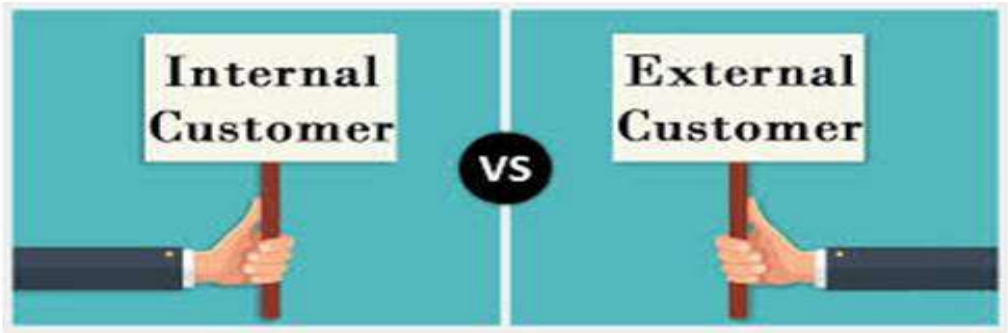
Freedom from deficiencies or defects

Patient Safety

Conformance of standard

CUSTOMER SATISFACTION


CUSTOMER


Internal Customer
VS
External Customer

What is the common Relationship in these pictures

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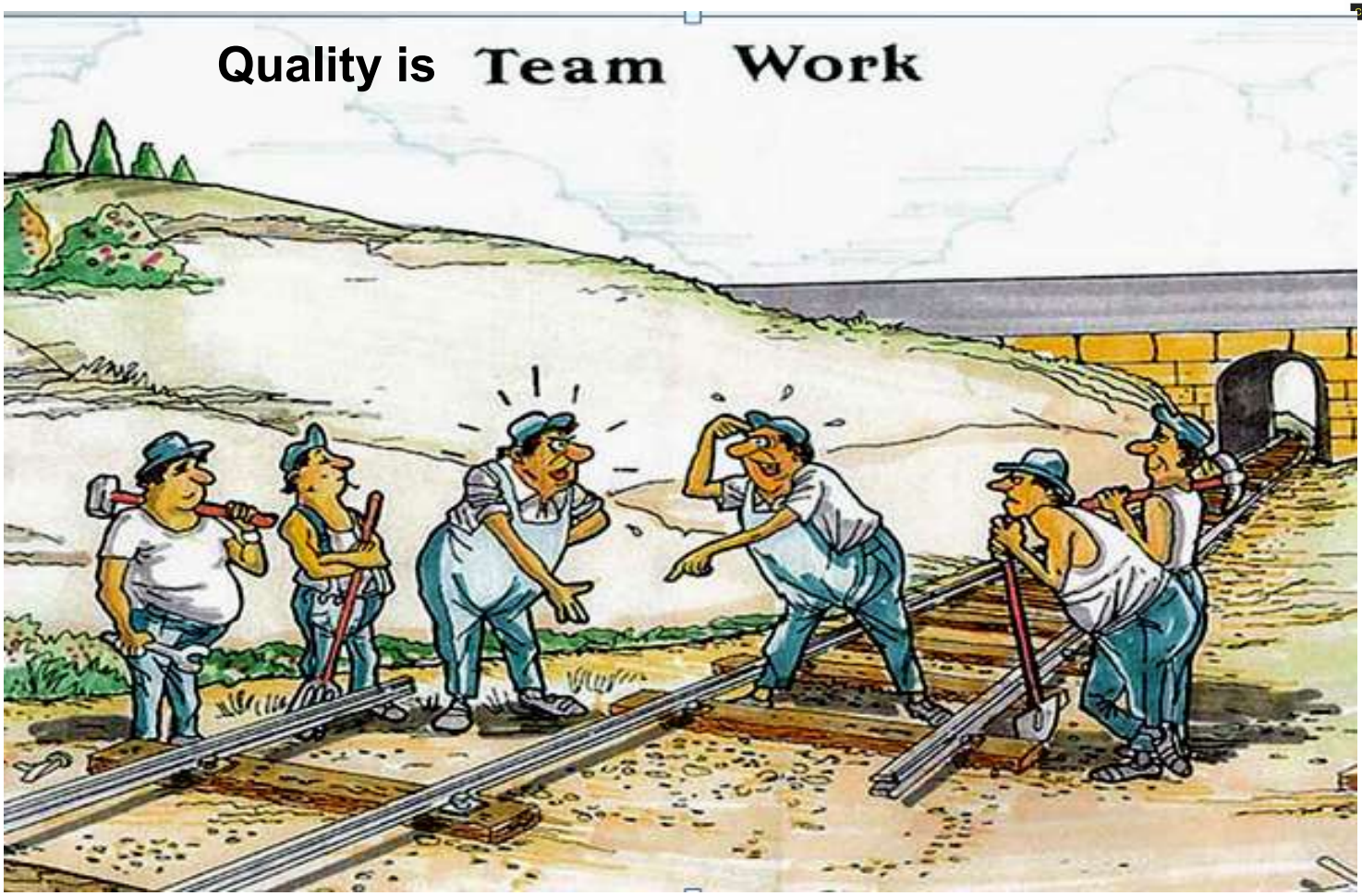

Quality

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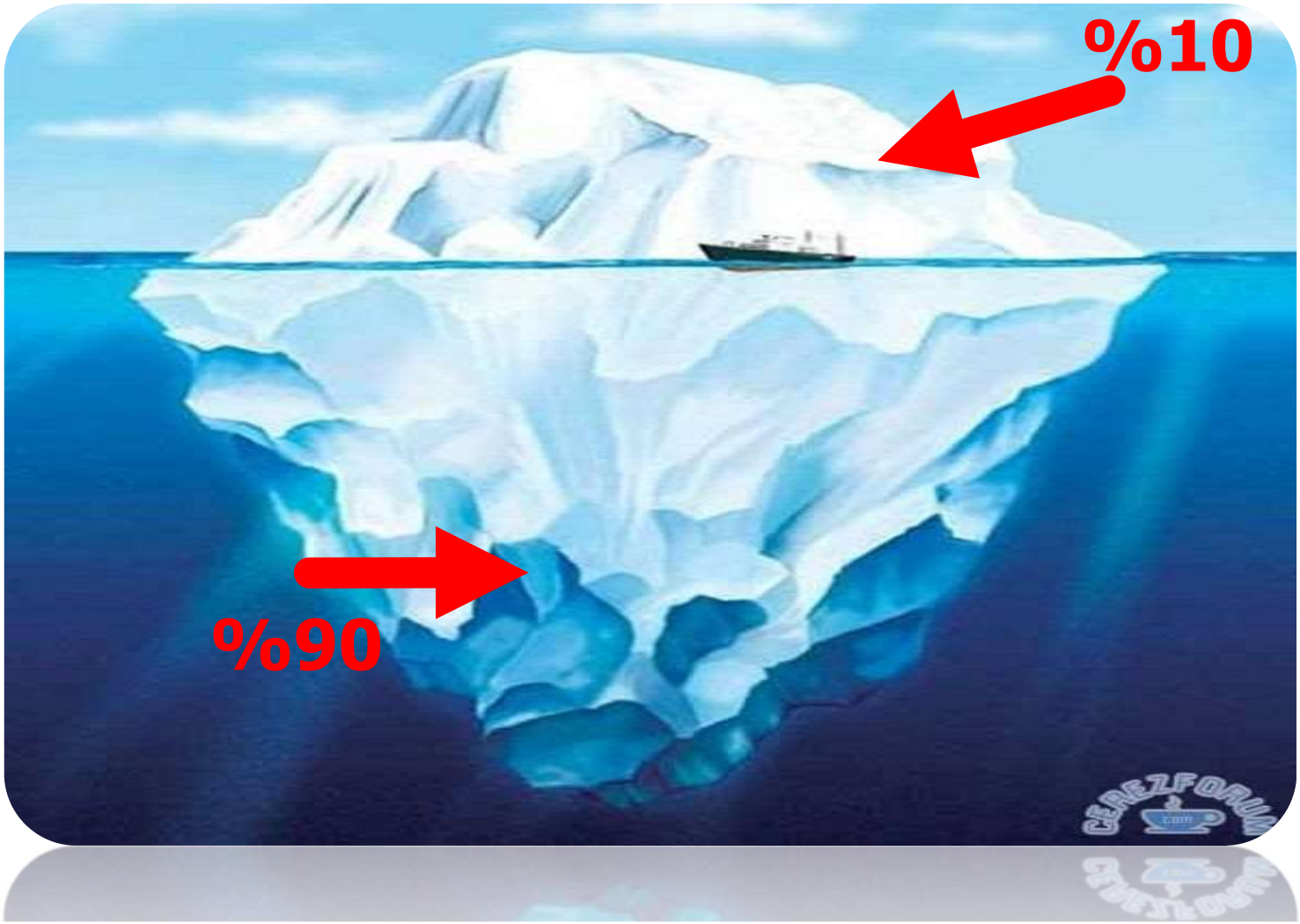

Why to apply Quality

Why Quality ?


Allah
will be pleased
with those
perfect way
إن الله يحب
إذا عمل أحدكم عملا
أن يتقنه


Rapid change


USER:
CUSTOMER
PASSWORD:
EXPECTATIONS


Limited resources


Competition

Work Perfection

The Speed of Change

THE SPEED OF CHANGE
MAKES YOU WONDER
WHAT WILL BECOME
OF ARCHITECTURE

High Customer Expectation and Satisfaction

Competition

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HOW WE CAN BUILD QUALITY ?

What is the Requirement of Quality ?

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Individual and Organizational Requirements

Individual Level

1- Way Of Thinking (Mentality)

- Positive Thinking
- Change before you have to
- You will see it when you believe it

2- Commitment

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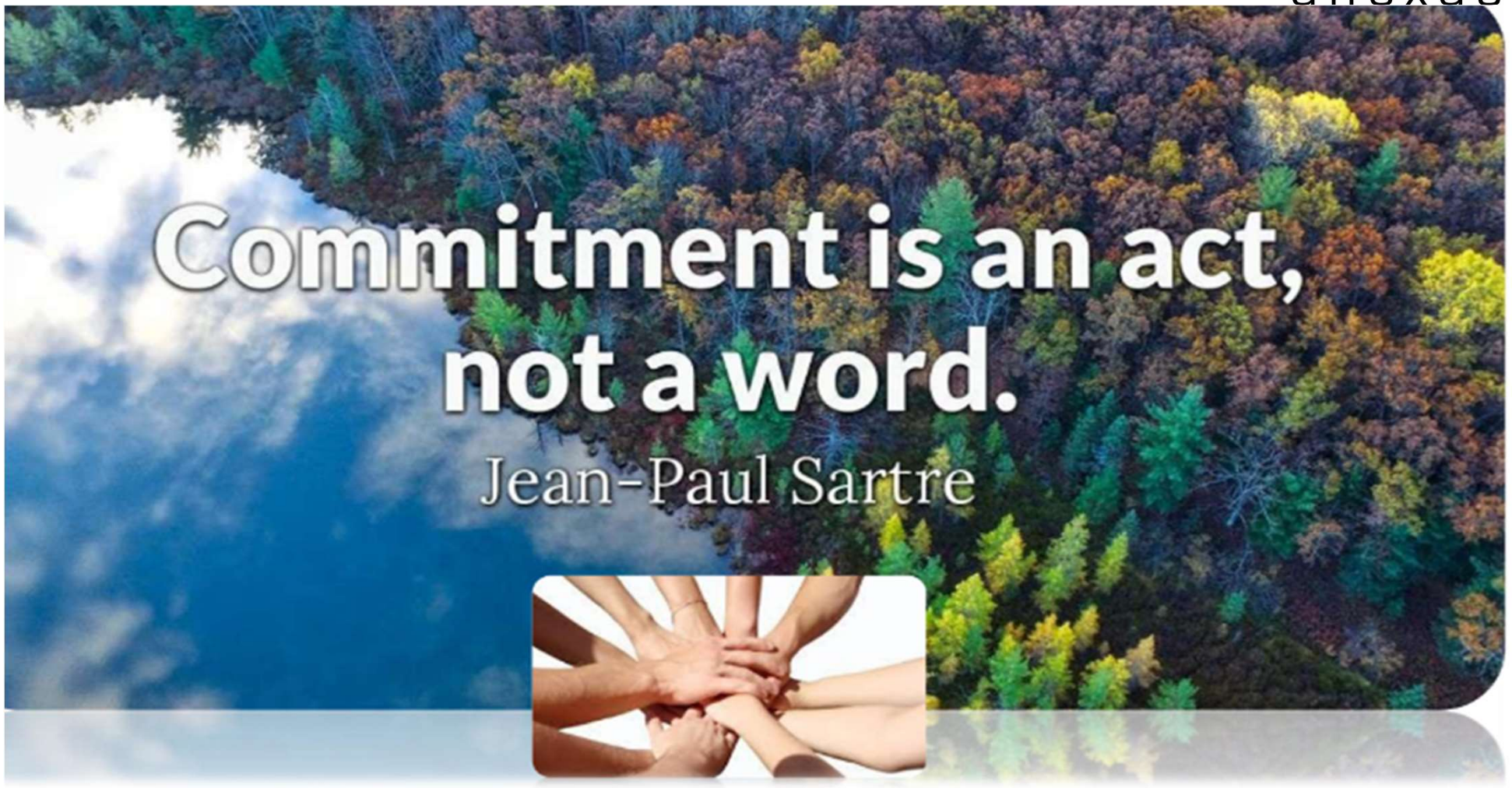

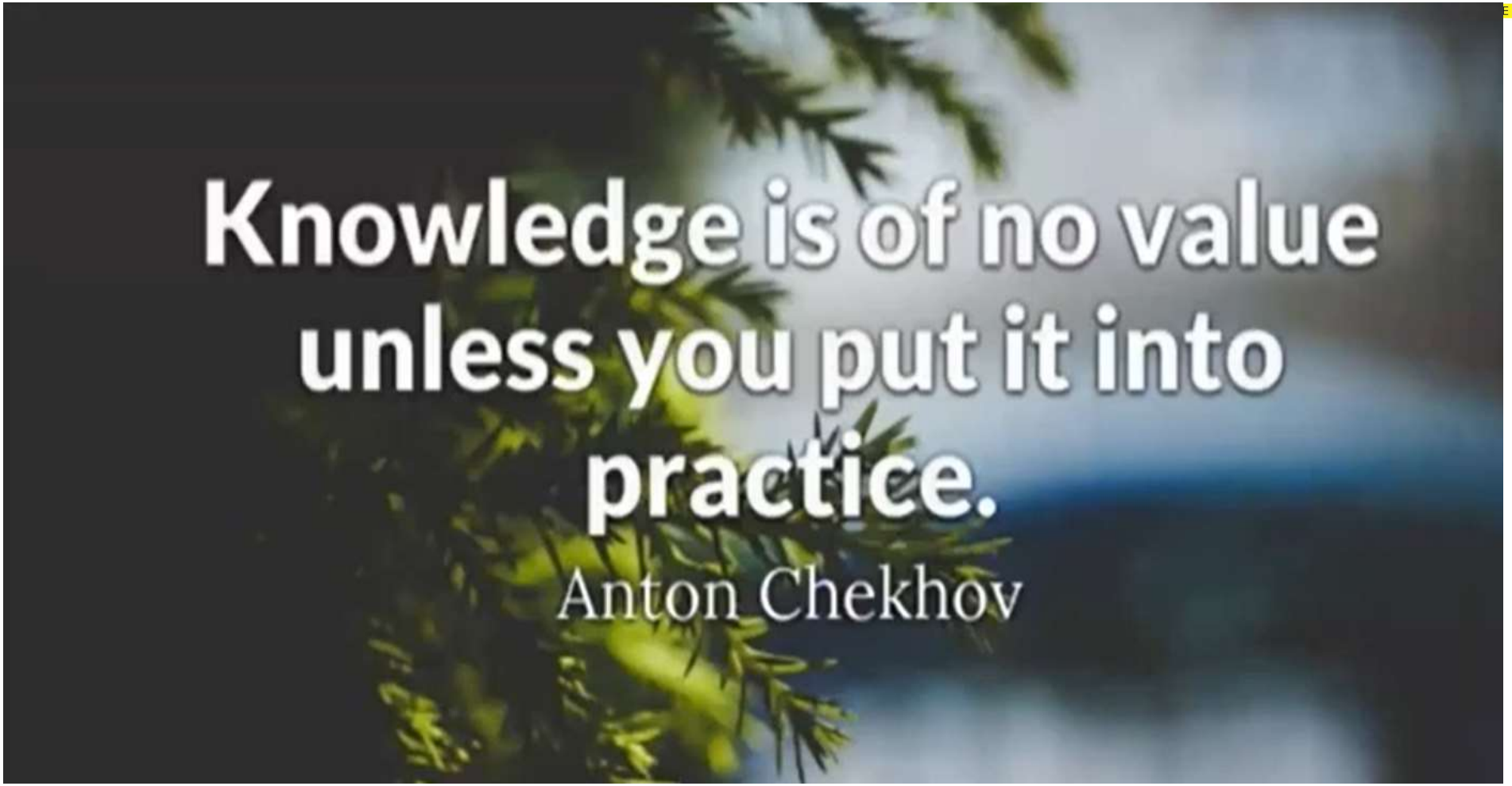
Knowledge is of no value unless you put it into practice.
Anton Chekhov

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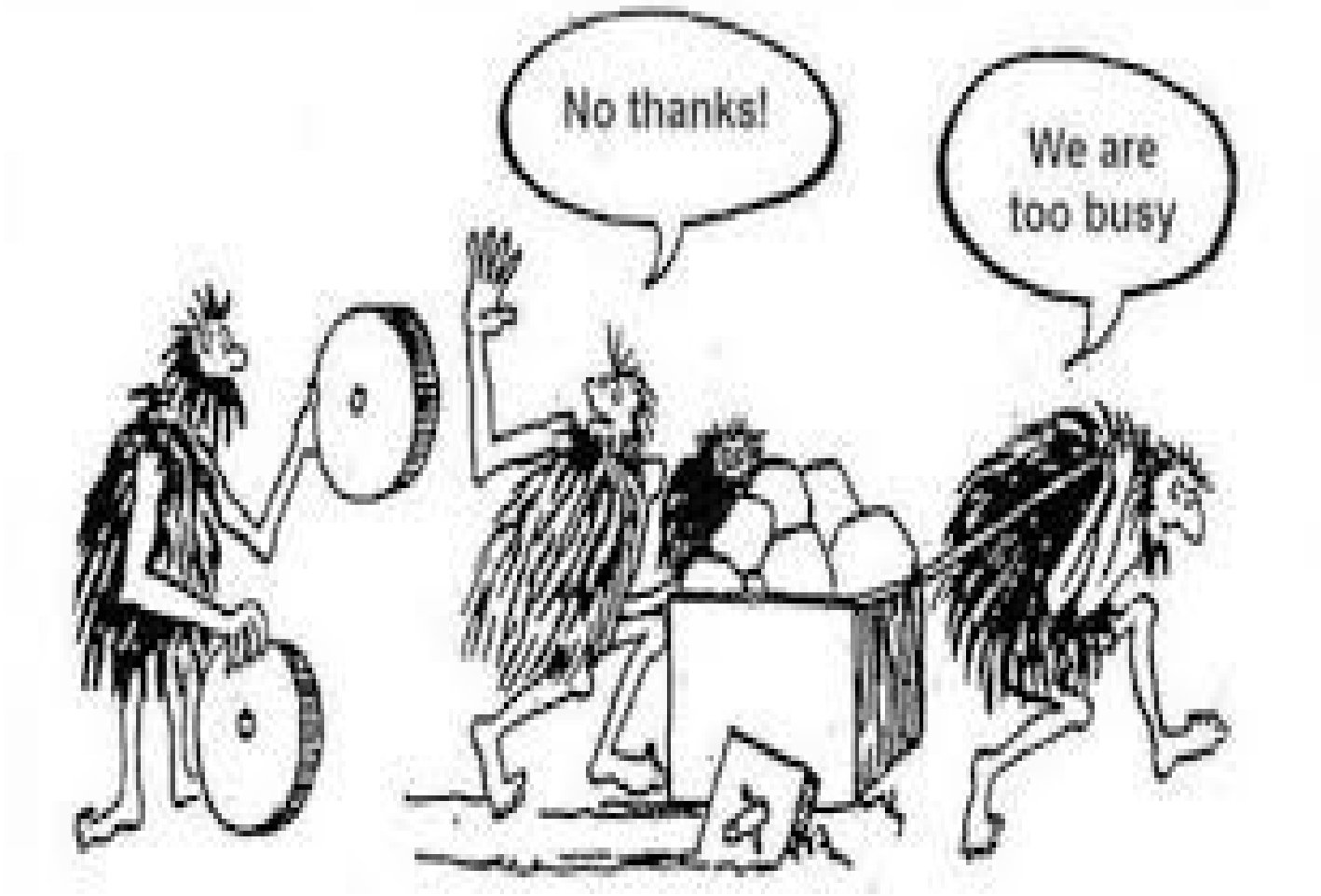

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Requirement in "Organizational" Level

Transformation Thinking

Requirement in "Organizational" Level

Alignment

Requirement in "Organizational" Level

Investment

Requirement in "Organizational" Level

Participation

Requirement in "Organizational" Level

Learning Organization

Requirement in "Organizational" Level

Transparency

Requirement in "Organizational" Level

Respect of Employee

Requirement in "Organizational" Level

All Win

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Requirement in "Organizational" Level

Quality All Responsibility

Is

the access road
to quality
furnished with

Flowers!

Barriers

Conceptually .....

At the Resource level .....

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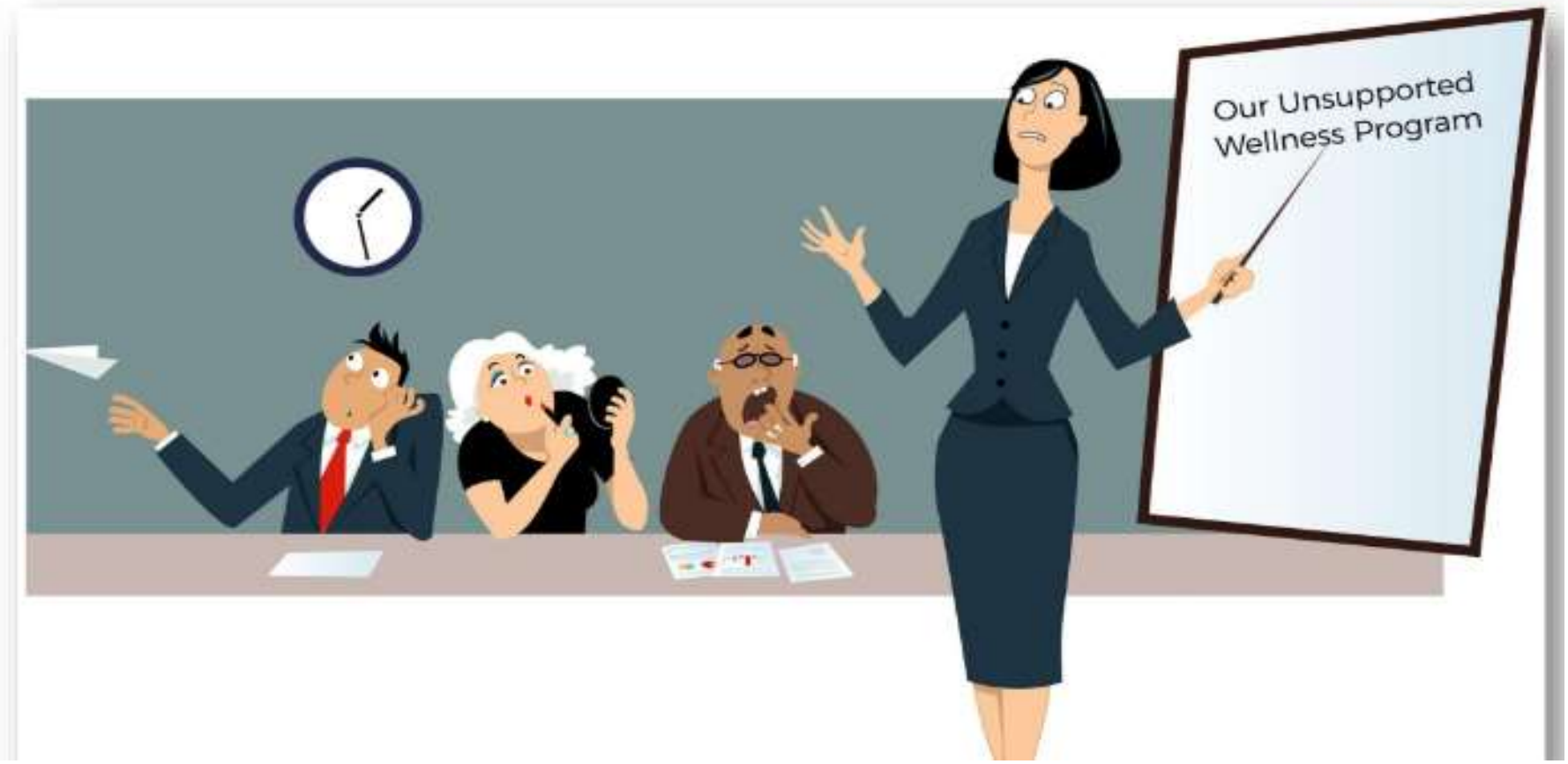
At the Top Management level .....



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At the Staff level .....

At the System level .....

A POWERFUL UNION

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Lean + Six Sigma = Lean Six Sigma

Lean

Systematic Methodology
Introduced by Toyota 1970

Process Drive Methodology
- **Reduce waste from process.**
- **Remove non value added from the process.**
- **Streamlines a process.**
- **Increase process speed.**
- **Improve the process.**

6 Sigma

Set of techniques and tools
Introduced by Motorola 1990

- **Data driven methodology.**
- **Reduces variation 6 timed from the customer requirements.**
- **Solve problems.**
- **Optimize the process steps and improve quality.**

Lean Six Sigma

Lean Accelerates Six Sigma

- **Implemented at 2004**
- **Faster and more efficient.**
- **Problem solving and improvement of a process.**

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Whats Lean ?

Lean means slim

How to become slim ?

By reducing waste

Dose not add any value to the process.

Value added

1- the customer is willing to pay for it.

2- The thing must physically change..

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Waste is any activity that consumes time, resources, or space but does not add any value to the product or service.

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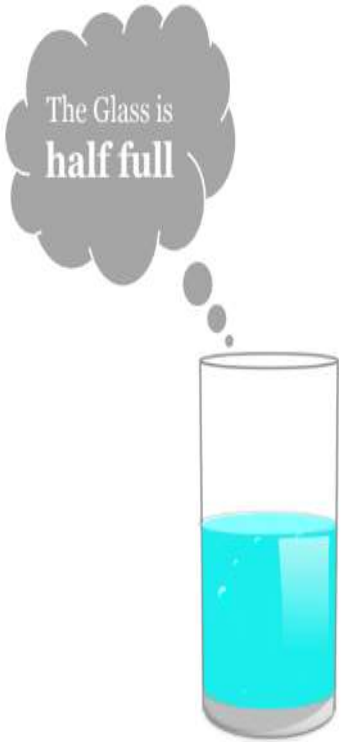
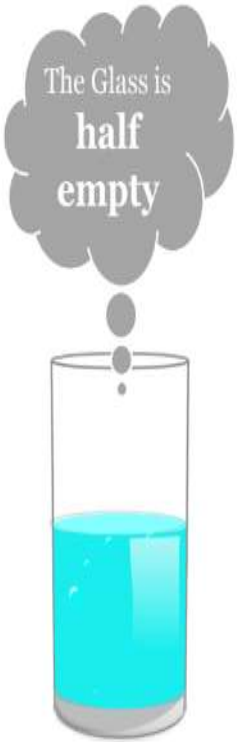
What do you think ?



The Optimist



The Pessimist

The LEAN Thinker

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A very, very brief history of Lean

- 1950
- one of the Toyota founders, Eiji Toyoda
- Visited Ford motor plants in Dearborn
- The Toyota Way or Toyota Production System (TPS)
- smaller batches of parts to be used 'just-in-time‘
- empowered workers to stop the line
- encouraged their workers to propose improvements


1910: Ford moves to Highland Park

A very, very brief history of Lean

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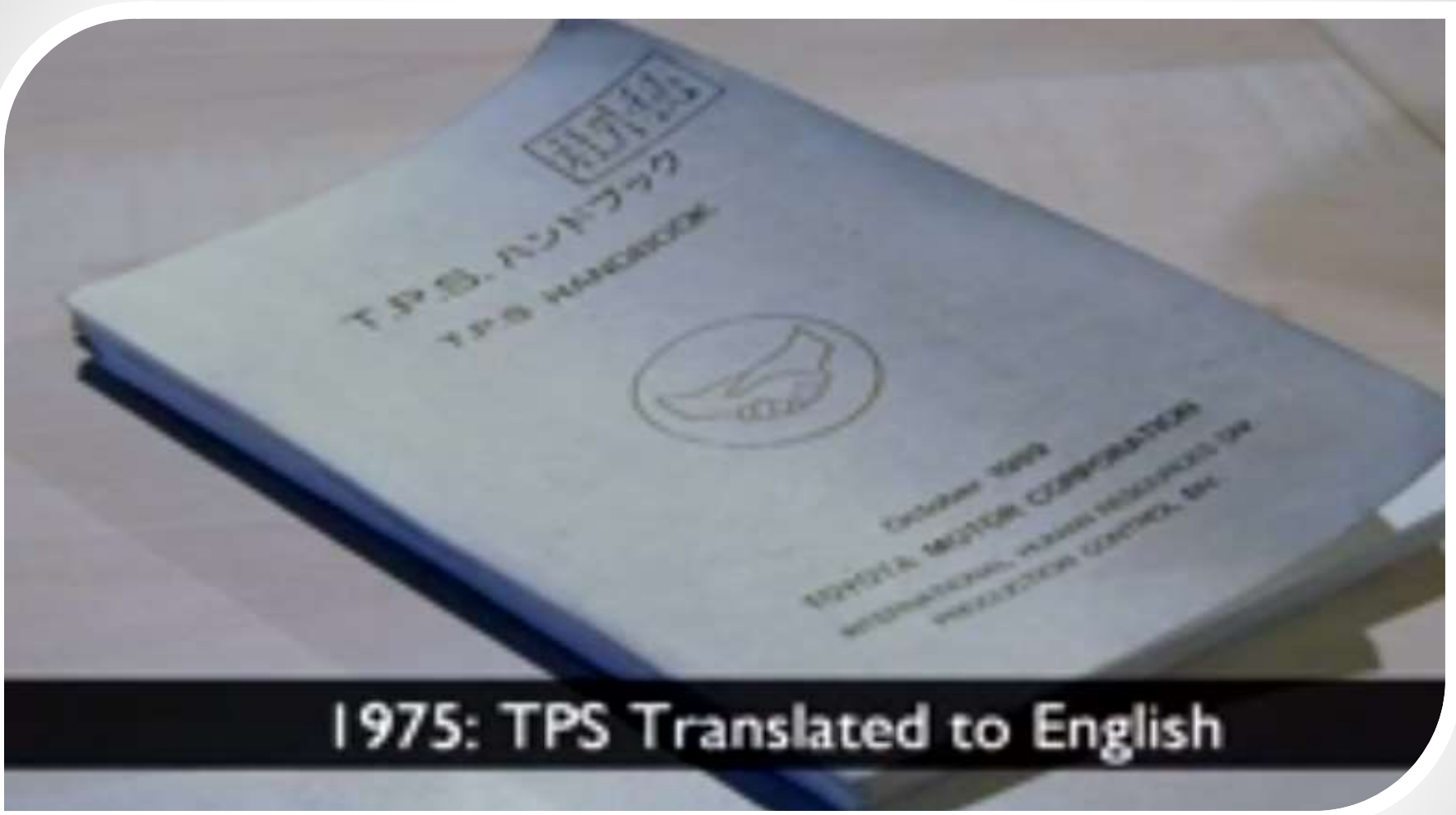

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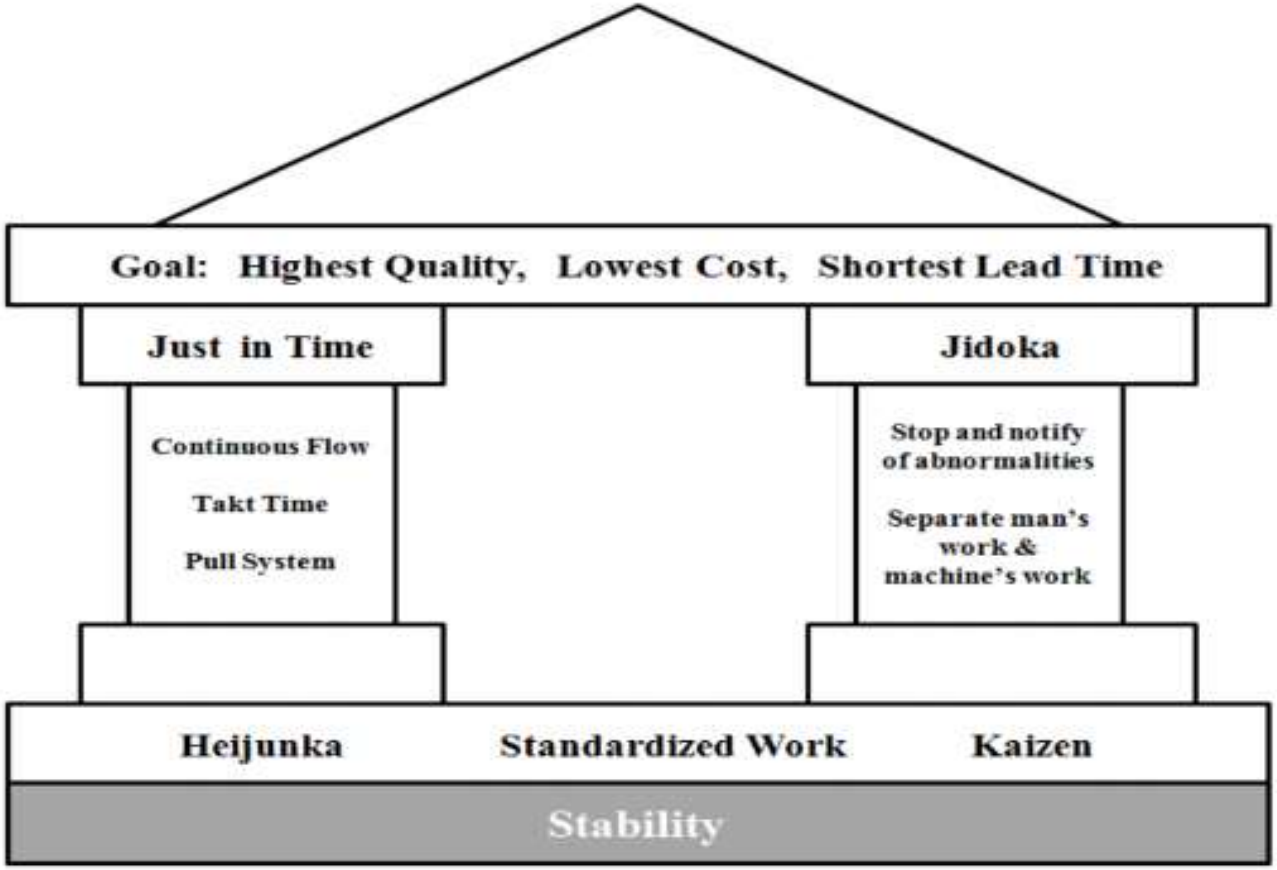
Toyota Production System



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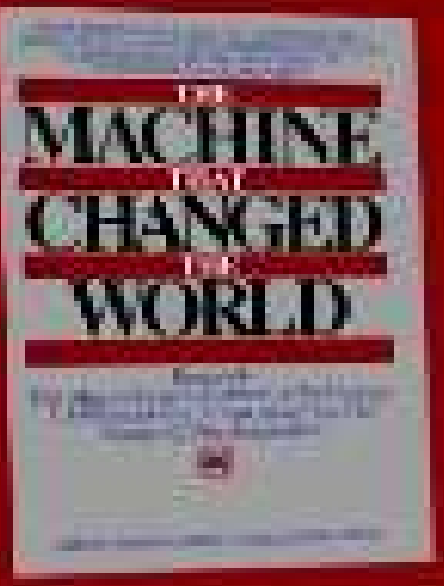
1990: James Womack and Daniel Jones



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7 Wastes of Lean

Unneccessary movement things (parts or machines) between processes

Transportation

Defects

Not right first time, repetition or correction of a process

T D I O M O W

Inventory

Raw material, work in progress or finished goods which is not having value added to it

Overprocessing

Processing beyond the standard required by the customer

Movement

Unnecessary movement of people within a process

Overproduction

To produce sooner, faster or in greater quantities than the customer demands

Waiting

People or parts that wait for a work cycle to be complete

Back Log

External

Internal

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Waste Simple Mnemonics :-

TIMWOOD	DOWNTIME
1. Transportation	Defect
2. Inventory	Over Production
3. Motion	Waiting
4. Waiting	Non Talent
5. Over Processing	Transportation
6. Over Production	Inventory
7. Defects	Motion
8. Skills	

1.Defect

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2.Over Production

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3.Waiting

4.Non-Utilized People

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5.Transportation

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6.Inventory

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7.Motion

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8.Extra Processing

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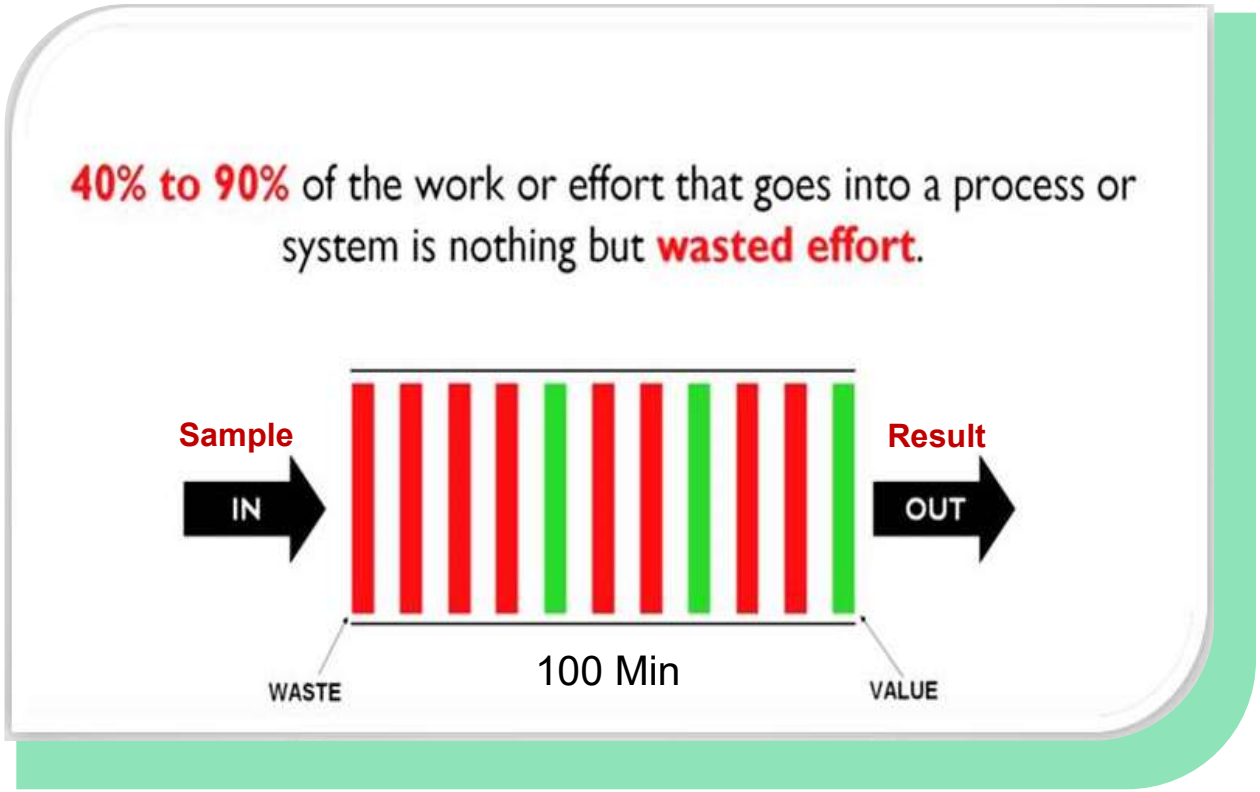
Focus on Processes that deliver customer value



Processes definition:
Particular method of doing something.
Generally involving a number of steps, activities or operations.

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Eliminate or remove waste

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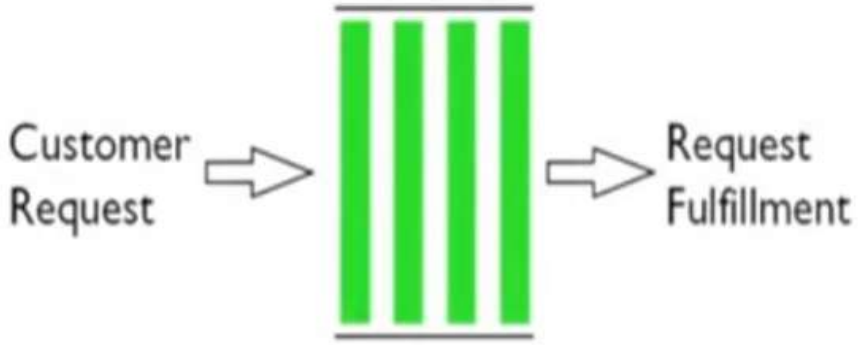

Eliminate or remove waste

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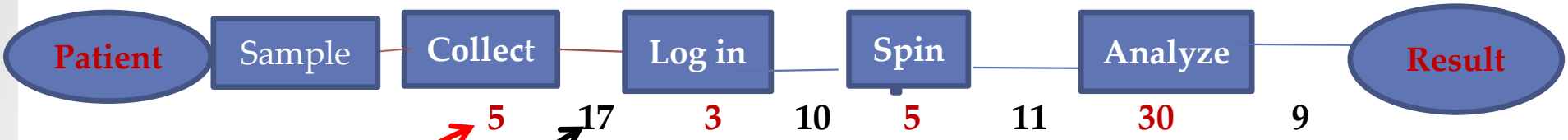
Example TAT

1 - Identify Value:-



VSM (VALUE STREAM MAPPING) :-

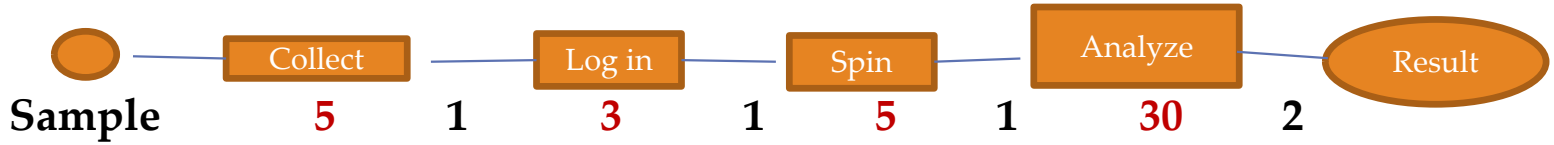
Cycle Time = 80 M

Touch Time : The time used for doing the activity = 43 min

Lag Time : The time between the two continuous activities = 47 min

After reducing waste (Non Value Added)

Cycle time = 48 M



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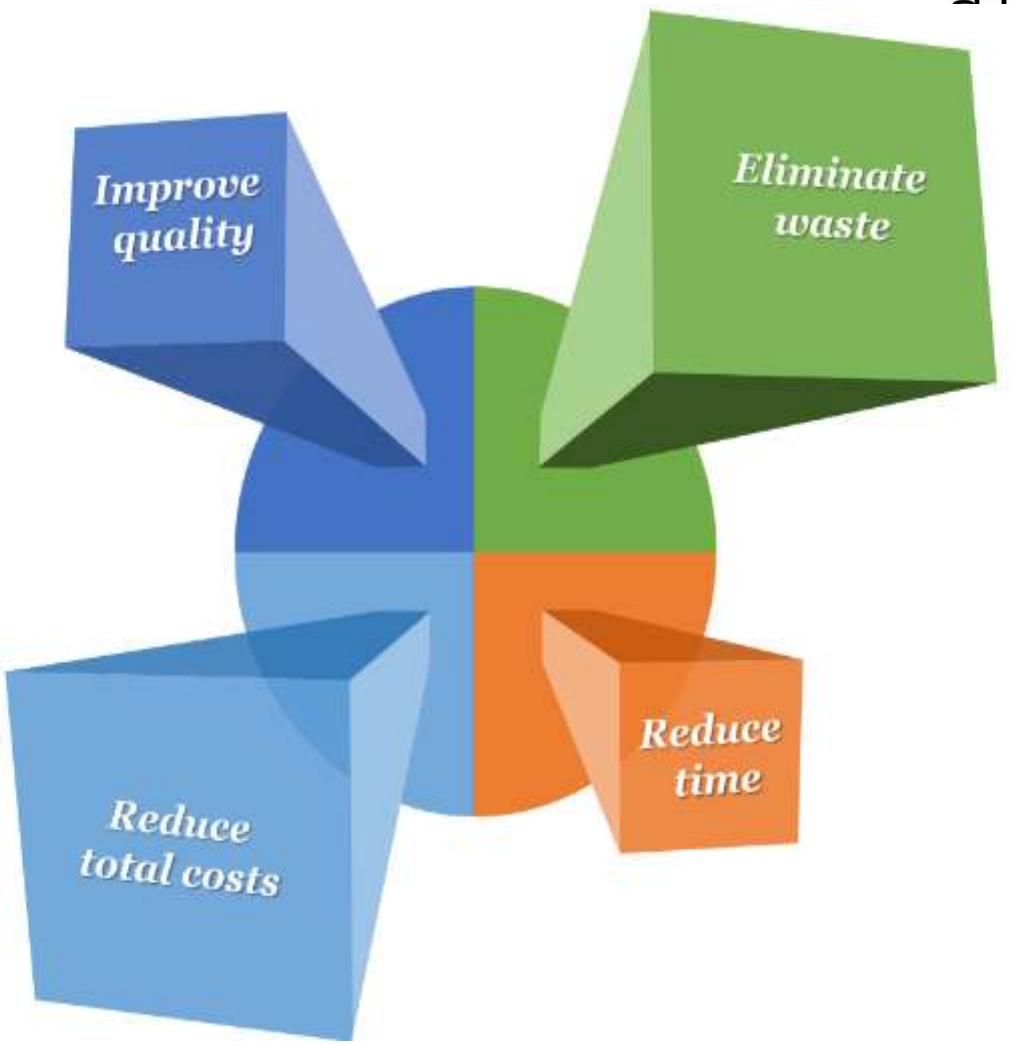
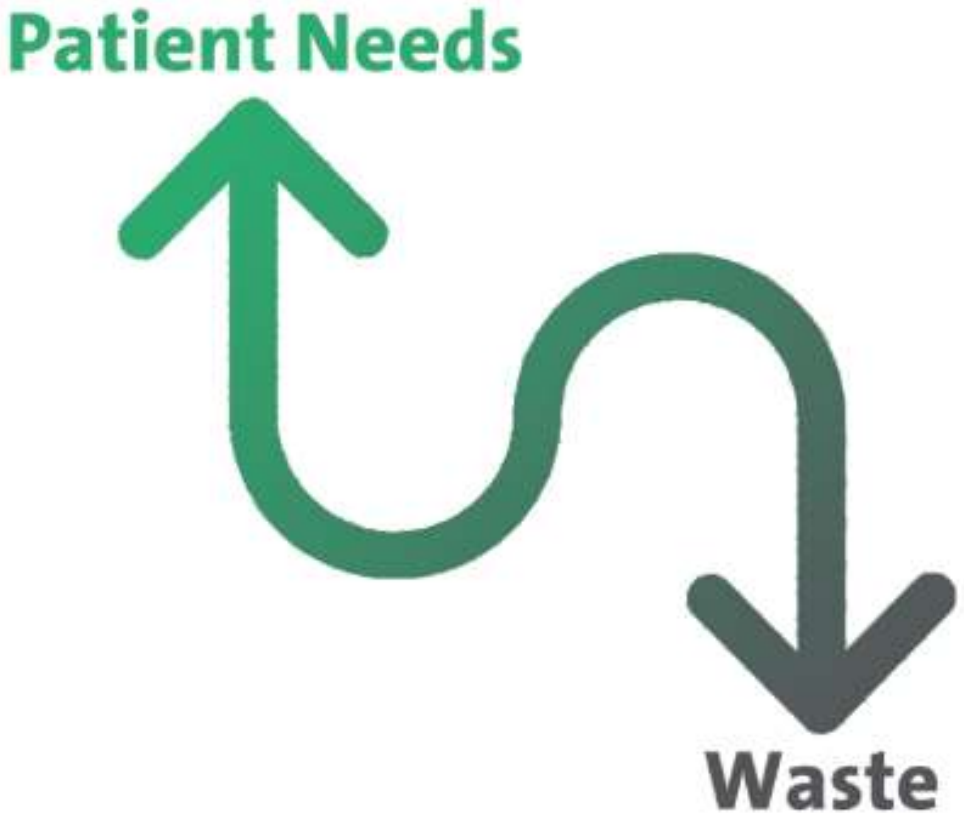
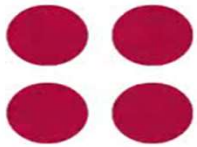
4 Goals of Lean




Patient Needs
Waste



FOURPRINCIPLES

THE LEAN MANAGEMENT EXPERTS

Get Lean in 90 Seconds

video by Quality Schnallity Inc.

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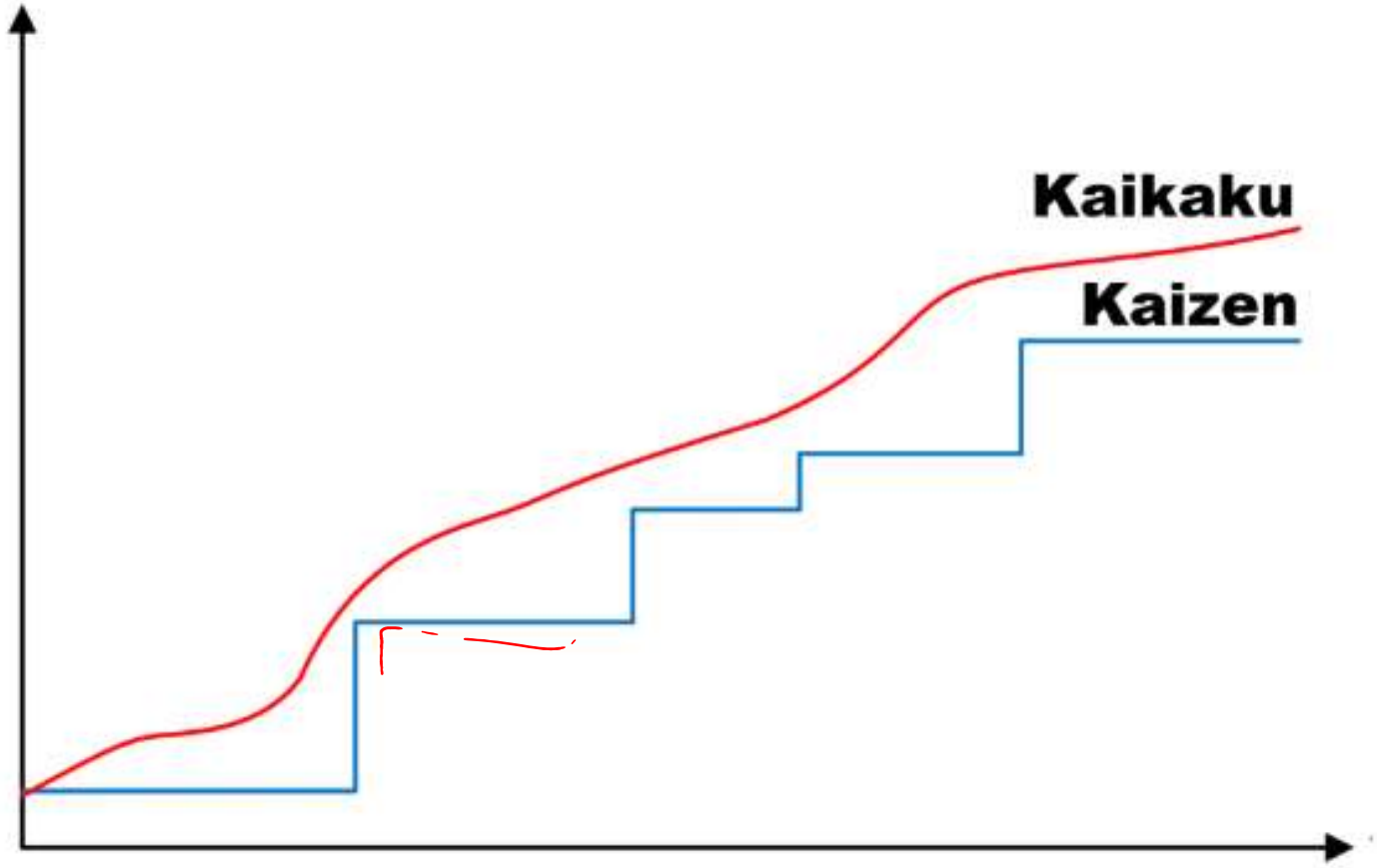
Lean Methods

- Kaizen Events (or SCORE events)
  - Select
  - Clarify
  - Organize
  - Run
  - Evaluate
- 5S –Sort, Store, Shine, Standardize and Sustain
- Kanban – a Japanese term that can be translated as “signal,” “card,” or “sign.”


Kaikaku
Kaizen

kai
"change"

zen
"good"

SORT Tool: Red Tag

KANABAN

Enlarge Red Tags

Red Tag Strategy
Tag potentially unneeded items in the factory, supply cabinet, or in the process

Three Questions for Red Tagged items:
1) Is this item needed?
2) If it is needed, is it needed in this quantity?
3) If it is needed, does it need to be located here?
   - No Red Tagging people!

Red Tag Holding Area
A temporary place to store Red Tagged items for a designated period of time

Visual Management

Examples of Visual Displays

Floor Marking for Pallets

Hazardous area marking

Safe Work Instruction

Tools Shadow Board

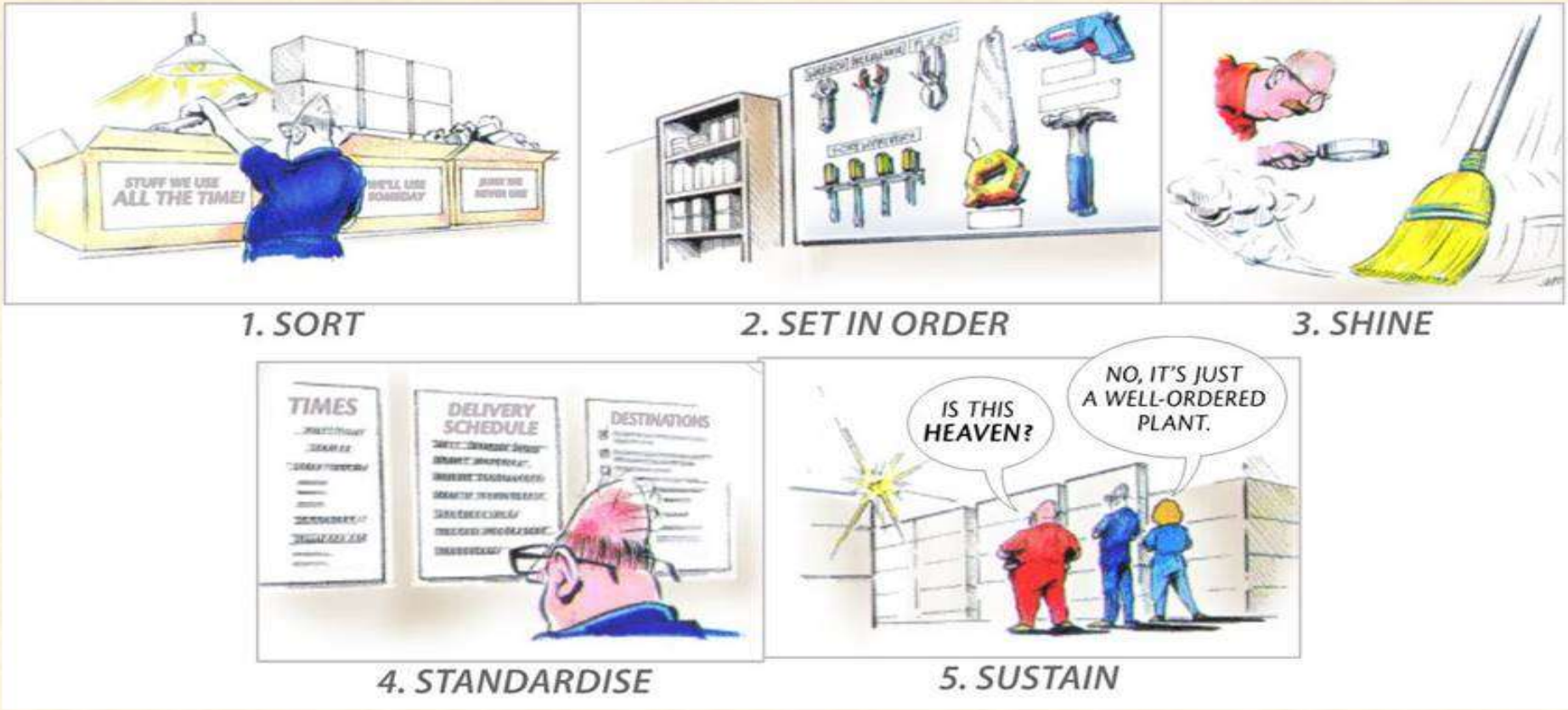
Floor Marking for trolleys

Standard work display

Product Identification

IMPROVE

5S Explained



Improvement Methodology

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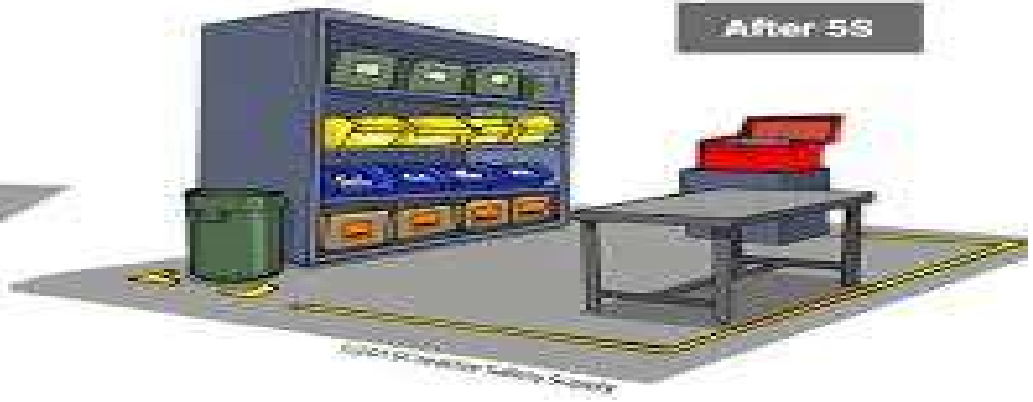

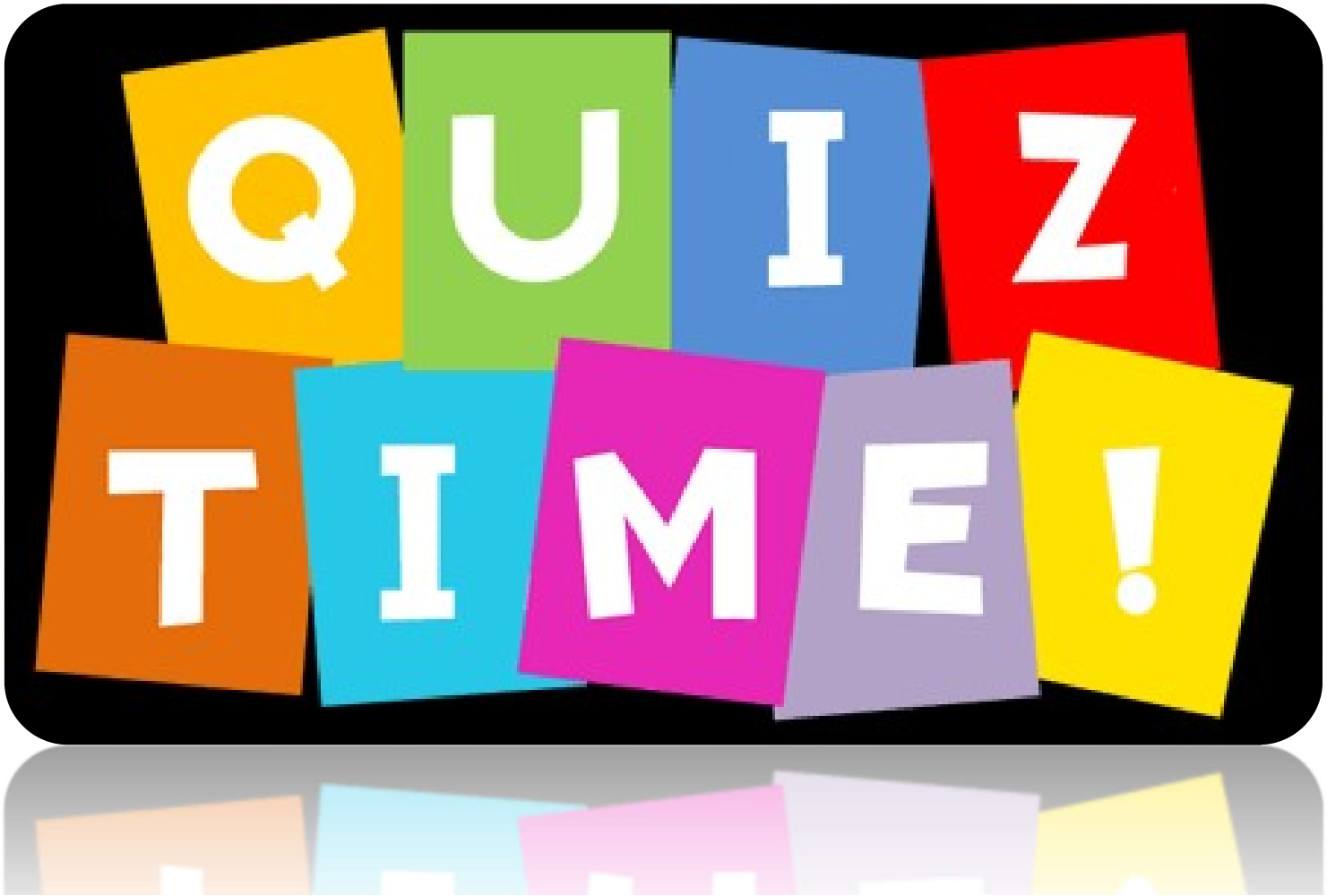

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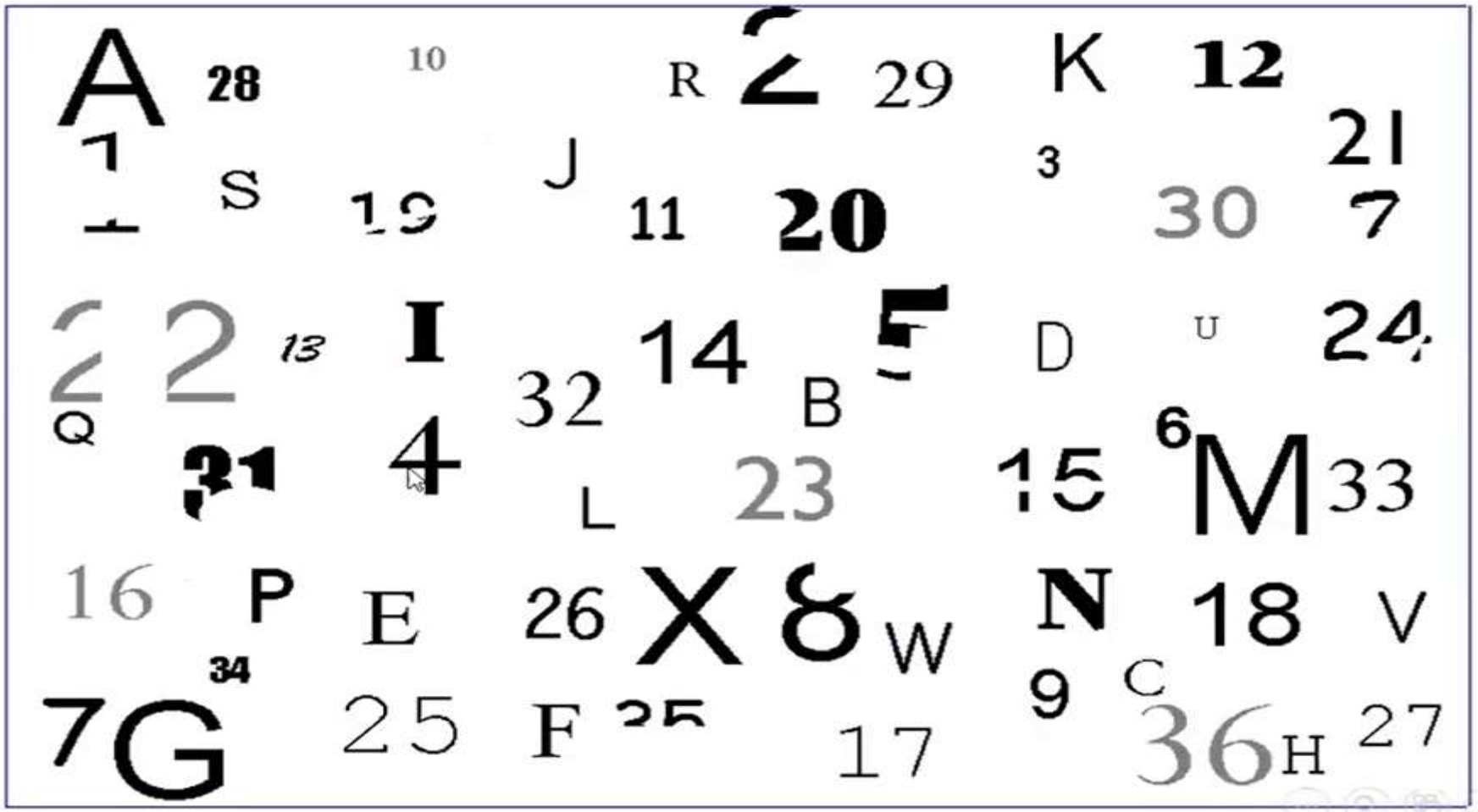
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Sort

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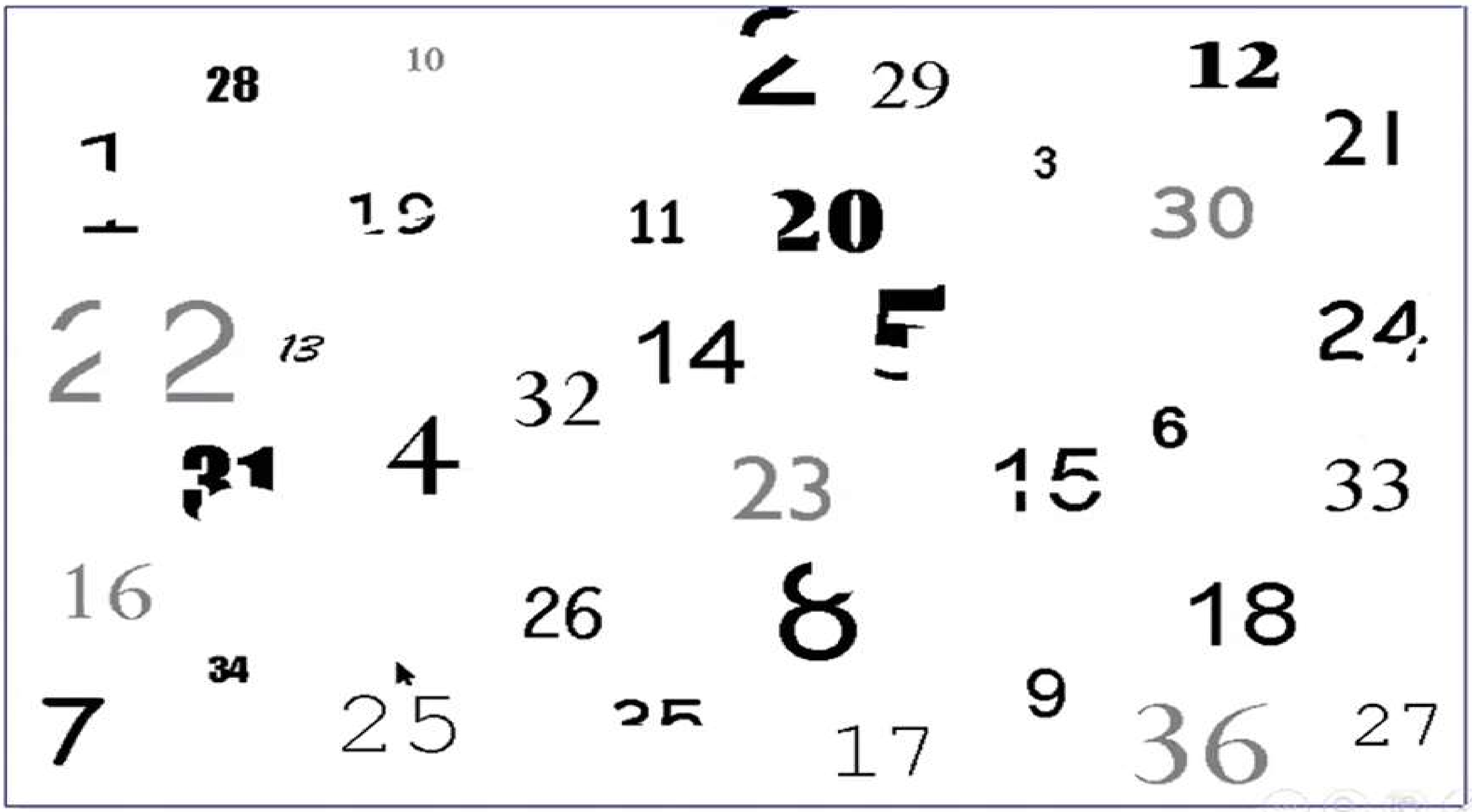
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Set In Order

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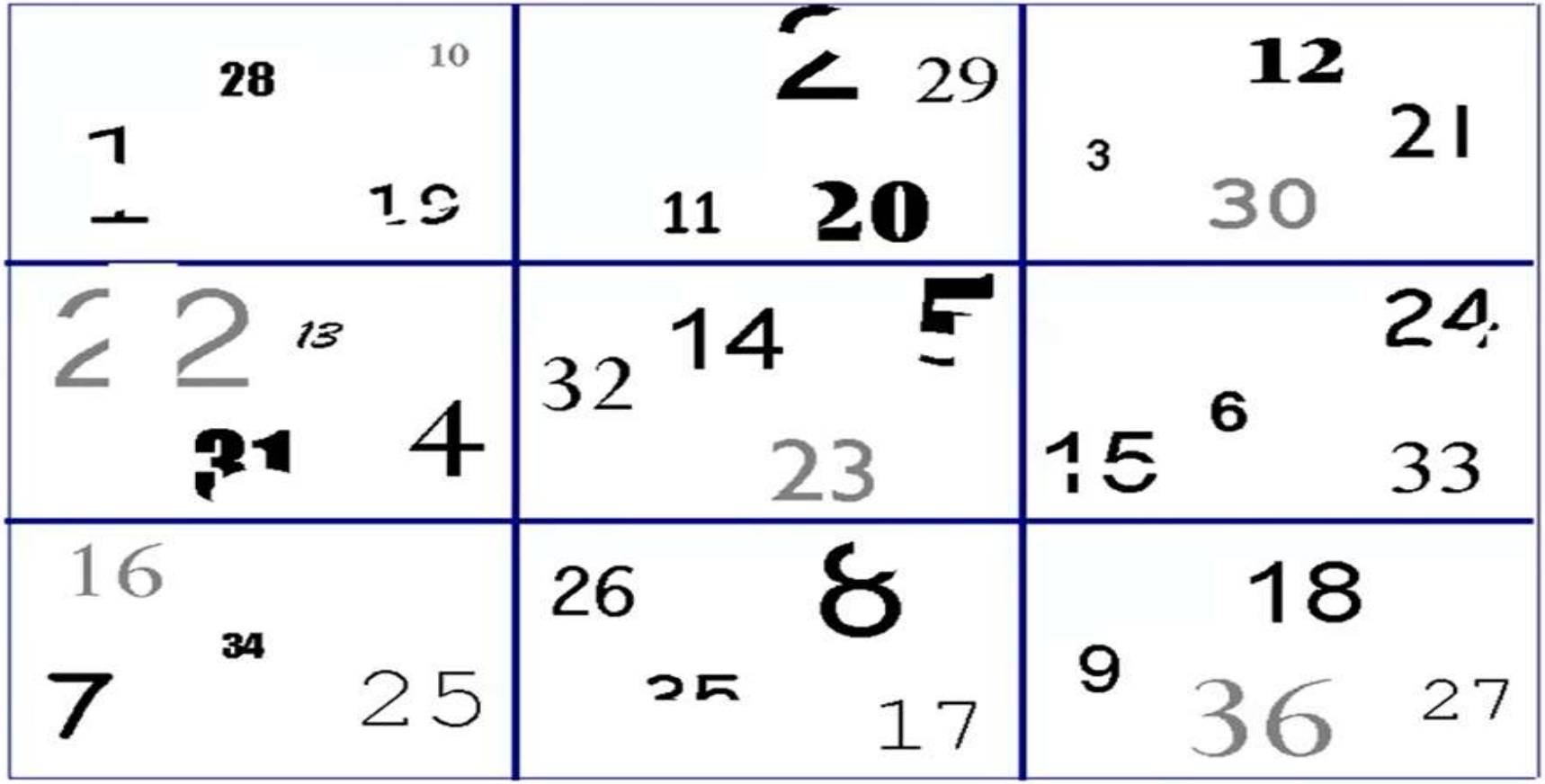

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Shine

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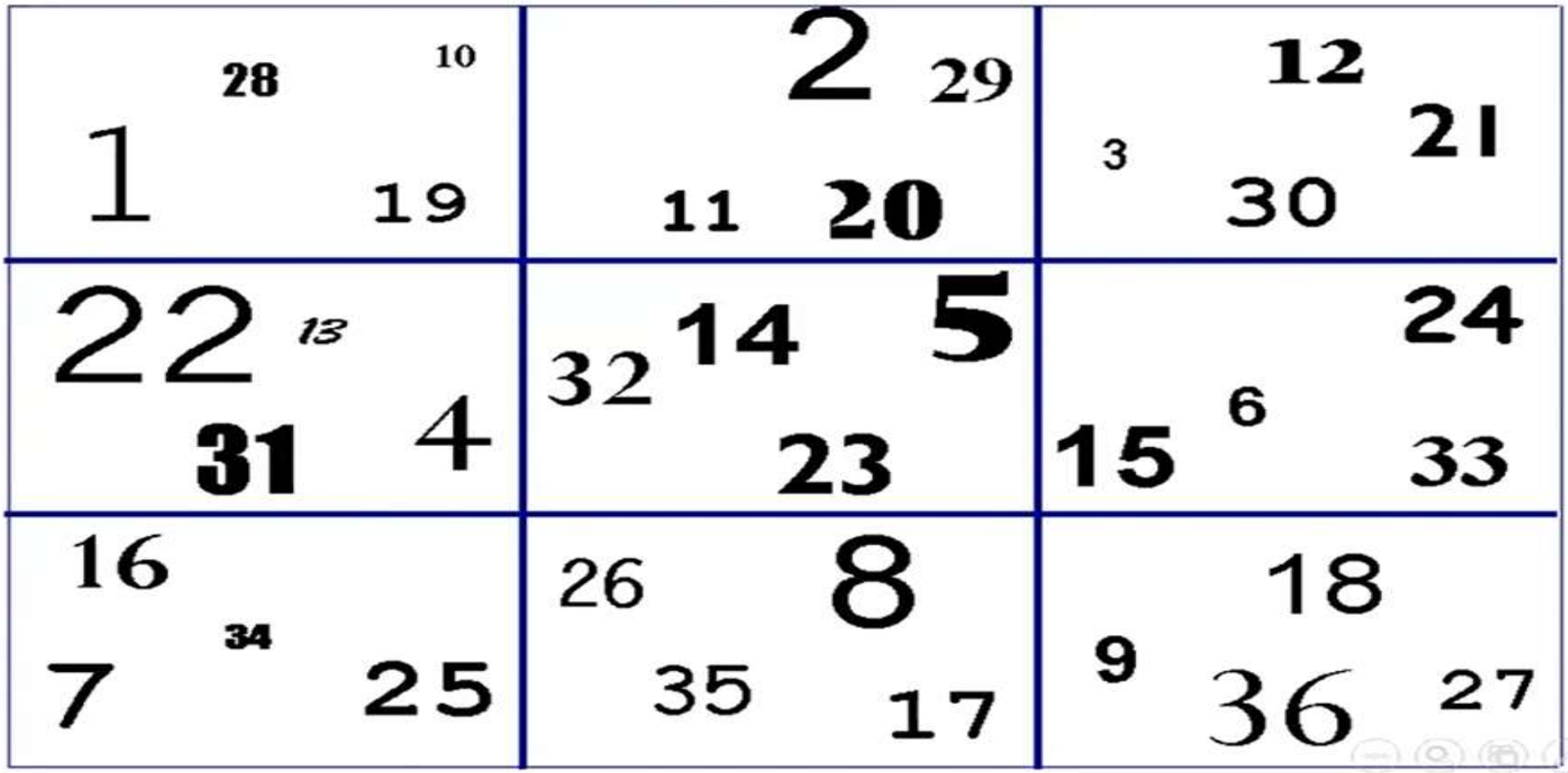
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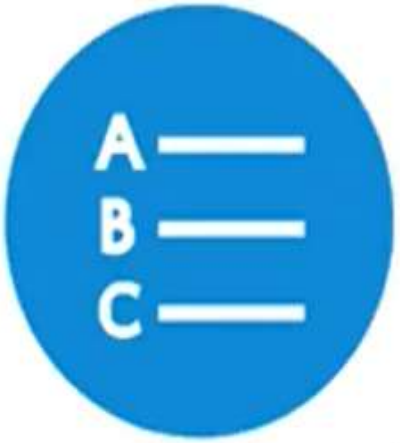

Standardize

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1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

1	2	3	4	5	6
7		9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28		30
31	32	33	34	35	36

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Ferrari F1 Perfection

The 6 SIGMA journey Towards Excellence Continues…

Thanks

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SIX SIGMA

History of six sigma

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- Conceptualized at *Motorola* during 1979 when in a management meeting an executive proclaimed.
  - بدأتها شركة موتورولا خلال عام ١٩٧٩
  - *"The real problem at Motorola is that our quality stinks"*
- ***Chief Executive Bob Galvin*** threw a challenge in 1981 to achieve 5-10 fold improvement in a span of five years.
- ***Bill Smith, an Engineer of Motorola*** presented a paper in 1985, established in a correlation between the extent of repair a product underwent during manufacturing and its field life.
- ***Mikel Harry***, subsequently developed a structured Six Sigma approach.

1979

The real problem at Motorola is the quality Stinks

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Bob Galvin
CEO

Father of Six Sigma

Bill Smith

Mikel Harry

(Black Belt in KARATE)

-Motorola

- Savings $ 15 billion in 11 years
- Sales grew over 9 years by 4.6 x
- Mfg costs reduced by $ 1.4 billion from 1987 to 1994
- Profits went up 9.2 x
- Stock rose 5.5 x
- Pager order to shipment came down from 56 days to < 1 hour
- Cycle time to file patents came down from 2 years to < 90 days

MOTOROLA
intelligence everywhere

- 2000 Projects Deployed
- Benefits $12 billion over 5 years
- Annual benefits over 2.5 billion
- 1% increase in uptime

We bring good things to life.

▪"The best Six Sigma projects begin outside the organisation not inside. How can we make our customer more competitive; What is critical to my customers success."

- GE, Director

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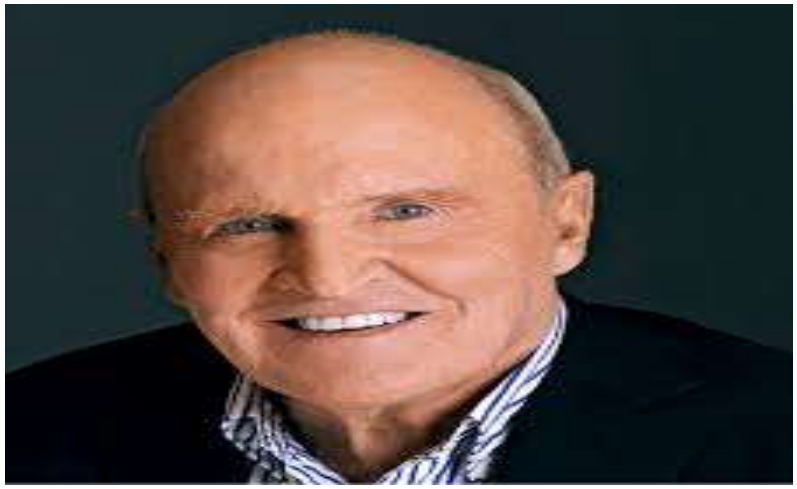
Jack Welch ,

GE Comp CEO



HISTORY OF SIX SIGMA

Developed by Mikel Harry and Bill Smith, Motorola.

تم تطويرها من قبل ميكل هاري و بيل سميث،موتورولا

Motorola was amongst the first recipients of the Malcolm Baldrige Award.

Companies Implemented Six Sigma

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What is Six Sigma?
ماهي سته سيقما؟

Six Sigma is a business statistical strategy to identify defects removing them from the process of products to improve quality

سته سيقما هي استراتيجية احصائية للعمل للتعرّف على الخلل و استبعاده من عملية المنتج لتحسين جودته

A ***defect*** is defined as any process output that does not meet customer specifications

الخلل يعرّف بأي نتاج للعمليه لا يلتقي مع مواصفات العميل

WHAT IS LEAN SIX SIGMA

Lean Six Sigma:
is a specific methodology for solving problems and developing business quality within an organization .

The primary aim of this methodology:
is to enable individuals to develop processes within the organization and to troubleshoot and minimize errors by define the problems , measure them and then analyze them to identify their causes

منهجية لين 6 سيقما : هي عبارة عن منهجية إحصائية ؛ لحل المشكلات و تطوير جودة الأعمال داخل المؤسسة.

والهدف الأساسي من هذه المنهجية:
هو تمكين الأفراد من تطوير العمليات داخل المؤسسة ، و استكشاف الأخطاء و تقليلها لأقصى حد ممكن ، وهذا يكون بتعريف المشكلات وقياسها ومن ثم تحليلها ؛ للتعرف على أسبابها ومعرفة حلها.

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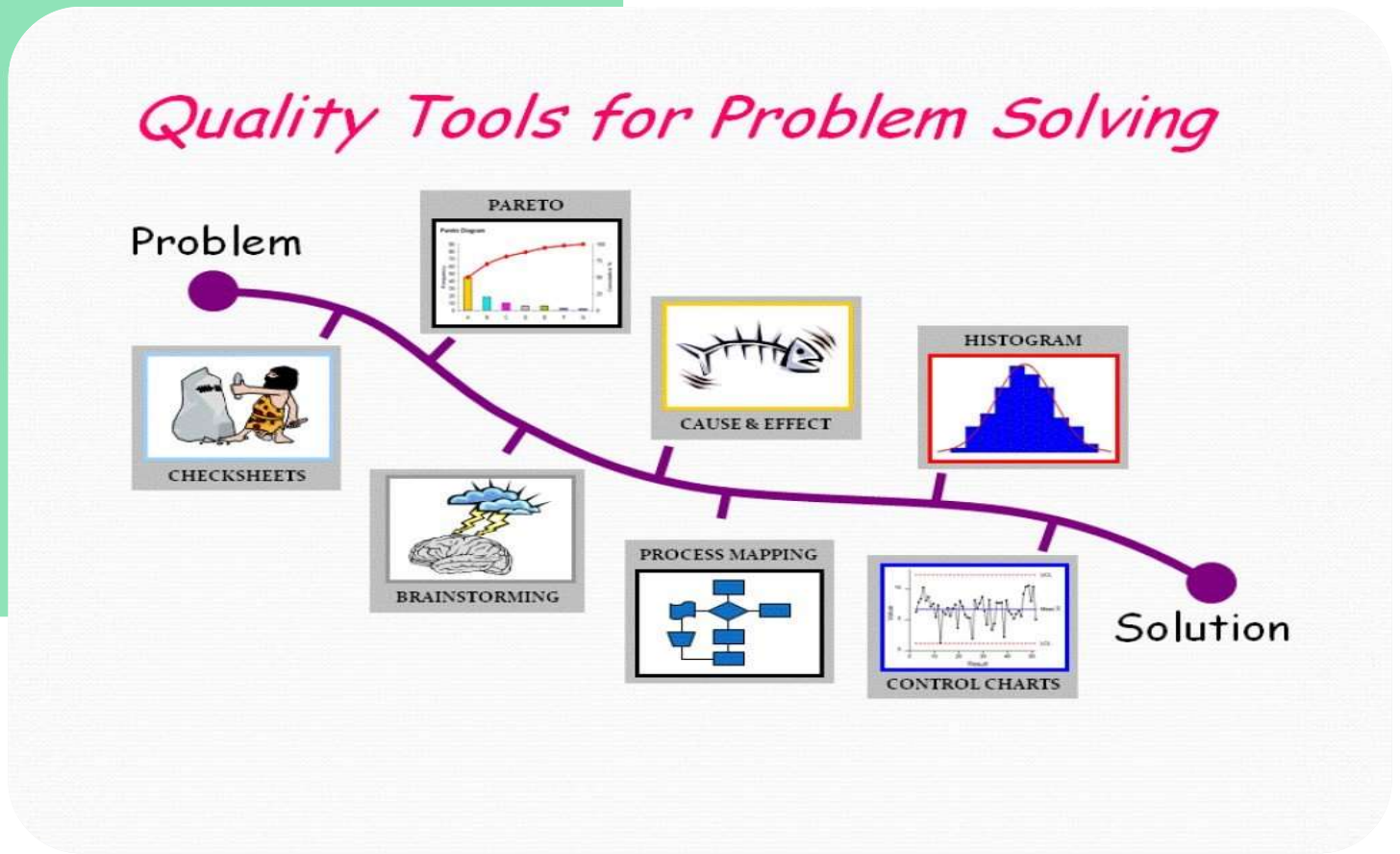

تشتمل منهجية DMAIC على خمسة مراحل لتحسين الجودة

Define	Measure	Analyze	Improve	Control
D	M	A	I	C
التعريف	القياس	التحليل	التحسين	التحكم
ما هو مهم	كيف نفعل	ما الخطاء	ما الذي يجب القيام به	كيف نضمن الأداء
تحديد المشكلة حدد بدقة نطاق المشكلة	قياس المشكلة فهم المشكلة ووصفها بدقة أكبر	تحليل السبب الجذري للمشكلة والبدء في البحث على أفضل الحلول	تحسين وتنفيذ الإجراءات ومحاولة معرفة الأفكار الجديدة وطرق للقيام بعمل أفضل من السابق لجذب	التحكم في النظم والسياسات القائمة لمنع تكرار المشاكل والحفاظ على الحل وضمان استدامة النتائج على المدى الطويل

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ستة سيقما

تركيز العميل

قياس(CTQ's) والخلل بناءً عى متطلبات العميل و توقعاته.
(التركيز الحقيقي على العميل)

الإعتماد على البيانات

المفهوم الإحصائي للمصطلح ستة سيقما يقصد به العمليات التي تتم بشكل مثالي تقريباً، اي تحقيق ٣,٤ اخطاء لكل مليون فرصة (تقود للمثالية)

ستة سيقما هي منهجيه

هذا المنطلق لستة سيقما يتعرّف على نهج اساسي و صارم يعرف بـ
DMAIC(التعريف،القياس،التحليل ، التحسين ، الضبط) (منهجية تعتمد على النظام لعملية التحسين)

Six Sigma

Customer Focus

Measure CTQs, and Defects based on customer needs/expectations (Genuine focus on customer)

Data Driven

The statistical concept of the term six sigma means that processes are working nearly perfectly, delivering only 3.4 defects per million opportunities. (Drive for Perfection)

Six Sigma is a methodology

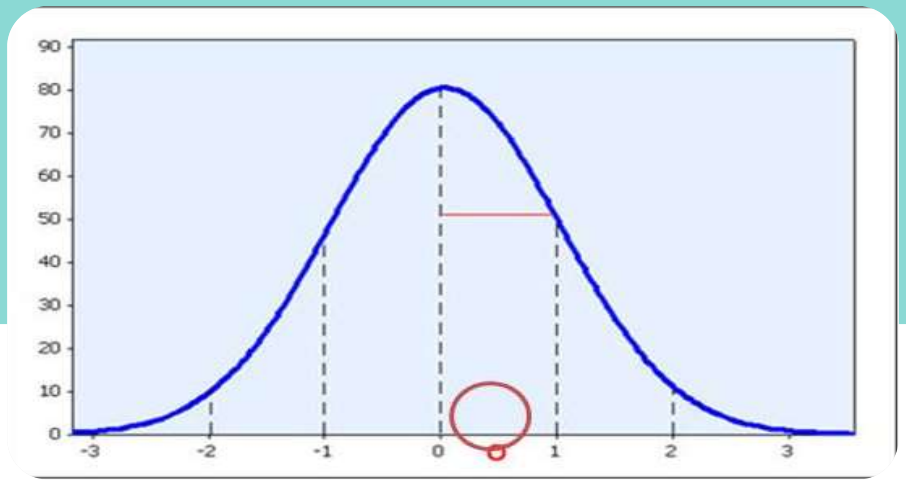
This view of Six Sigma recognizes the underlying and rigorous approach known as DMAIC (define, measure, analyze, improve and control) (Systematic approach for process improvement)

What is in a name ?

Sigma is the Greek letter representing the standard deviation of a population of data.

Sigma is a measure of variation (the data spread).

Six(6) means reduce variation 6 times from the customer need.



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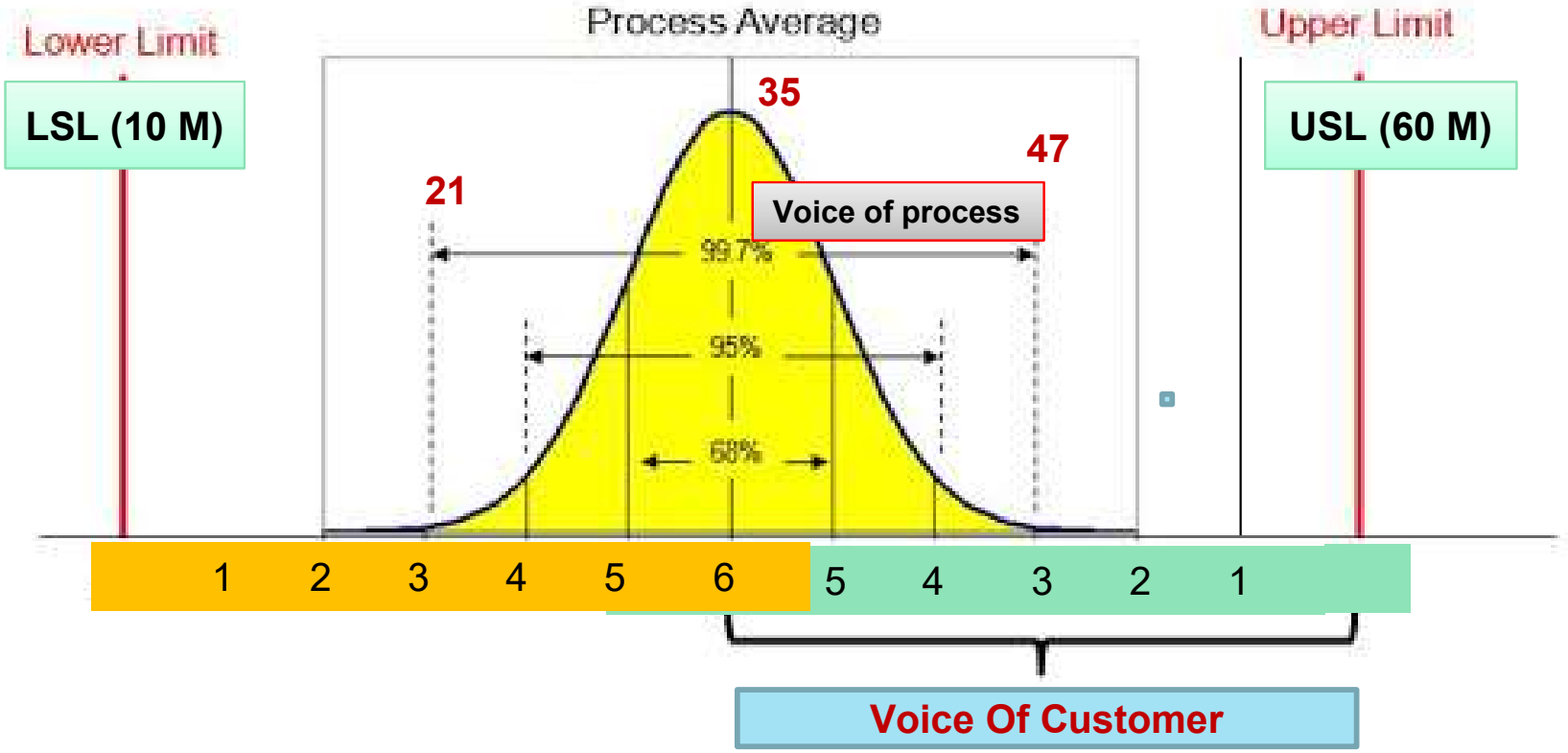
This Six in six sigma implies that there are six standard deviations (also called sigma) between the average of the process and the allowed service level limits by customer.



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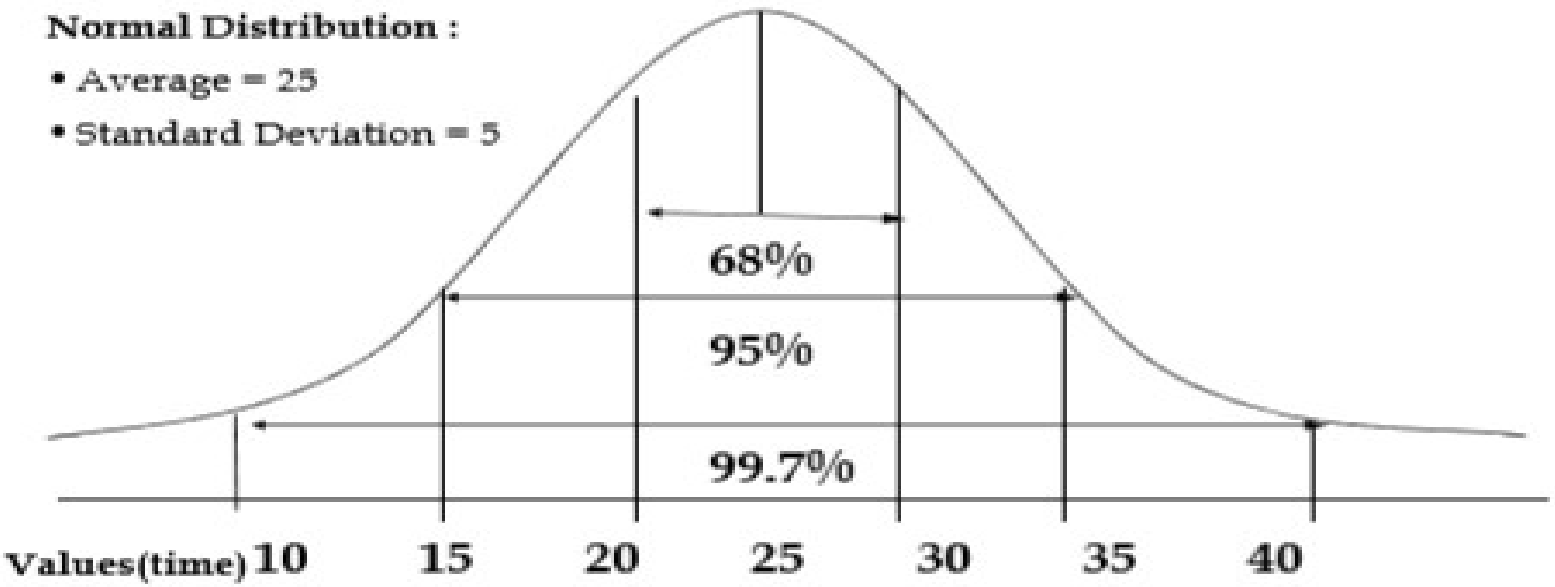
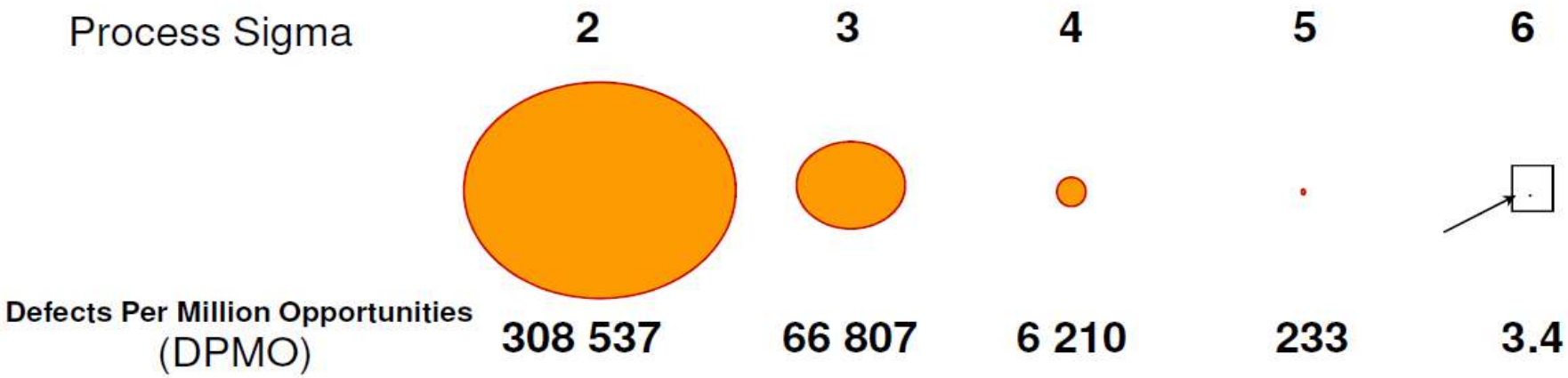
THE NORMAL CURVE WOULD BE AS FOLLOWS



What is 6 sigma ?

- A measurement scale which compares the output of a process to the customer's requirements

3.4 Defect per **Million** opportunity



Six Sigma Scale

SIGMA	% GOOD	% DEFECTS	DPMO
1	30.9 %	69.1 %	691.462
2	69.1 %	30.9 %	308.638
3	93.3 %	6.7 %	66.807
4	99.38 %	0.62 %	6210
5	99.977 %	0.023 %	233
6	99.9997 %	0.00034 %	3.4

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8 Sigma

At least 10-12 sigma

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Attitude & Discipline

- Customer Focus
  - View Quality externally from the customer's perspective
  - Measure the same way that the customer does
- Meet customer expectations every time
  - Continuous improvement cycle
    - Systematic
    - Scientific
    - Fact-based
    - Data-driven
  - Process focus

Customers Have All The Votes Concerning Extent Of Satisfaction And Value

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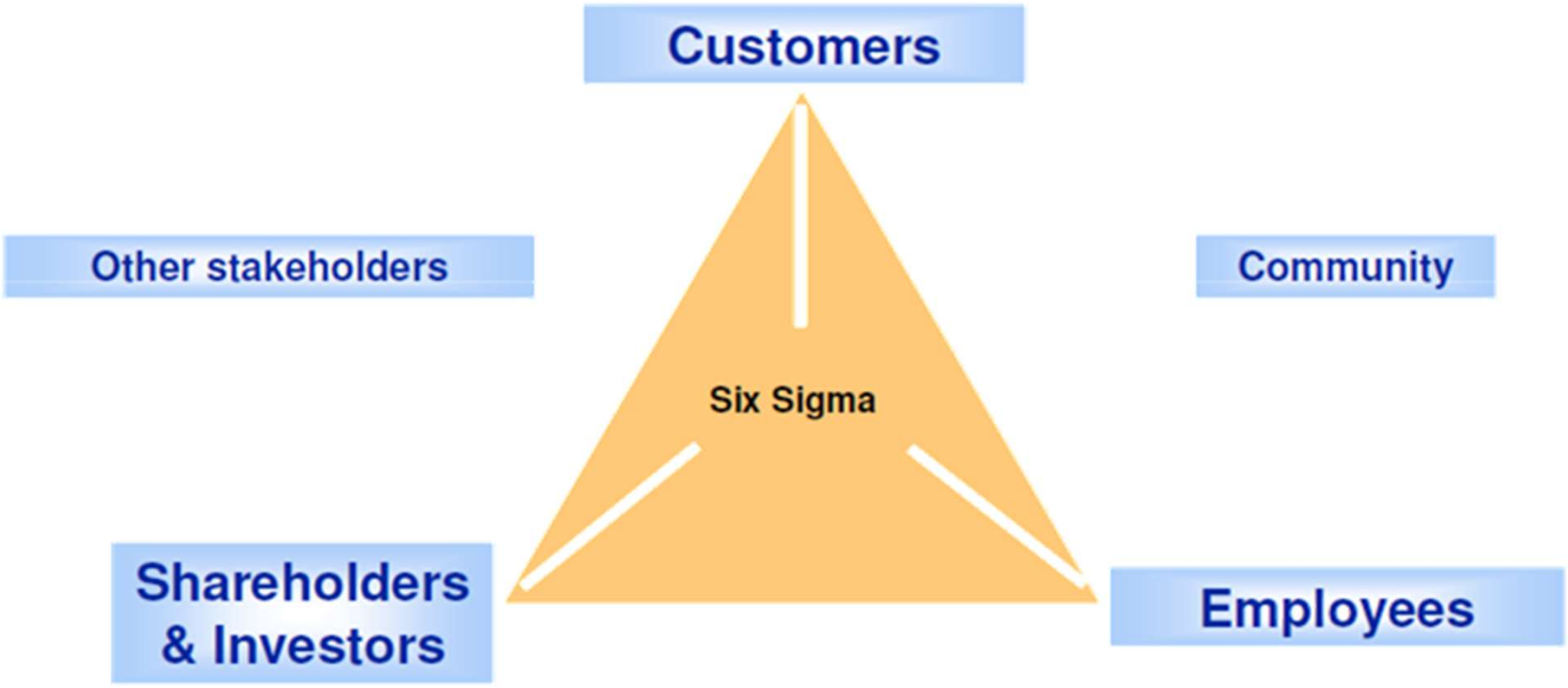
Commitments



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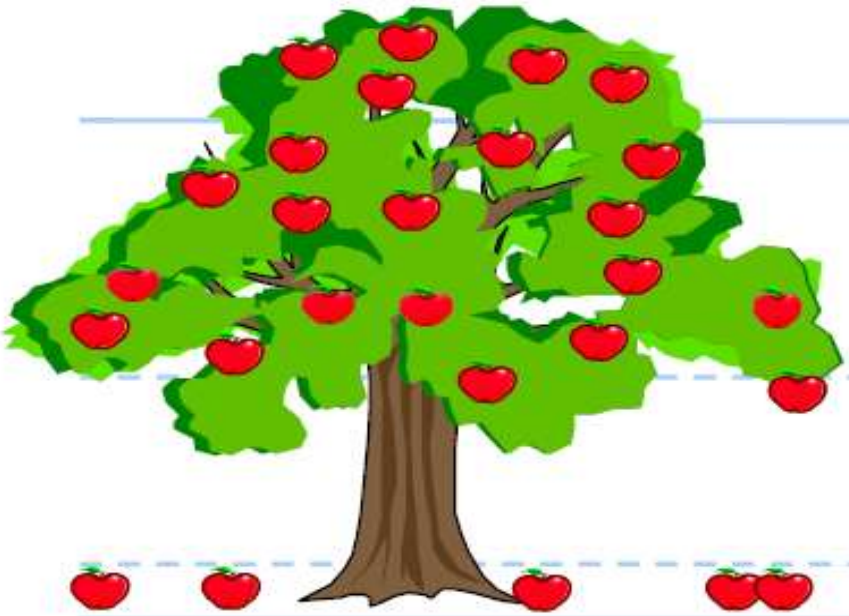
Harvesting the Fruit of Six Sigma



Sweet Fruit
Design for Six Sigma

5σ Wall, Improve Designs

Bulk of Fruit
Process Characterization and Optimization

4σ Wall, Improve Processes

Low Hanging Fruit
Seven Basic Tools

3σ Wall, Beat Up Suppliers

Ground Fruit
Logic and Intuition

Many organizations in the world have achieved huge savings and improved bottom lines by implementing Six Sigma

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Where to start

5S

1 – Structure

- Work environment
- Procedures & instructions
- Abnormalities visible

Kaizen

2 – Overview & Insight

- Visual Management KPI's
- WIP control
- Continuous improvement culture

Lean

3 – Stability

- Stable processes
- Eliminating Waste
- Flow & Pull

6 Sigma

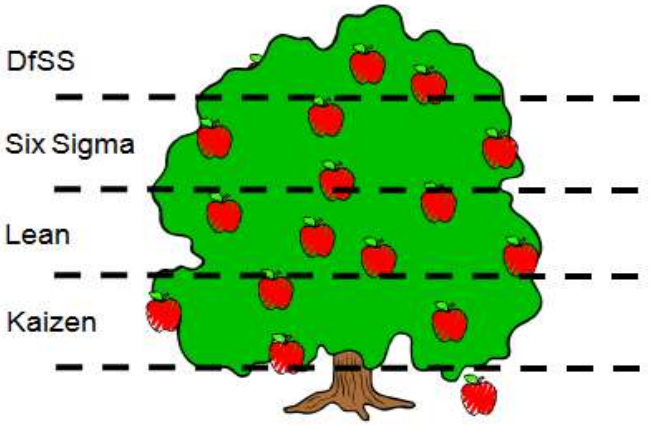
4 – Capability

- Reducing variation
- In-process control
- Statistical tools

DfSS

5 – Robustness

- Robust processes
- Design for Six Sigma
- Quality Function Deployment



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مكونات تحليل SIX SIGMA

هناك نوعان من المنهجيات في Six Sigma

DMAIC

يهتم DMAIC بالتحديد والقياس والتحليل والتحسين والتحكم
يستخدم منهج DMAIC لتحسين العملية القائمة.

DMADV

يهتم DMADVبالتحديد والقياس والتحليل والتصميم والتحقق، والتي يتم
استخدامها لإنشاء تصاميم المنتجات الجديدة أو التصاميم العملية

Roles & Responsibilities

الأدوار و المسؤوليات

Six Sigma Belts

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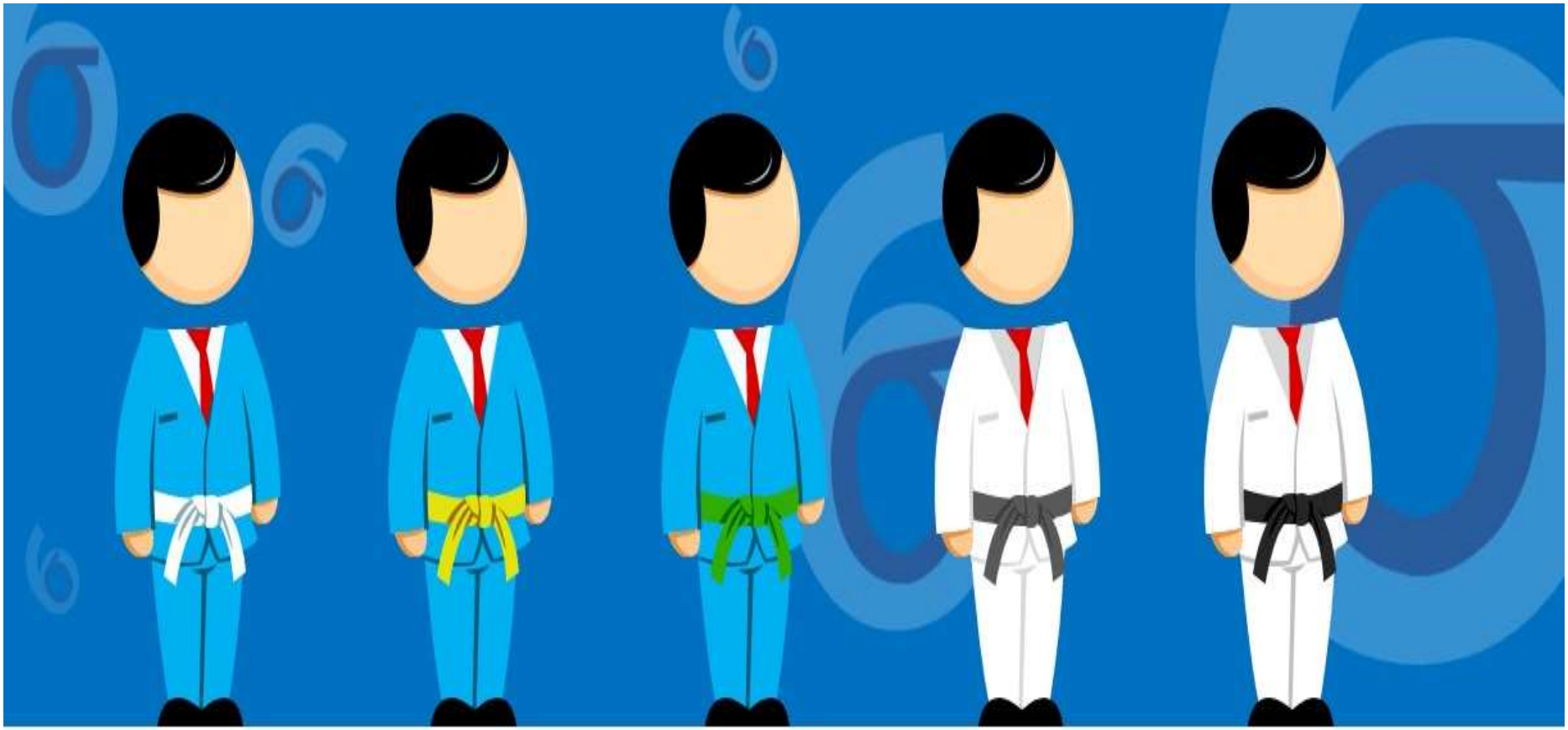


White belts Yellow belts Green belts Black belts Master black belts

Roles & Responsibilities

- Owns vision, direction, integration, results
- Leads change

Executive

- Support Six Sigma
- Ensure success of GB/BB projects

Yellow Belts

- Supports Black Belts by participating on project teams

Green Belts

- Develops deployment and Strategy
- Supports cultural change

Champion / Sponsor

All Employees (White Belts)

- Understand vision
- Apply concepts to their job and work area

- Apply Breakthrough Strategy to specific projects, lead and direct teams to execute projects

Black Belts

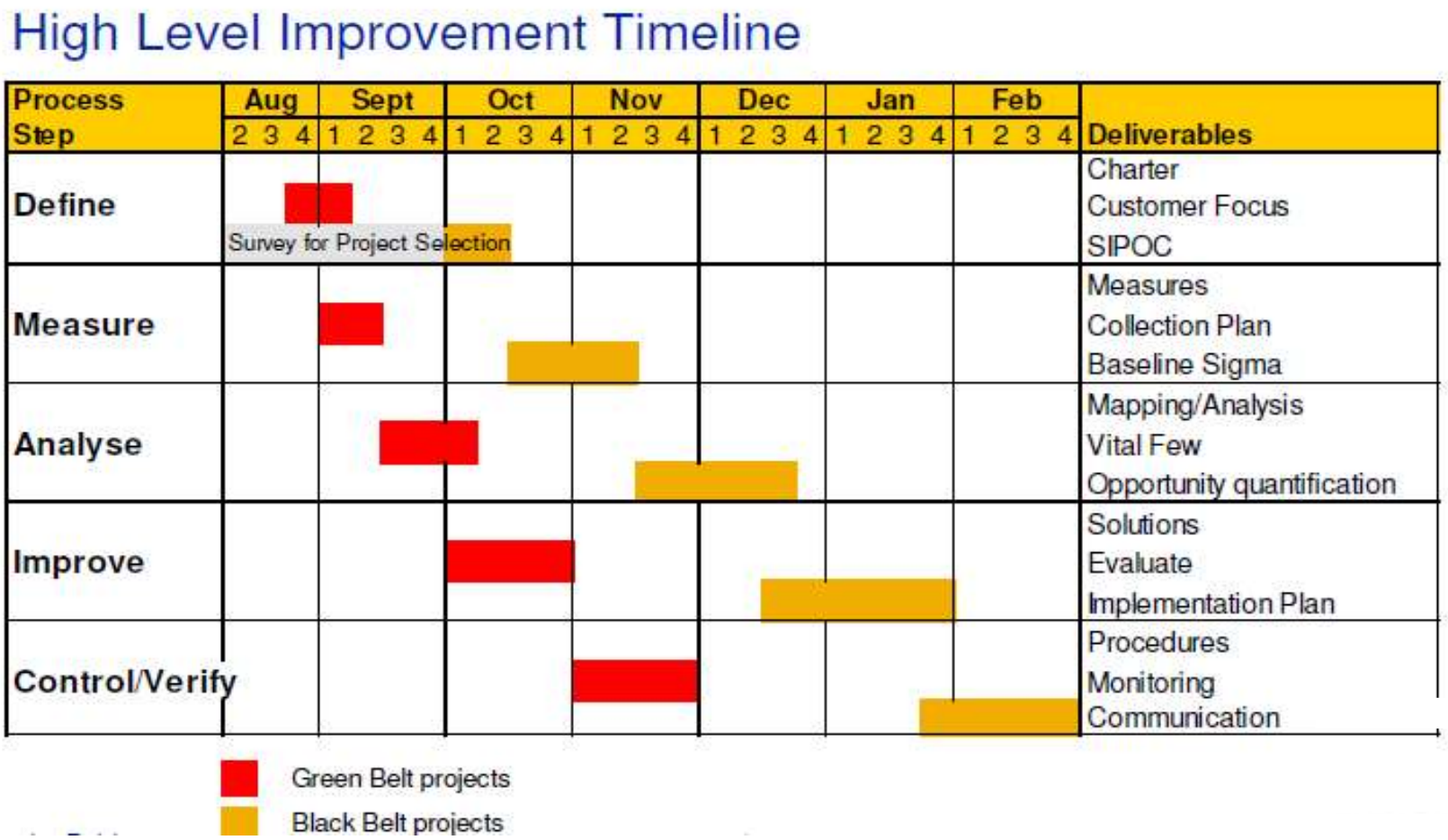
- Owns the process in which GB/BB works
- Challenges GB findings

Process Owner

Master Black Belt

- Trains and coaches Black Belts , Green Belts and leaders

A Typical one Wave Implementation Plan at an organization



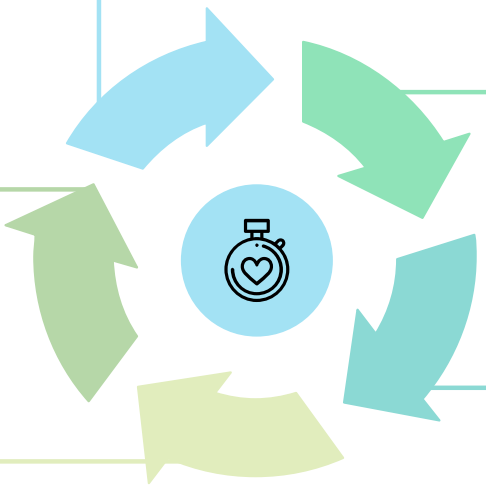
Operational Excellence

- "Eighty-five percent of the reasons for failure to meet customer expectations are related to deficiencies in systems and processes, not to the fact that our employees are not up to the challenge…"

- "The Manager's role is to promote process improvement."

DEMING

DMAIC : An Improvement Methodology



Define
Set direction for improvement.

Measure
Collect reliable data to understand current process performance

Analyse
Identify problem's root causes through process and data analysis.

Improve
Determine new improved process design.

Control
Ensure improvement effectiveness over time.

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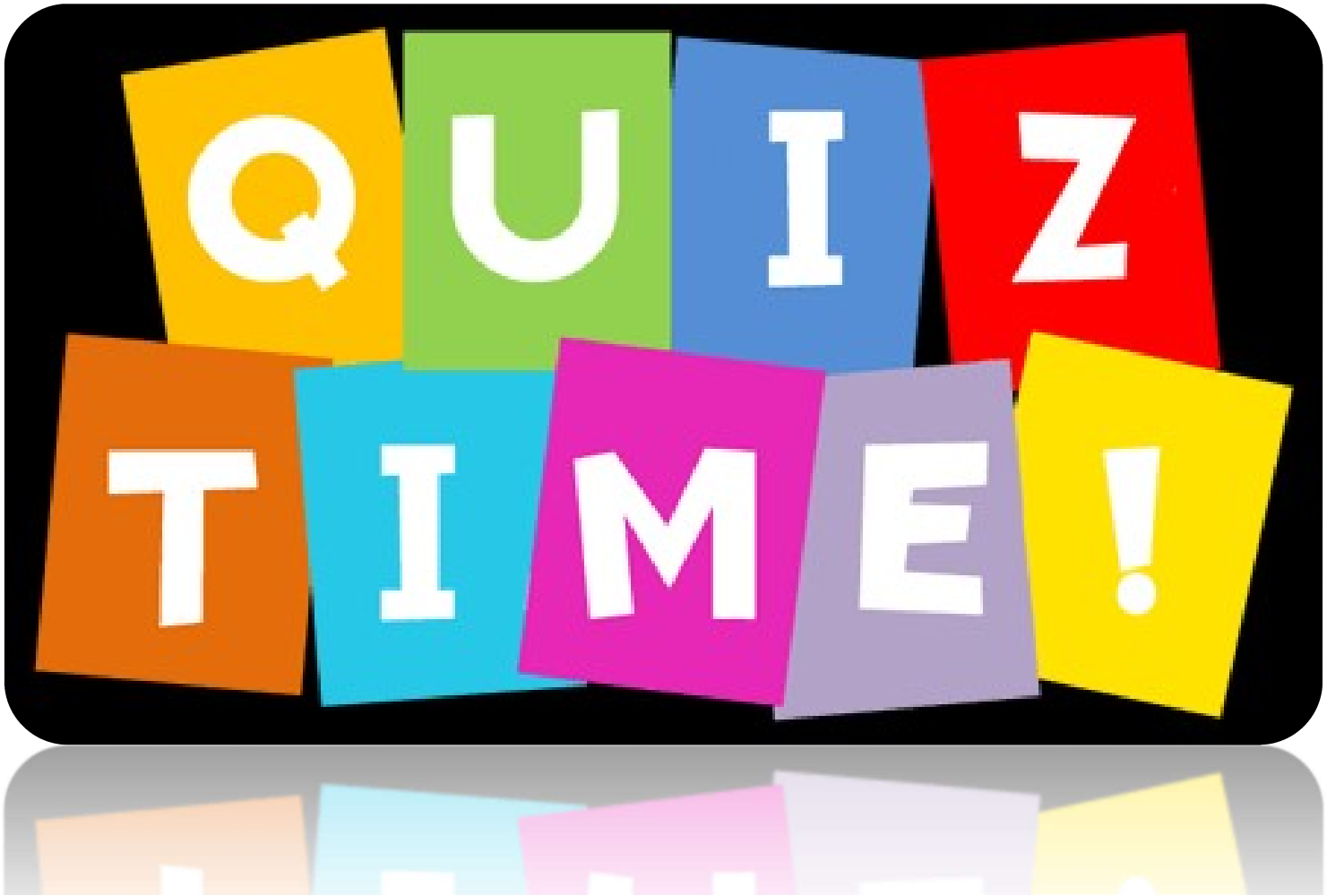

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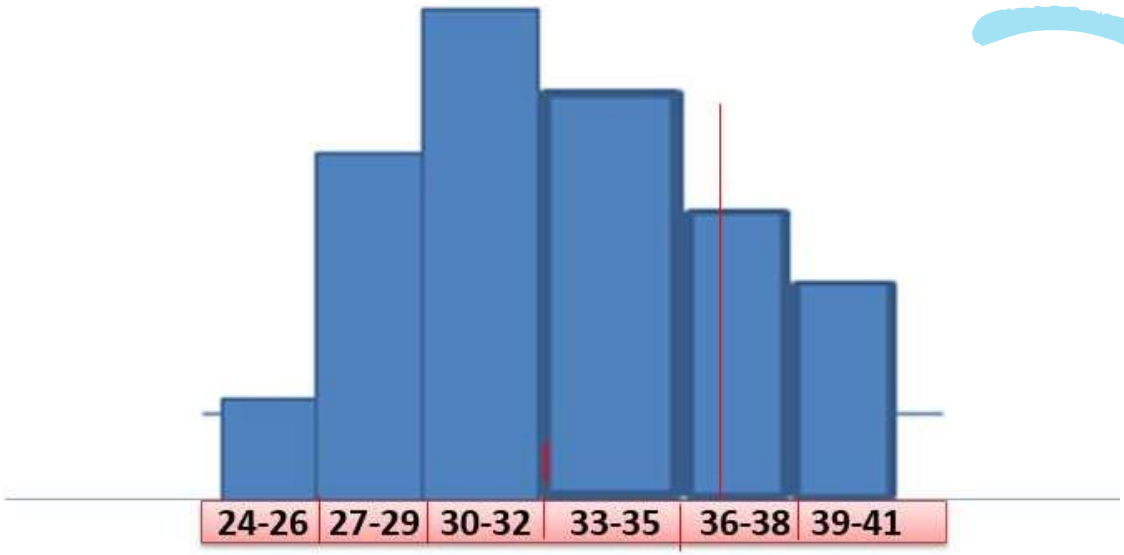
تدريب على التفتيش

أوجد عدد المرات التي يتكرر فيها حرف (f) القطعة التالية:

The necessity of training farm hands for first class farms in the fatherly handling of farm livestock is foremost in the eyes of farm owners.
Since the forefathers of the farm owners trained the farm hands for first class farms in the fatherly handling of farm live stock, the farm owners feel they should carry on with the family tradition of training farm hands of first class farmers in the fatherly handling of farm live stock because they believe it is the basis of good fundamental farm management.

Histogram



There is Variation (24 - 41)

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Analyze

What is the Root Causes for Variation ?

- Distance
- Small Letters
- Time
- Brightness
- Repetitive Letters
- Age

Choose the most important causes and improve it by:

Fish Bone Diagram , 5Y
Scatter Diagram
Pareto Chart

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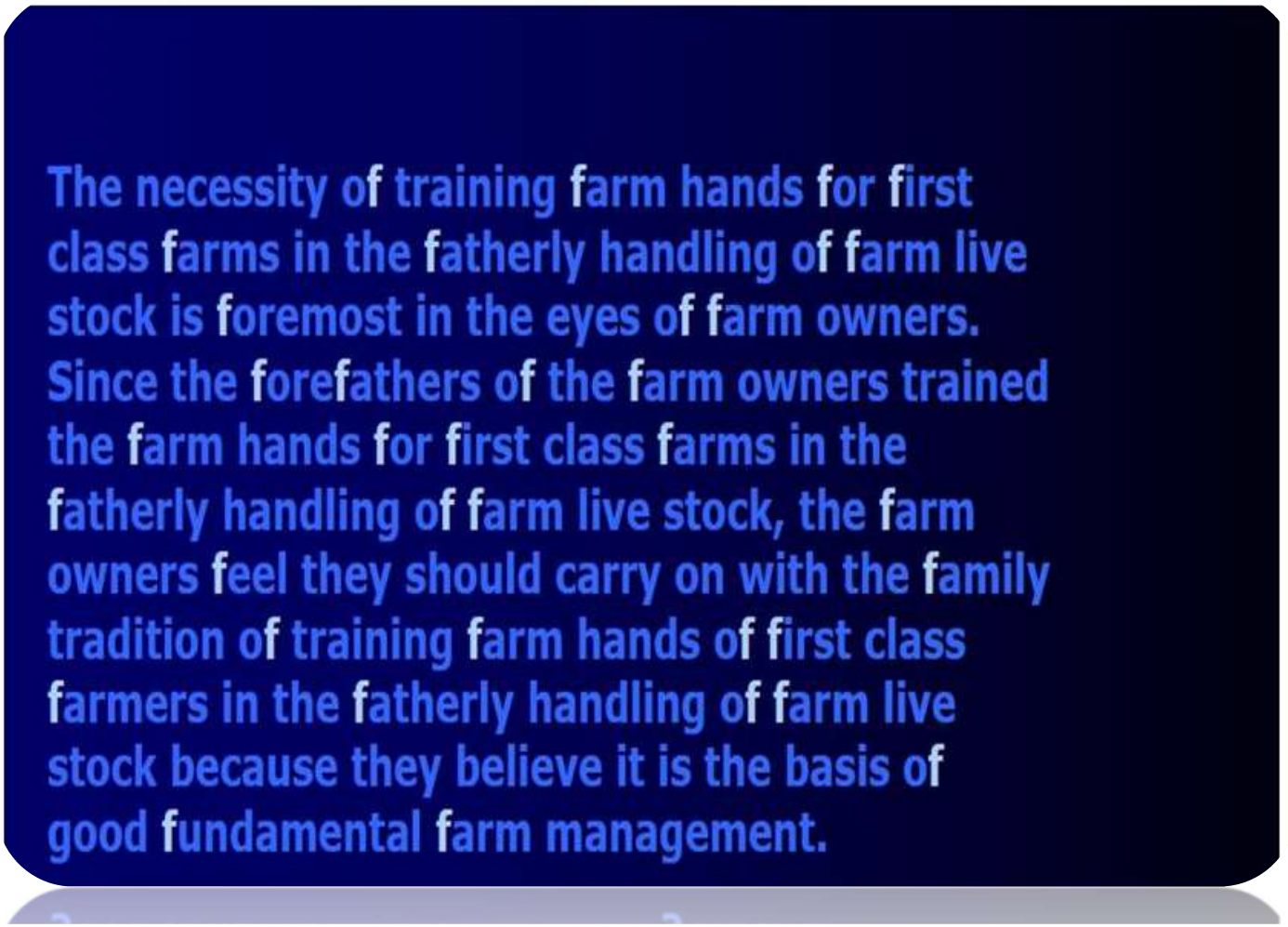
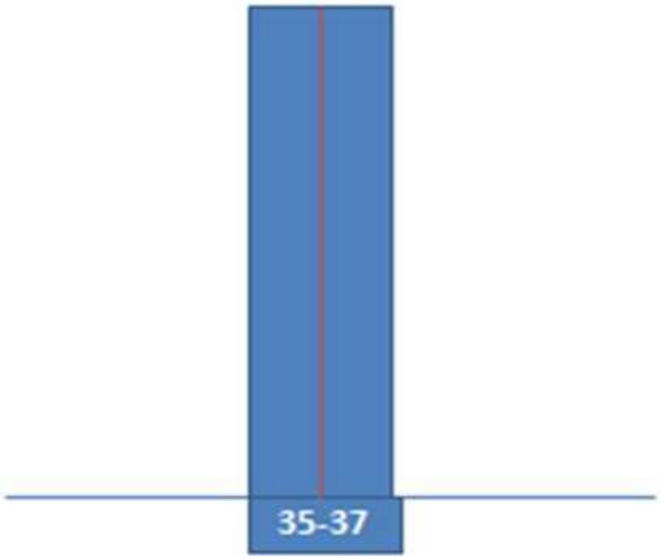
Improve

- Brain Storming
- Getting Ideas by : (Round Robin) , (5 – 3 – 5)
- Do FMEA (Risk Management)
- Choose Best Solutions (Impact Effort Matrix)
- Check Data Before and After Improve

After Improve



After Improve



Variation reduced (37 - 37)

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Thanks!

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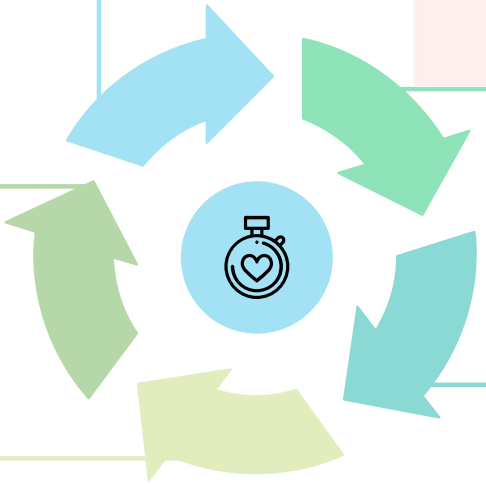
The 6 SIGMA journey Towards Excellence Continues…

DMAIC : An Improvement Methodology



Define
Set direction for improvement.

Measure
Collect reliable data to understand current process performance

Analyse
Identify problem's root causes through process and data analysis.

Improve
Determine new improved process design.

Control
Ensure improvement effectiveness over time.

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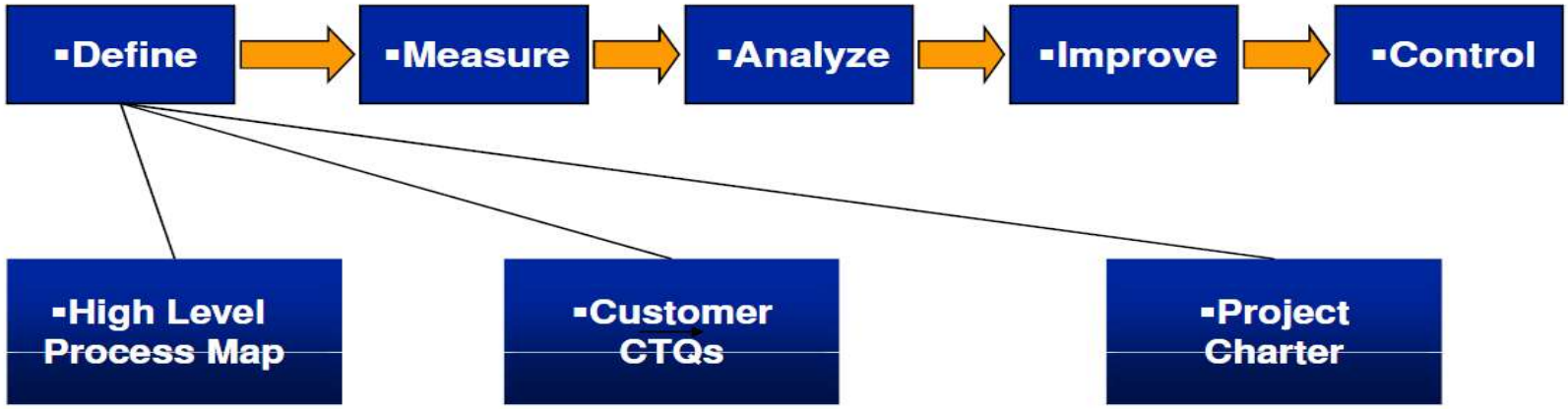
▪ DEFINE

▪ Roadmap



▪High Level Process Map

- Process Definitions
- Connecting the Customer to Your Process

▪Customer CTQs

- Types of customers
- Methods of collecting customer requirements
- Translate customer needs into specific requirement
- Customer requirements analysis and prioritization

▪Project Charter

- Business Opportunities
- Preliminary Problem Statement
- Goal statement
- Project Scope
- Milestones
- Roles

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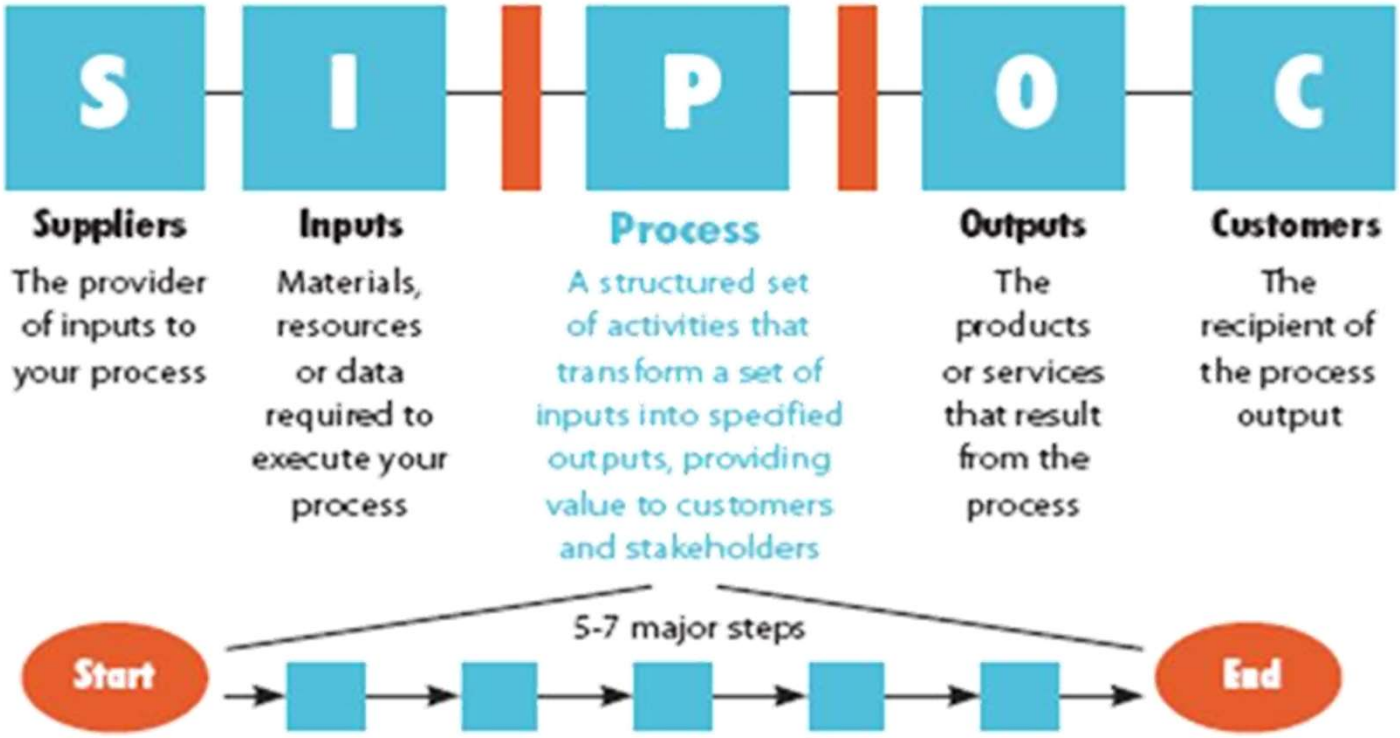
SIPOC / COPIS

(Suppliers, Inputs, Process, Outputs, Customers,

Figure 1. SIPOC – understanding processes



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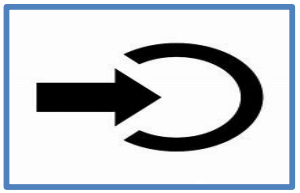
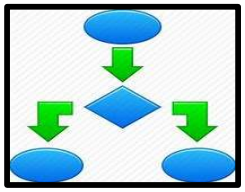
SUPPLIER (S)

The Provider of inputs to your Process



INPUT (I)

Materials, Resources or data required to execute your process



PROCESS (P)

A structured set of activities that transform set of inputs into specified outputs, providing value to customers and stakeholders

OUTPUT (O)

The Products or services that result from the process

CUSTOMER (C)

The recipient of the process input

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1 → 2 → 3 → 4 → 5 → 6

Project Name: Reducing LAB TAT

SIPOC

supplier

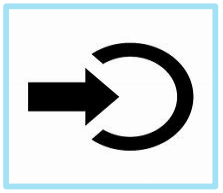
Patient مريض
Nurse ممرضه

HR شؤون الموظفين

Ware House

Med Comp

ITA



Input

Sample

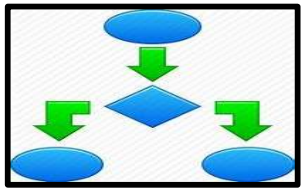
Lab Tech , System

Machine

Analyzer

Computer

System



Process

Receive The Sample

Log In the Sample

Centrifuge the sample

Analyze the sample

Check the result

Verify the result

Output

Lab Result

Output

Customer

Patient

Doctor

Nurse

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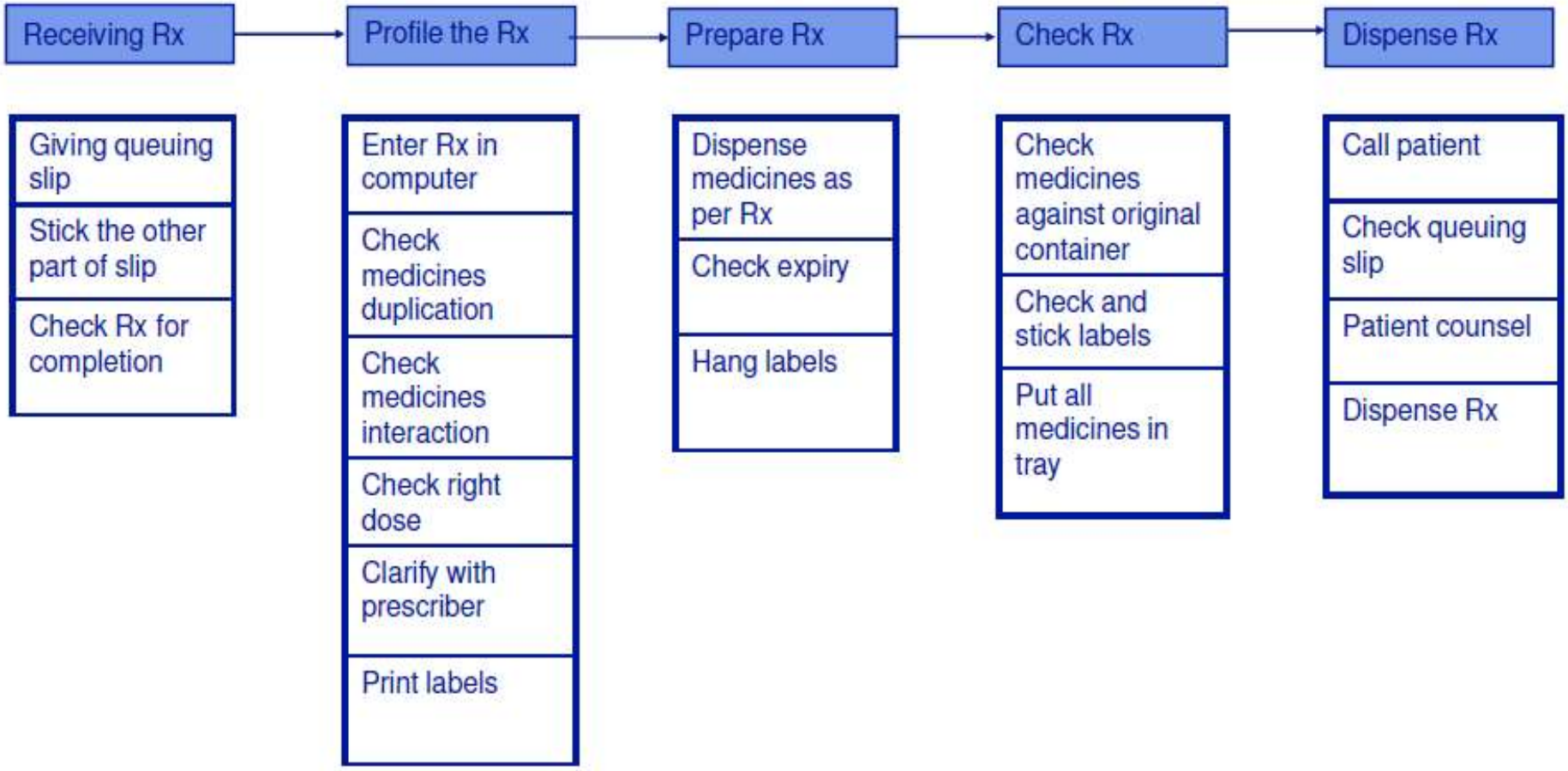
Process Mapping : Top Down Charting

D M A I C



CTQ (critical to quality)

01 Identify the voice of the customer

02 Understand the customer requirements parameters

03 Prioritize the parameters.

04 Convert the requirements into CTQs

Ask these questions:

How does the customer view my process?

What does the customer look at to measure my performance?

Understanding the Voice of the Customer

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The term Voice of the Customer (VOC) is used to describe customers' needs and their perceptions of your product or service

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Understand the Voice of Customer

Understand the Voice of Customer

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Define Customer Segments

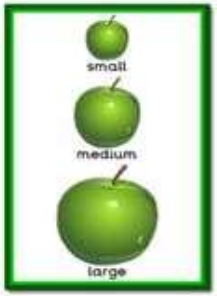
Segmentation is recommended to focus customer research on the most important customers:

Review your list of customers.
Determine logical customer segments.

Customer

Geographic location

Size of deal



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Basic VOC Systems

1. **Reactive systems**
   - Information comes to you whether or not you take action

2. **Proactive systems**
   - You need to put effort into gathering the information

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Typical Reactive VOC Systems

- Customer complaints (phone or written)
- Technical support calls
- Claims, credits, contested payments
- Product return information
- Problem or service hotlines
- Customer service calls
- Sales reporting
- Warranty claims
- Webpage activity

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Customer Complain

Customer Service Call

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Technical Support Call

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Web Page Activity

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Proactive VOC Systems

- Direct customer observation
- Interviews
- Focus groups
- Surveys
- Comment cards
- Data gathering during sales visits or calls
- Market research, market monitoring
- Benchmarking

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Direct Customer Observation

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Interview

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Focus Group

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Survey

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Comment Cards

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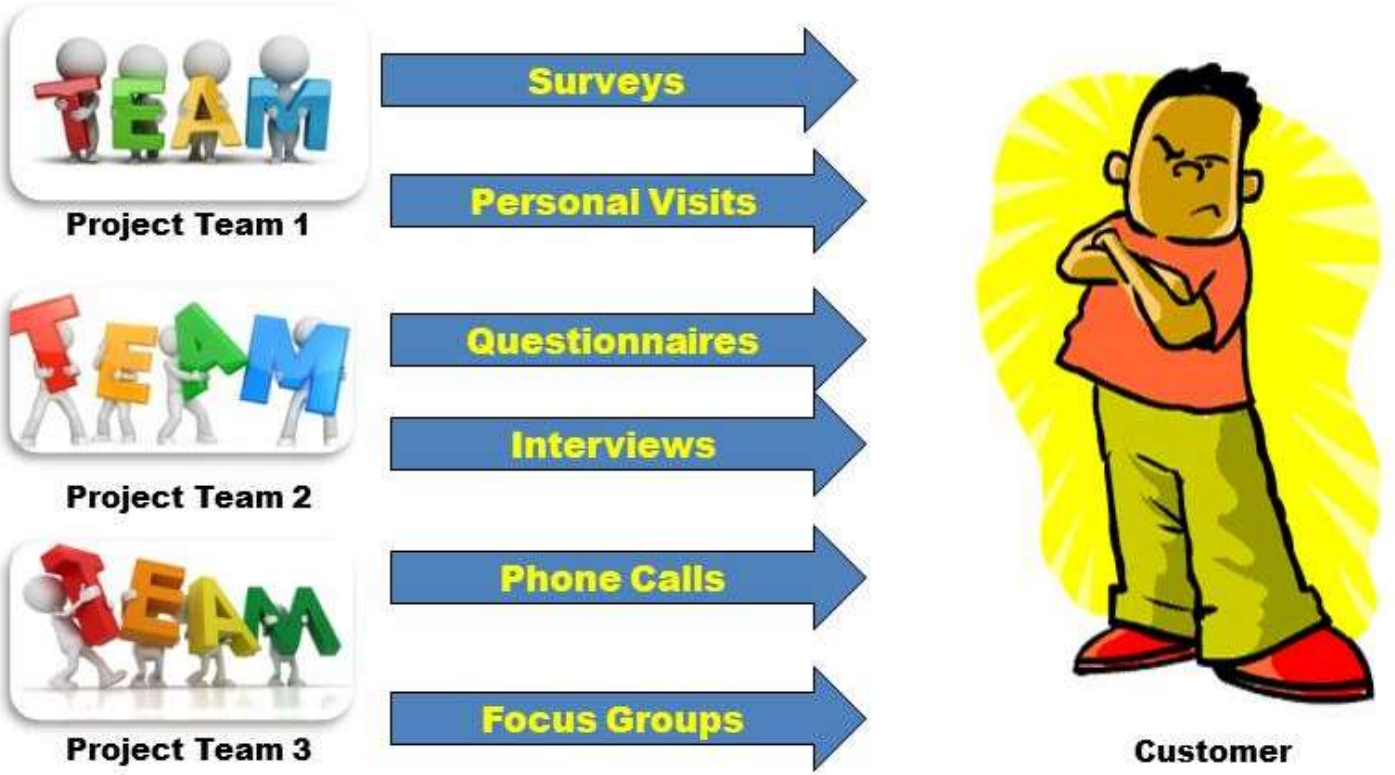
Gather VOC data (voice of customer)



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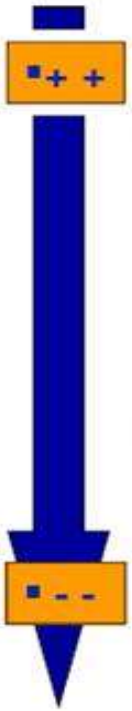
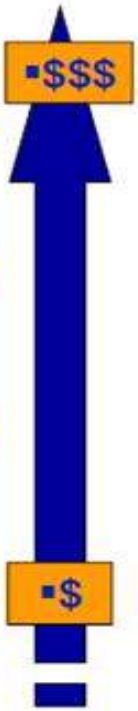
Different Ways to Listen to the Voice of the Customer



▪Interview	▪Learn about a specific customer's point of view on service issues, product/service attributes, and performance indicators/measures. Supports development of hypothesis about customer needs.
▪Focus Group	▪Organize information from the collective point of view of a group of customers that represent a segment. Helps clarify and define customer needs.
▪Survey	▪Measure the needs or the importance and performance of a product, service or attribute across an entire segment or group of segments. Furnishes quantitative data.
▪Customer Scope	▪It is the organization initiative to achieve the delivery of the brand promise. It consists in measuring customer satisfaction versus customer expectations through a well thought questionnaire.
▪Customer Complaint Data	▪Collect and classify customer feedback about product performance, features and attributes – classify by type across product lines. Furnishes qualitative and quantitative data.



Critical To Quality (CTQ)

Customer	Voice of Customer	Quality Issue	Specific Need Statement
Patient 01	Delay of services	Time	I need to finished my ER journey within 1 hour
Patient 02	Proper diagnoses	Efficiency	I expect 100% of the doctor decisions are complimented with my compliant
Patient 03	Improper communication	Respect	I expect 100% of Staff conversations with me to be in respective manner
Patient 04	Lack of prioritization system in providing ER services	Equity	I need to deal with equal system in 100% of steps of my ER journey
Patient 05	lack of providing my special needs during my journey in ER	Patient Centered	I need to find 100% special needs during my journey in ER

CTQ

(Critical to Quality)

Accurate Translation for the Customer Need is Critical!

- **Must be written from the customer's perspective**
- **Write the need, not the solution**
- **Write the need in complete sentences, examples help**
- **Use measurable terms**
- **Be concise**
- **Write from a positive perspective**
-
- **Validate the need with the customer**

Your Project Example — *Identify the CTQs*

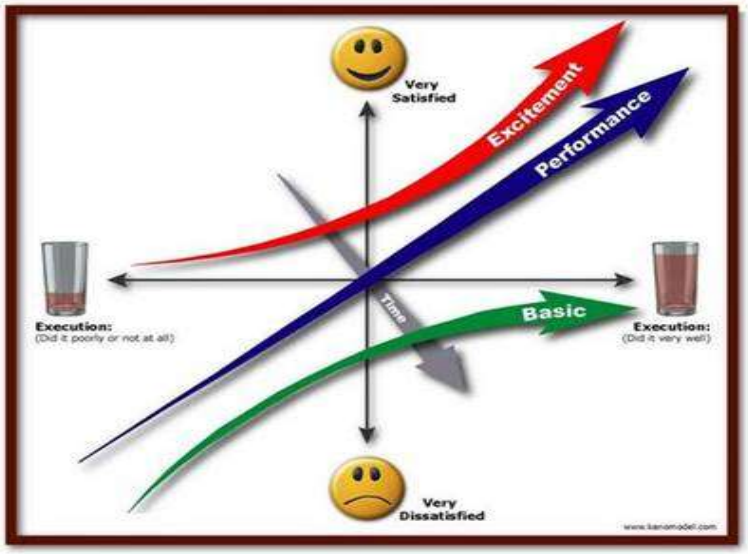
- **Identify your CTQs (10 Minutes)**

What	How	Who	Timing
Introduction	. Introduce the purpose of the exercise	Trainer	2 min
Preparation	. List the CTQs of your project	Participants	5 min
Write on flip chart	. Write the CTQs on flip chart	Participants	2min
Present your CTQs	. Present your CTQs to everyone	Presenter from your group	1min

CTQ

(Critical to Quality)

Prioritize your Customers CTQs



Example: Coffee

Must have! — Cup clean, Coffee hot

Good to have! — Choice in flavor, Choice in type

Nice to have! — Chocolate square, Chocolate nut

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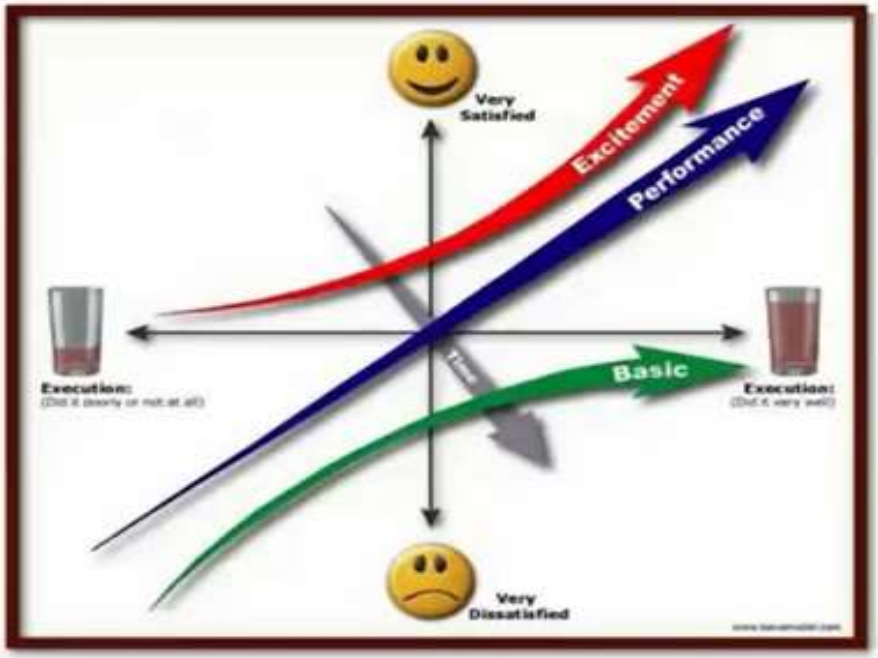
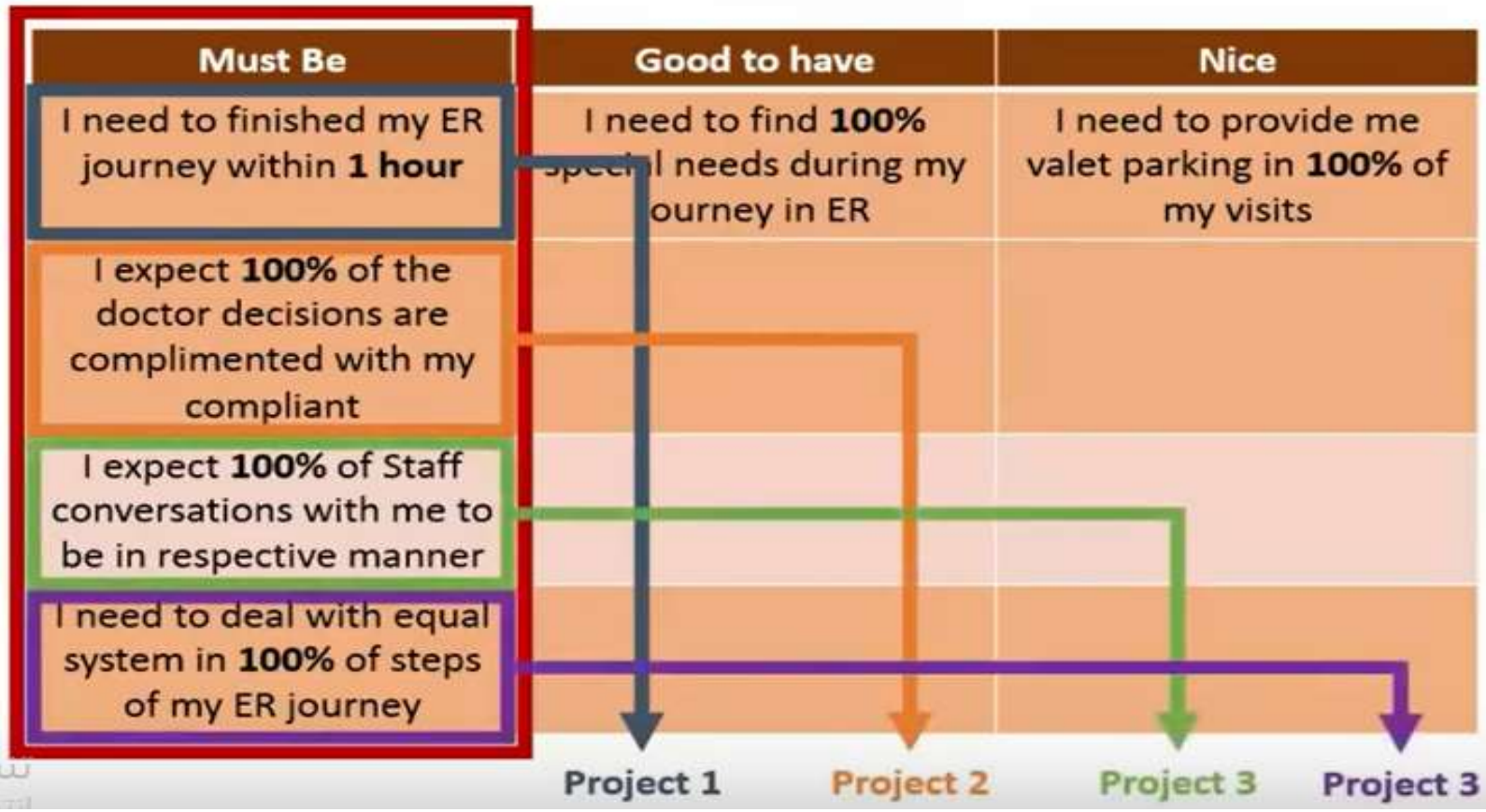
KANO Model



KANO Model

Must Be	Good to have	Nice
I need to finished my ER journey within **1 hour**	I need to find **100%** special needs during my journey in ER	I need to provide me valet parking in **100%** of my visits
I expect **100%** of the doctor decisions are complimented with my compliant		
I expect **100%** of Staff conversations with me to be in respective manner		
I need to deal with equal system in **100%** of steps of my ER journey		

KANO Model


Must Be
Good to have
Nice
I need to finished my ER journey within 1 hour
I need to find 100% special needs during my journey in ER
I need to provide me valet parking in 100% of my visits
I expect 100% of the doctor decisions are complimented with my compliant
I expect 100% of Staff conversations with me to be in respective manner
I need to deal with equal system in 100% of steps of my ER journey
Project 1
Project 2
Project 3
Project 3

DMAIC Project Charter

Project No.:_____

Project Name:	Process :
Resource Plan	**Team Members**
Champion / Sponsor: Green / Black Belt: Functional Managers/Process Owner: Coach / Master Black Belt:	*Text*
Problem Statement	**Scope**
Text	*Text*
Goal Statement	**Customer CTQ's**
Text	*Text*
Estimate Financial Opportunities	**High Level Project Milestone**
Text	*Text*

Validation

Green / Black Belt	Master Black Belt	Process Owner
CEO	Financial Analyst	Champion / Sponsor

PROJECT CHARTER

Resource Plan

Champion :
Green/Black Belt :
Process Owner :
Coach / Master Black Belt :

Problem Statement

(when)
(where)
(what)
(how big).
(how it impact).

Don't use WHY & WHO

Goal Statement

Starts with a verb (reduce , eliminate ,....)
Focus of project (Cycle time , Accuracy)

Estimate Intangiibile,Financial Benefits

Reducing Waiting Time
Reduce the Cost

Team Members

Name of the Team working on the project

Scope

What process will the team focus on
What are the boundaries of the process

Customer CTQs

Customer Requirement

High-level project Milestone

Define : 12 days
Measure : 15 days
Analyze : 30 days
Improve : 60 days

Project name : Reduce LAB TAT

Resource Plan

Champion : AHMAD
Green/Black Belt : MOHAMAD
Process Owner : NASSER
Coach / Master Black Belt : KHALID

Problem Statement

For The Last 2 years in the lab average TAT for Stat Lab results is more than 2 hours . This affect delaying of lab results affecting Patient Care .

Goal Statement

To reduce TAT from more than 2 hours to less than 1 hour in next month

Estimate Intangiibile,Financial Benefits

Reducing Waiting Time
Reduce the Cost

Team Members

ABDULLAH
REEM
MOATH
TAREQ

Scope

TAT OF STAT LAB RESULTS

Customer CTQs

LESS THAN ONE HOUR

High-level project Milestone

Define : 12 days
Measure : 30 days
Analyze : 20 days
Improve : 15 days

Thanks!

Khalid Abu Issa **Mobile : 505279422**

Email : kabuissa8@gmail.com

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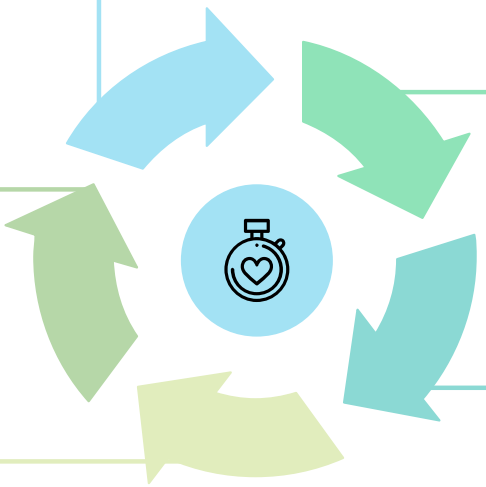
The 6 SIGMA journey Towards Excellence Continues…

DMAIC : An Improvement Methodology



Define
Set direction for improvement.

Measure
Collect reliable data to understand current process performance

Analyse
Identify problem's root causes through process and data analysis.

Improve
Determine new improved process design.

Control
Ensure improvement effectiveness over time.

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Ferrari F1 Perfection

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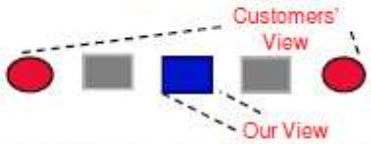
MEASURE

Purpose : **To measure and understand baseline performance** for the current process by collecting reliable data (quantitative & qualitative)

Data Collection

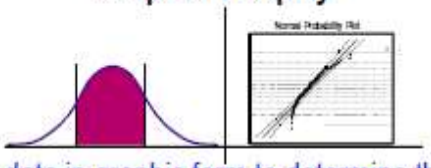
- Develop a data collection plan
  - Operational definition
  - Sampling
  - Measurement System Analysis (MSA including Gage R&R)

Customer oriented mindset



- Select the measure your customer uses to judge your performance (Key Output Measure Y)
- Plan to collect CONTINUOUS data

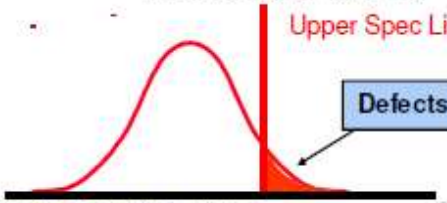
Graphical Display



- Display data in graphic form to determine the type of distribution, the metrics to understand variation and set goals for the improvement strategy.
  - Normal Distribution described by Mean and Standard deviation
  - Skewed Distribution described by Q1 (or Q3) and Inter Quartile Range
  - Long tailed distribution described by Median and Span 5-95

Calculate Process Sigma

Defects "Outside" Spec Limit



- Compute baseline sigma

MEASURE: Measure the Current Situation

Goal

- Collect data to gather information on the current situation

Output

- Data that pinpoints problem location or occurrence
- Baseline data on how well the process meets customer needs (to determine current process sigma)
- Understanding of how current process operates
- Display the collected data as histogram, graphs and charts

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Overview

❑ **Objective**:
collect reliable data to understand current process performance.

❑ **Steps:**
- Choose the data to be collected. (data selection)
- Organize data collection plan.
- Study process variation.
- Calculate sigma level.
- Process capability.

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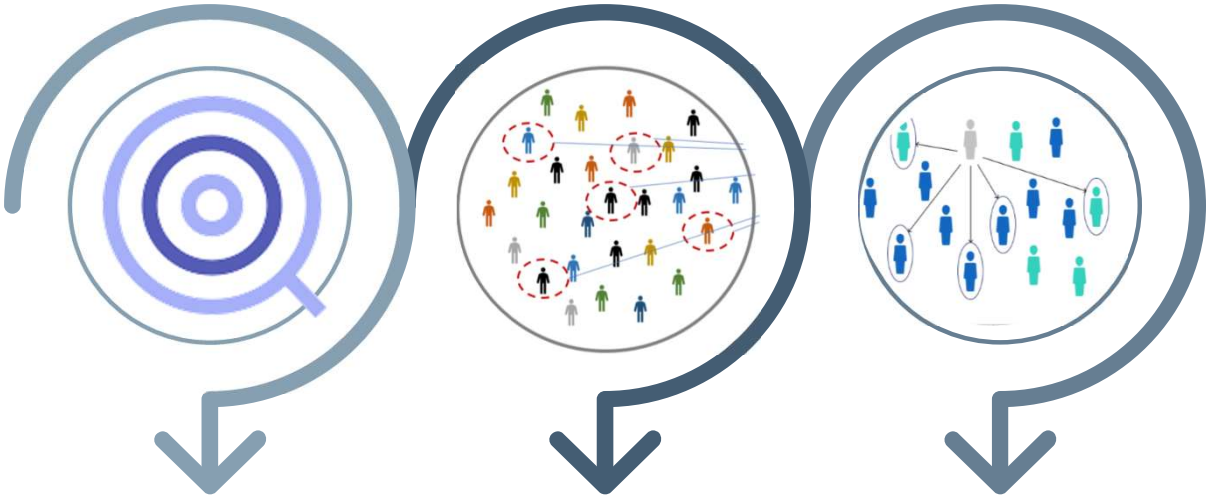
Data collection plan



Data Type

Sample Size

Sampling Type

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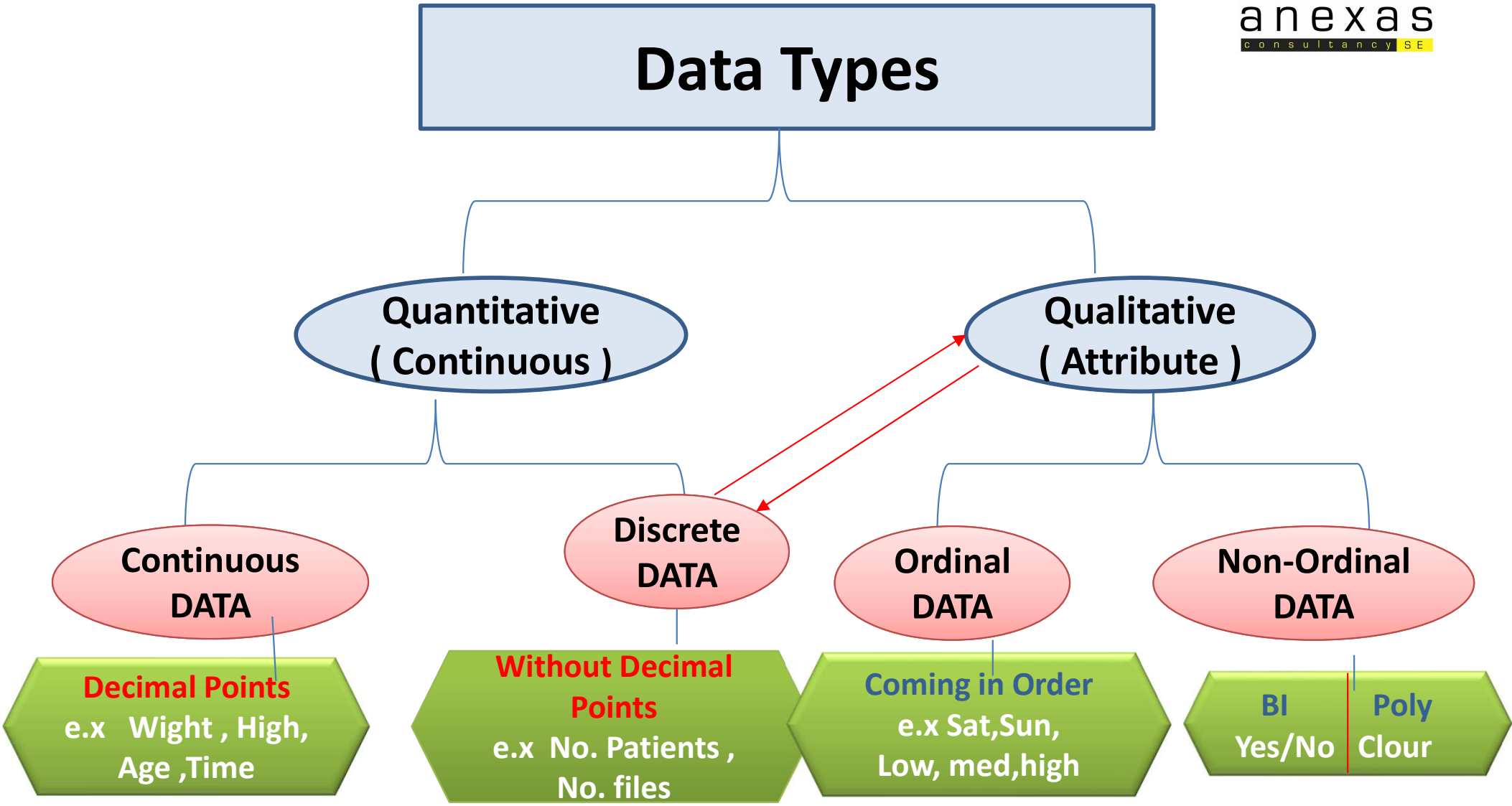
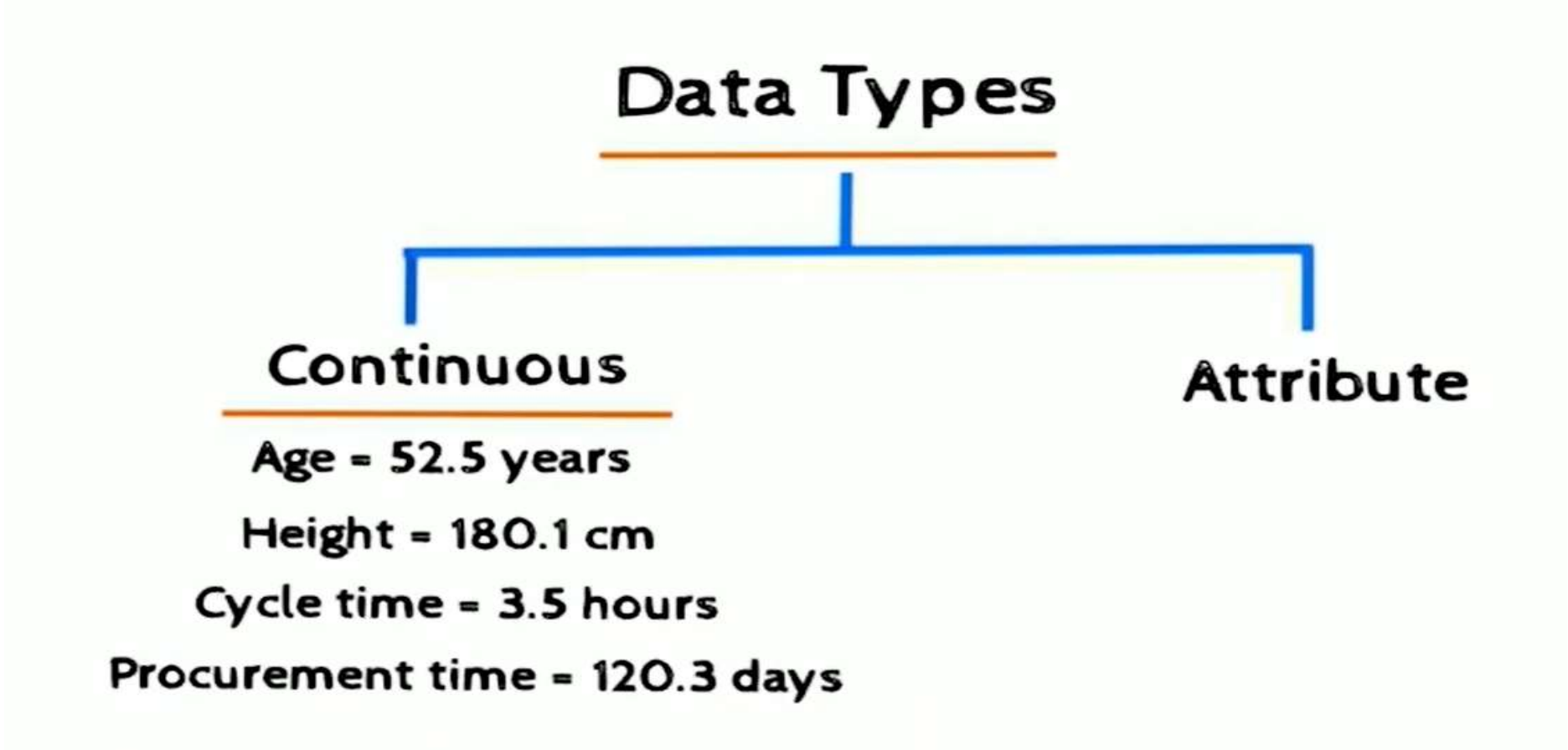
Data Types




Data Types
Continuous
Attribute
Age = 52.5 years
Height = 180.1 cm
Cycle time = 3.5 hours
Procurement time = 120.3 days

Attribute

Attribute	Category	Count	Proportion
Happiness	Happy	60	0.6
	Unhappy	40	0.4
		100	1.0

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Why Use Six Sigma as a Metric?

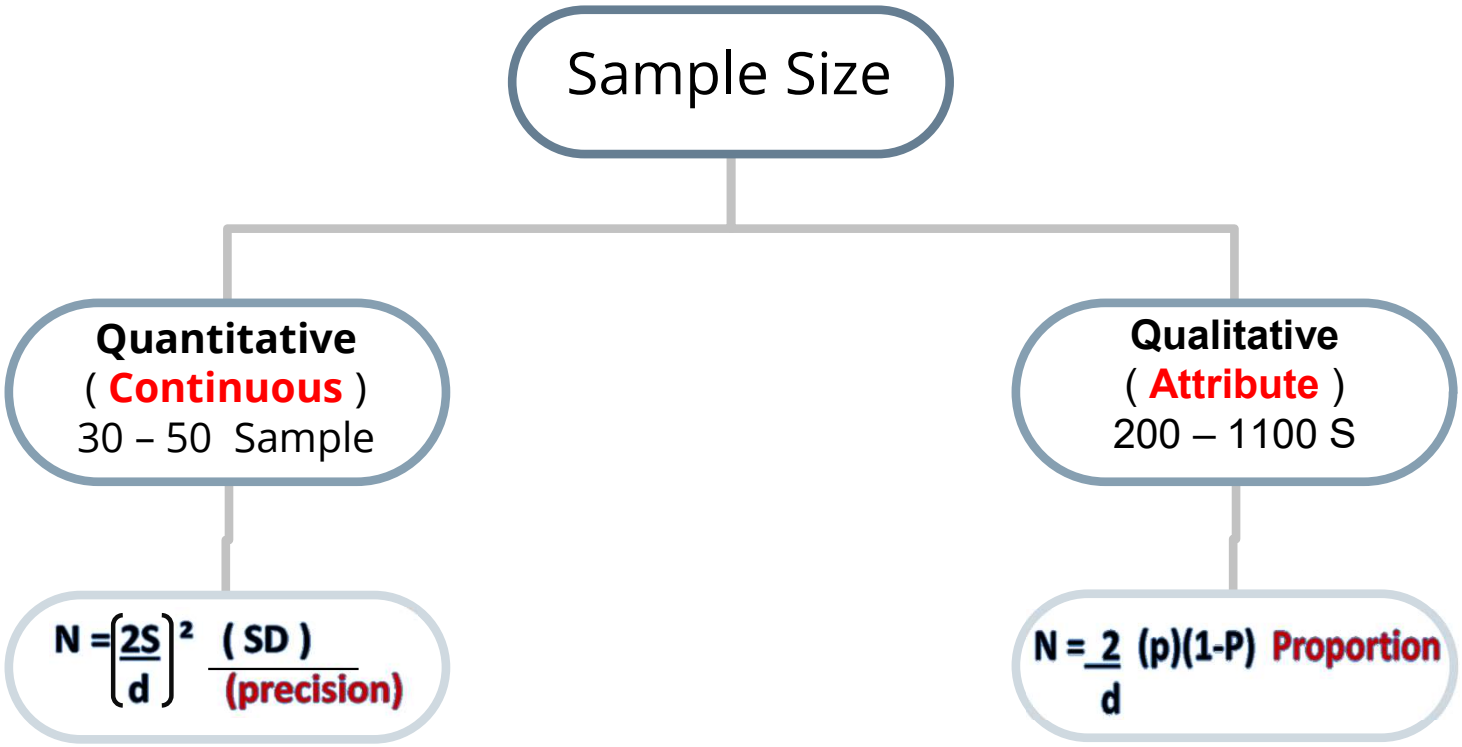
Process sigma is a more sensitive indicator than quality percentage

Quality Percent	DPMO	Sigma Level
93	66,807	3.0
98	22,750	3.5
99	6,210	4.0
99.87	1,350	4.5
99.977	233	5.0
99.9997	3.4	6.0

Sample vs Population

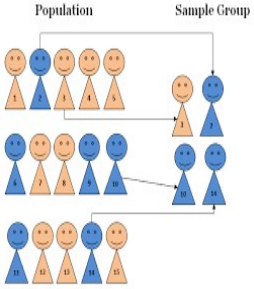
- ***Population:*** All the items that have the "property of interest" under study.

- ***Sample:*** A significantly smaller subset of the population used to make an inference.



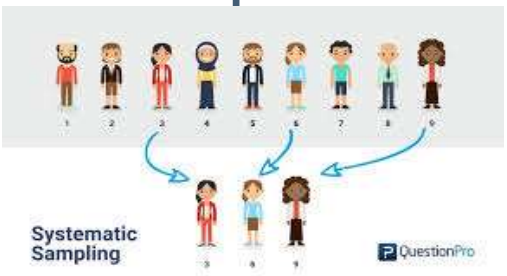
If N < 100 , n = 30 if N 100 - 1000 , n = 20 % if N 1000 - 10000 , n = 10 %
for one Month (L.T) better than (S.T) collected in one week

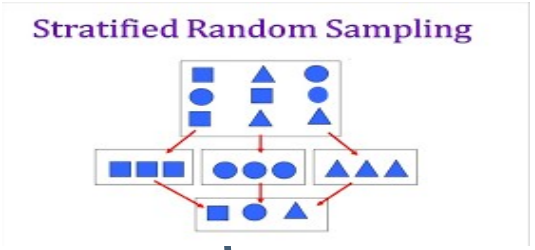
Sampling Techniques



Simple Random

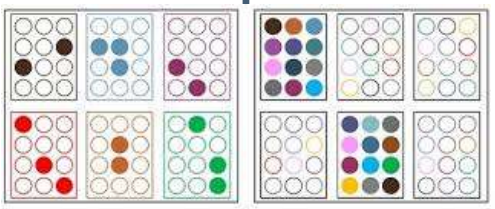
Systematic Random





Stratified Random

Cluster



Stratified Sampling Vs Cluster Sampling

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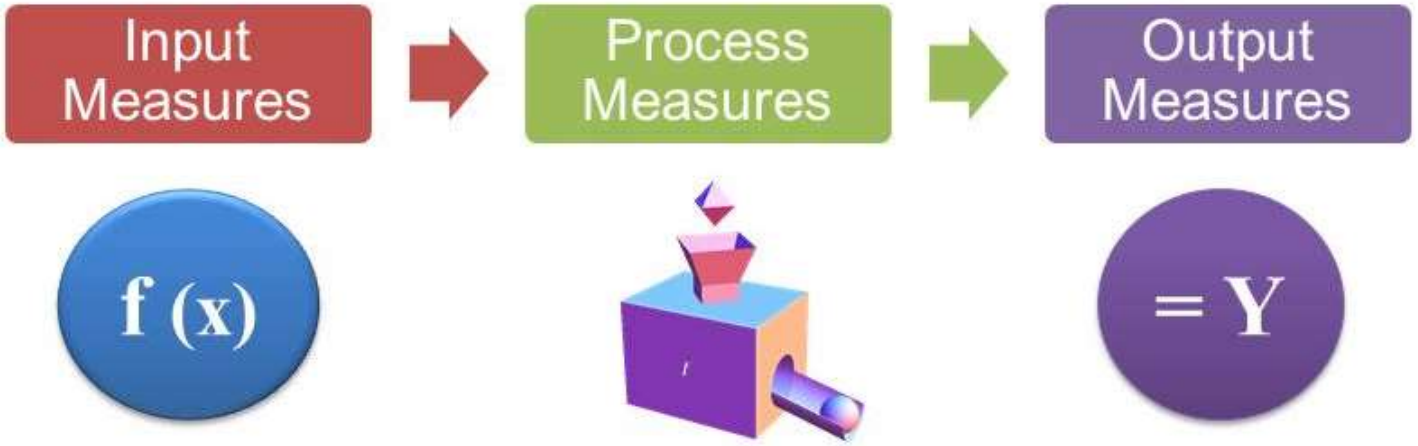
Choose the data to be collected



Prediction

- Independent
- Input/Process
- Cause
- Problem

Response

- Dependent
- Output
- Effect
- Symptom

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Data Collection for Potential Causes (Y = F (X))

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	f (X)		
Patient N	Dat	TAT	Time to send blo	Time to Log in Syste	Time to Start sp	Spining Tir	Waiting time between spin & Analys	Analysis Tir	RepReporting tir	Technici	Machi	Test ty	Speciali	Wa	Shift
2	13-May	138	15	56	14	10	10	30	3	K	1	R,H,B	General	A	Before 10
3	13-May	62	5	6	9	10	10	20	2	K	1	R,H,B	General	CLINIC	After 10
4	13-May	80	2	3	5	10	10	45	5	K	1	R,H	General	CLINIC	After 10
5	13-May	61	1	4	8	10	7	30	1	K	1	R,H	General	CLINIC	After 10
6	13-May	240	125	11	4	10	25	63	2	K	1	R,H,B	General	B	Before 10
7	13-May	49	1	1	3	10	5	25	4	J	1	R,H,B	General	CLINIC	After 10
8	13-May	160	1	1	8	10	10	70	60	J	1	R,H	General	CLINIC	Before 10
9	13-May	155	18	2	35	10	10	75	5	J	1	R,H	General	B	Before 10
10	13-May	262	85	40	45	5	30	55	2	K	1	R,H	General	B	Before 10
11	13-May	97	1	4	10	10	5	65	2	K	1	R,H,B	General	CLINIC	Before 10
12	13-May	66	10	18	2	10	5	20	1	J	1	R,H,B	General	CLINIC	Before 10
13	13-May	172	70	20	30	10	5	36	1	J	1	R,H,B	General	A	Before 10
14	13-May	185	70	21	14	10	10	58	2	J	1	R,H,B	General	A	Before 10
15	13-May	162	69	22	14	10	10	36	1	K	1	R,H,B	General	A	Before 10
16	13-May	72	5	4	6	10	5	40	2	K	1	R,H	General	CLINIC	Before 10
17	13-May	198	68	27	26	9	5	62	1	K	1	R,H	General	D	Before 10
18	13-May	96	20	36	14	10	2	13	1	K	1	R,H	General	CLINIC	After 10
20	13-May	176	65	30	12	10	8	48	3	J	1	R,H	General	A	Before 10
21	13-May	54	5	3	7	10	5	22	2	J	1	R,H,B	General	B	Before 10
22	13-May	110	0	6	4	10	15	45	30	J	2	R,H	General	CLINIC	After 10
23	13-May	44	2	10		10	7	22	3	J	2	R,H	General	CLINIC	After 10
24	13-May	70	5	7		15	5	40	5	J	2	R,H,B	General	CLINIC	After 10
25	13-May	161	20	30	10	10	10	78	3	K	2	R,H,B	General	B	Before 10
26	13-May	112	20	20	20	10	11	29	2	K	2	R,H	General	A	Before 10
27	13-May	82	2	3	10	10	3	52	2	J	2	R,H	General	A	Before 10
28	13-May	66	2	5	3	13	7	35	1	K	2	R,H	General	CLINIC	Before 10

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Data collection plan

What?	Why?	When?	Who?	How?	How many?

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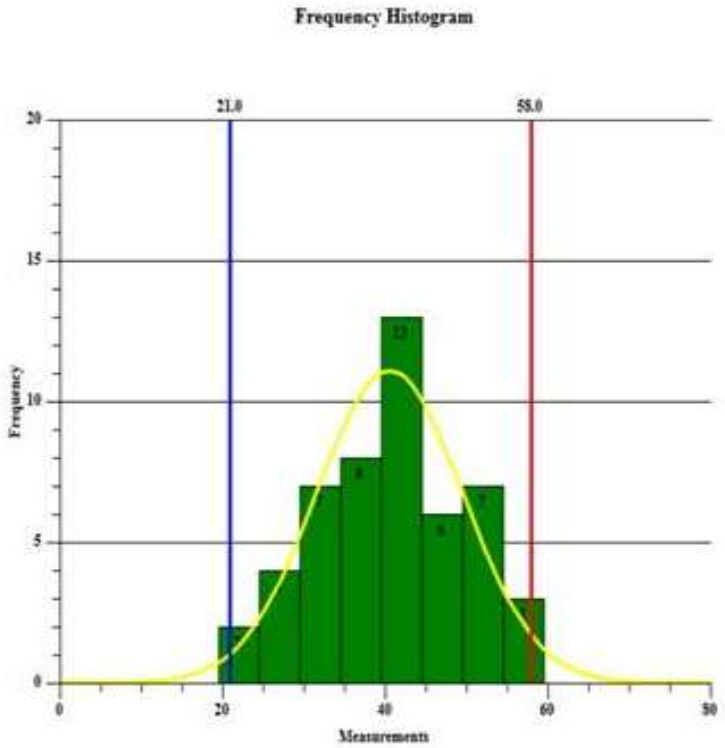
Study process variation

Histogram

The Histogram illustrates the shape (or distribution) of the data by indicating how often different values appear.



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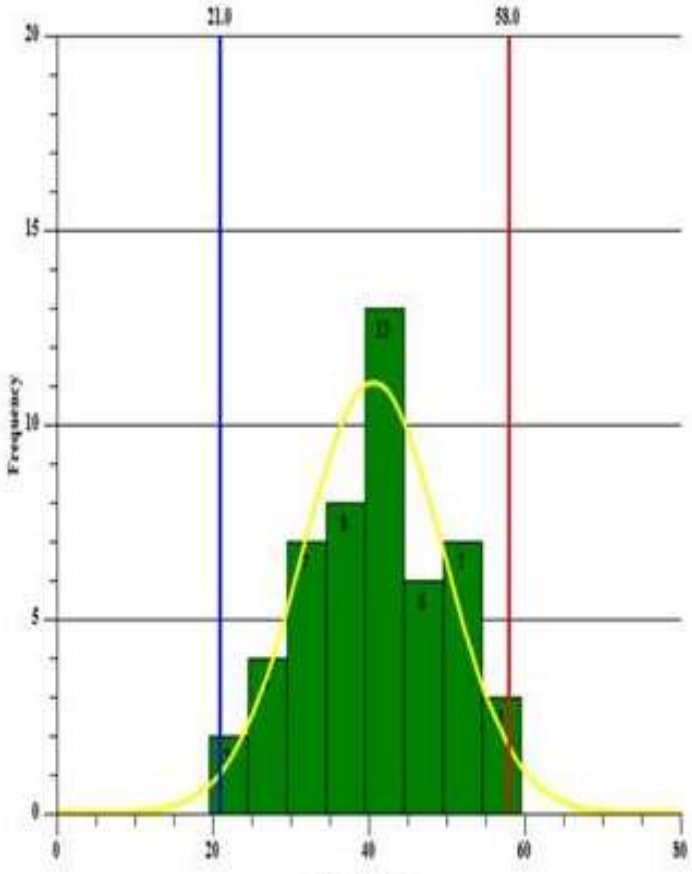
Interpretation of histogram

Key Questions :

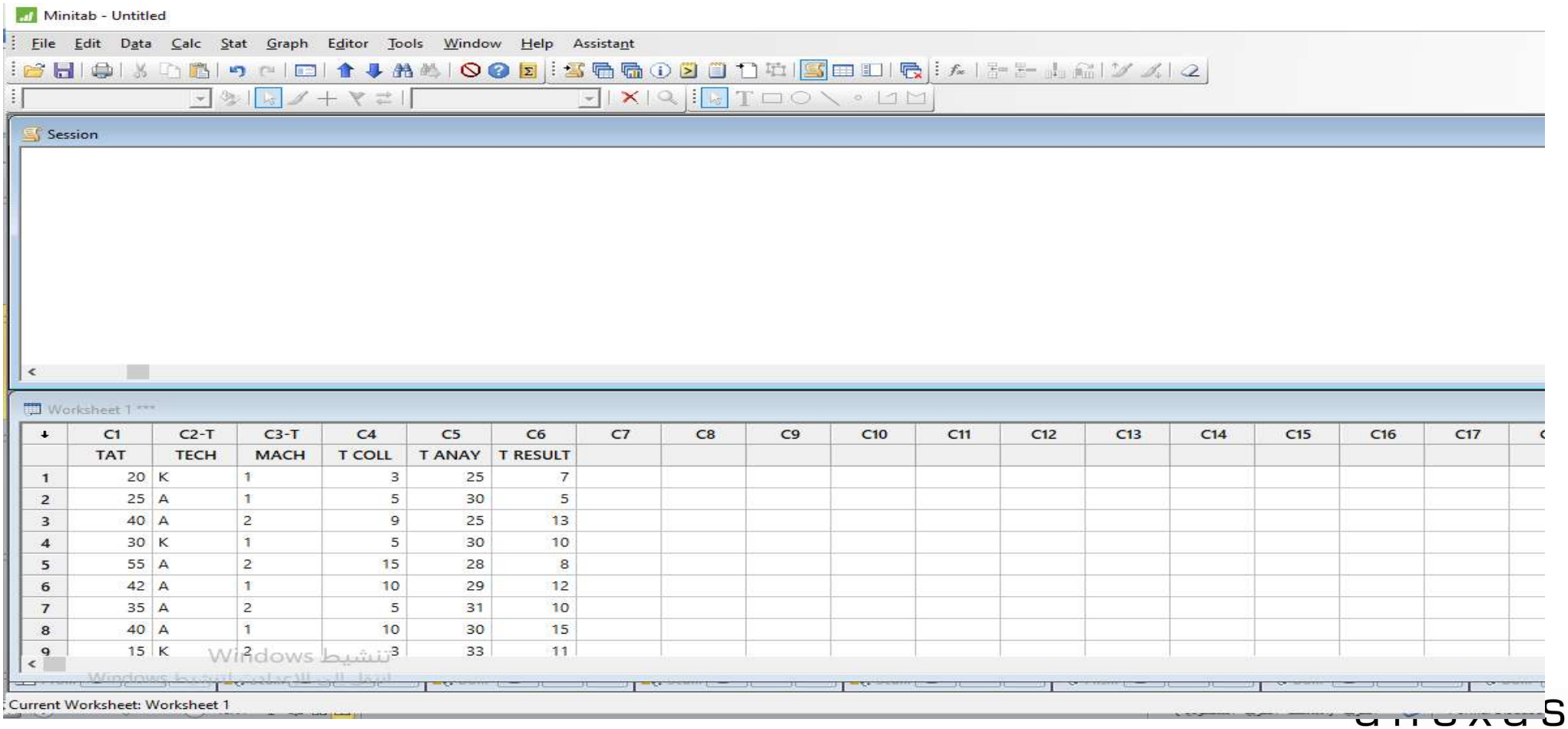
- What is the shape of the distribution ?
- What is the central trend ("center") of the distribution ?
- What is the variation ("spread") of the distribution ? Is the curve wide or narrow?

→ Are we confronted with a problem of "process centring within the limits of customers' expectations or do we have a problem of "too much variation" ?



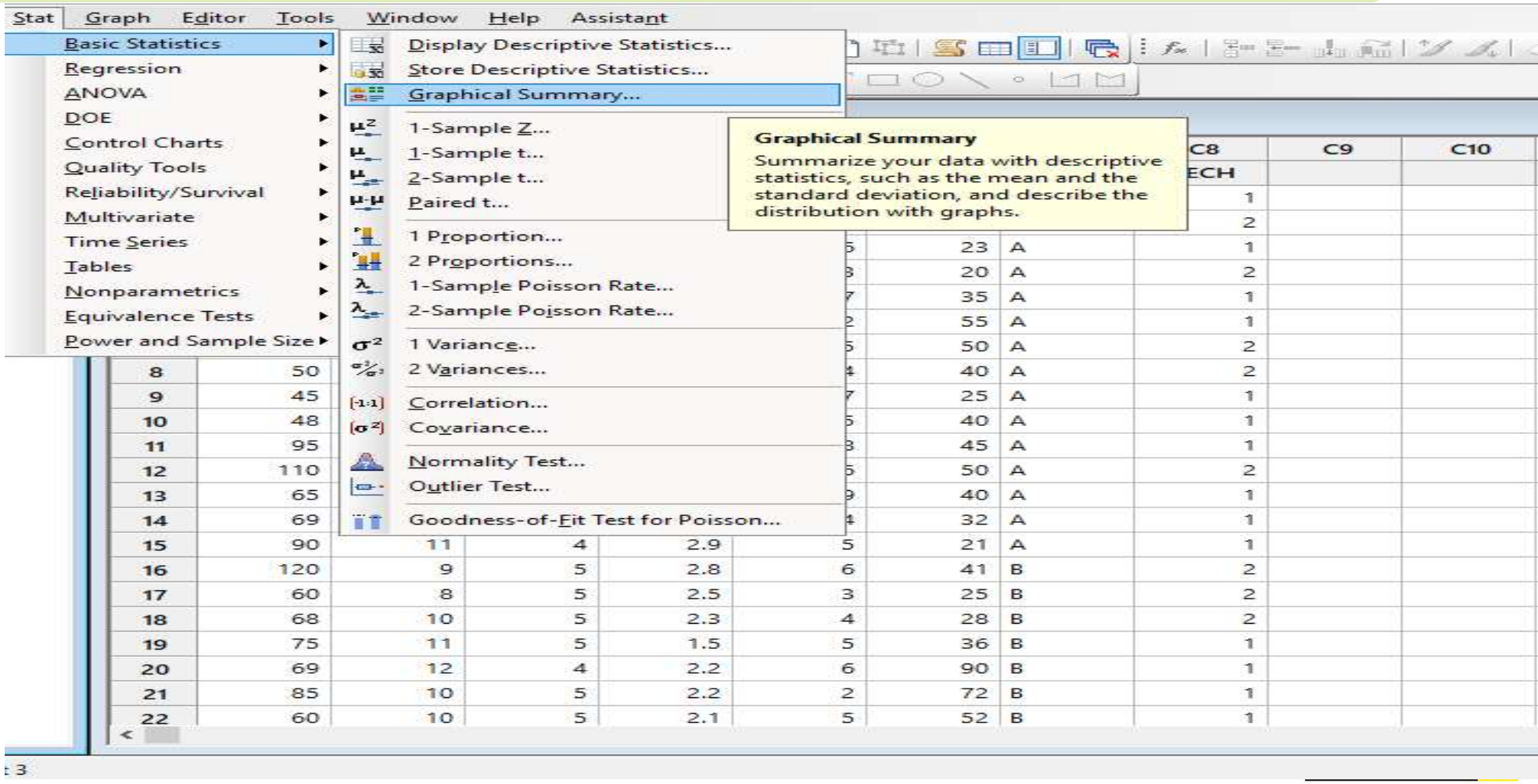
Data Collection for Potential Causes

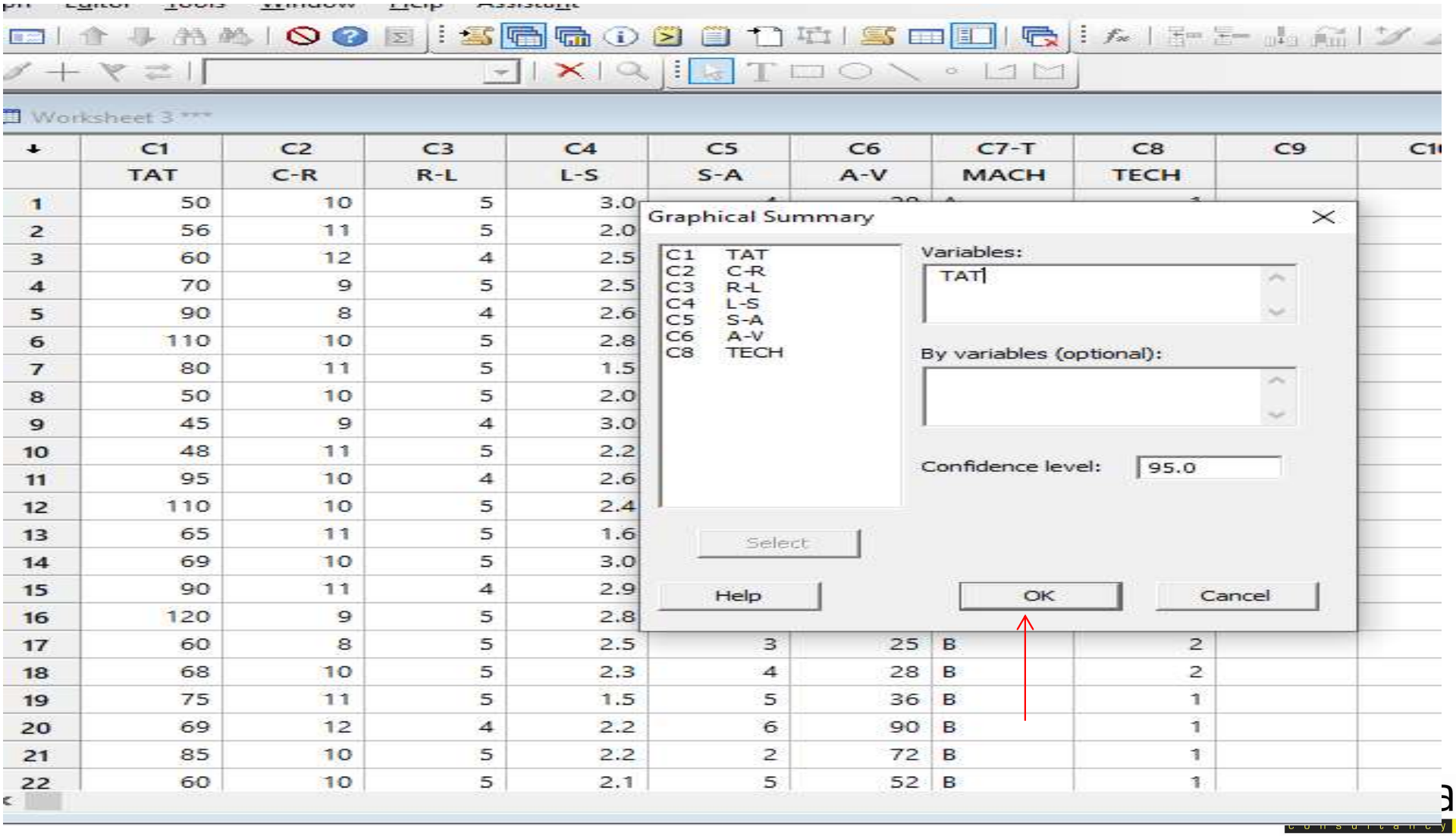
Patient N	Dat	TAT
2	13-May	138
3	13-May	62
4	13-May	80
5	13-May	61
6	13-May	240
7	13-May	49
8	13-May	160
9	13-May	155
10	13-May	262
11	13-May	97
12	13-May	66
13	13-May	172
14	13-May	185
15	13-May	162
16	13-May	72
17	13-May	198
18	13-May	96
20	13-May	176
21	13-May	54
22	13-May	110
23	13-May	44
24	13-May	70
25	13-May	161
26	13-May	112
27	13-May	82
28	13-May	66



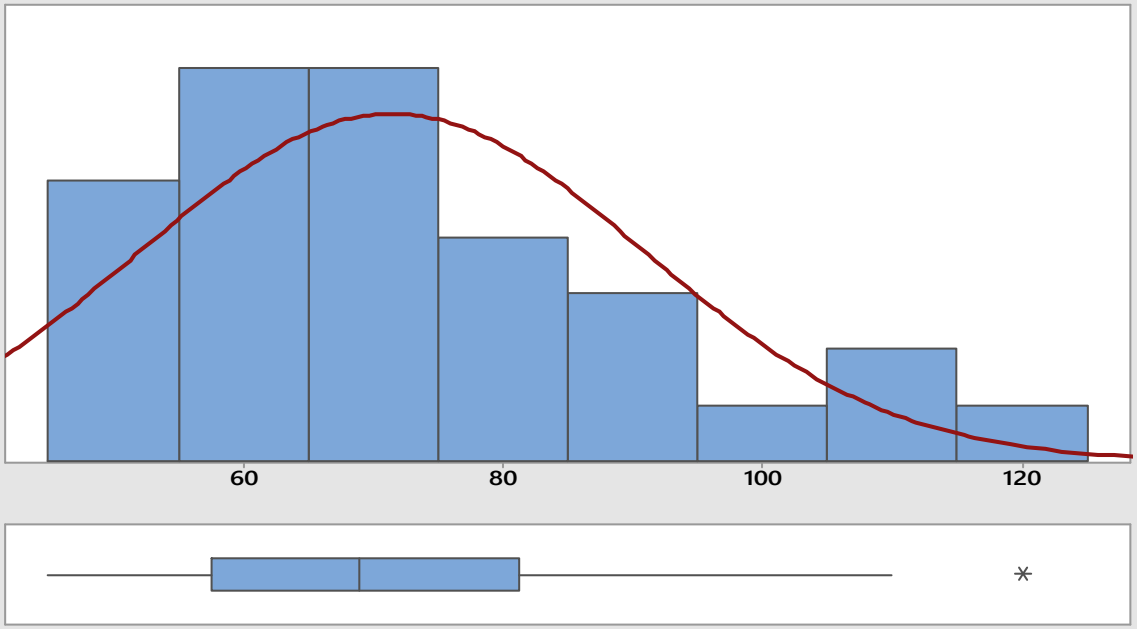
	C1	C2-T	C3-T	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
	TAT	TECH	MACH	T COLL	T ANAY	T RESULT											
1	20	K	1	3	25	7											
2	25	A	1	5	30	5											
3	40	A	2	9	25	13											
4	30	K	1	5	30	10											
5	55	A	2	15	28	8											
6	42	A	1	10	29	12											
7	35	A	2	5	31	10											
8	40	A	1	10	30	15											
9	15	K	2	3	33	11											

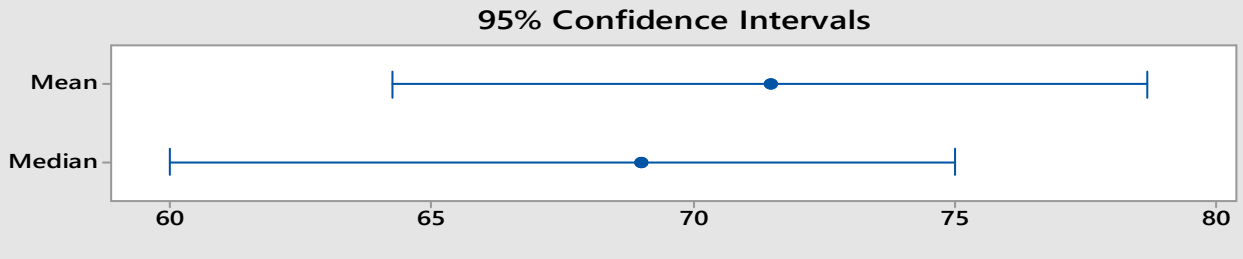
MINITAB SOFTARE PRACTICE: HOW TO DO GRAPHICAL SUMMARY




Worksheet 3 ***
C1 TAT
C2 C-R
C3 R-L
C4 L-S
C5 S-A
C6 A-V
C7-T MACH
C8 TECH
1 50 10 5 3.0
2 56 11 5 2.0
3 60 12 4 2.5
4 70 9 5 2.5
5 90 8 4 2.6
6 110 10 5 2.8
7 80 11 5 1.5
8 50 10 5 2.0
9 45 9 4 3.0
10 48 11 5 2.2
11 95 10 4 2.6
12 110 10 5 2.4
13 65 11 5 1.6
14 69 10 5 3.0
15 90 11 4 2.9
16 120 9 5 2.8
17 60 8 5 2.5 3 25 B 2
18 68 10 5 2.3 4 28 B 2
19 75 11 5 1.5 5 36 B 1
20 69 12 4 2.2 6 90 B 1
21 85 10 5 2.2 2 72 B 1
22 60 10 5 2.1 5 52 B 1
Graphical Summary
C1 TAT
C2 C-R
C3 R-L
C4 L-S
C5 S-A
C6 A-V
C8 TECH
Variables:
TAT
By variables (optional):
Confidence level:
95.0
Select
Help
OK
Cancel

Summary Report for TAT



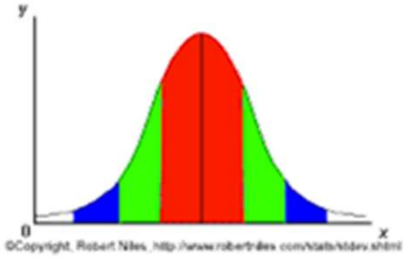


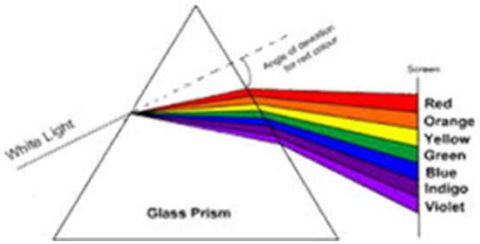
Anderson-Darling Normality Test	
A-Squared	0.73
P-Value	0.051
Mean	71.467
StDev	19.303
Variance	372.602
Skewness	0.928965
Kurtosis	0.390733
N	30
Minimum	45.000
1st Quartile	57.500
Median	69.000
3rd Quartile	81.250
Maximum	120.000
95% Confidence Interval for Mean	
64.259	78.674
95% Confidence Interval for Median	
60.000	75.000
95% Confidence Interval for StDev	
15.373	25.949

Study Process variation

Descriptive Statistics

- Measure of Central Tendency (**Location**)
  - MEAN
  - MEDIAN
  - MODE
- Measure of Dispersion **(Variation)**
  - Range
  - variance
  - Standard deviation





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Measure of Location (Central Tendency)

MEAN

Average of a set of values that does not have outliers

The Mean is the sum of all the values divided by the number of values

Example: Sum of Values 3 , 4 .5 , 5 , 5 , 6 , 6 , 7 , 8 , 8 , 99

Number of Values : 11

Mean 66 / 11 = 6

Mean 14

Median

It is the middle value in an ordered data set

Useful for data sets contain outliers.

Order the values from least to greatest.

Locate the middle value

Example: 3 , 4 , 5 , 5 , 5 , 6 , 6 , 7 , 8 , 8 , 99 Median = 6

If the number of values is even, the median is the average of the two middle values

Mode

The Value that occurs most often in a data set.

Useful for data sets containing outliers.

If there is no mode in the data set, it's of no use

Not as popular as mean or median.

How to determine the mode in a data set ?

Order the values from least to greatest.

Locate the value that occurs the most.

Example :

3,4,5,5,6,6,6,7,8,8,99 Mode = 6

3,4,5,5,5,6,6,6,8,8,99 Mode = 5 and 6

1,2,3,4,5,6,7,8,9,10,11 No Mode

Measure of Dispersion

Range in Statistics

The Difference between the lowest and highest values in a data set

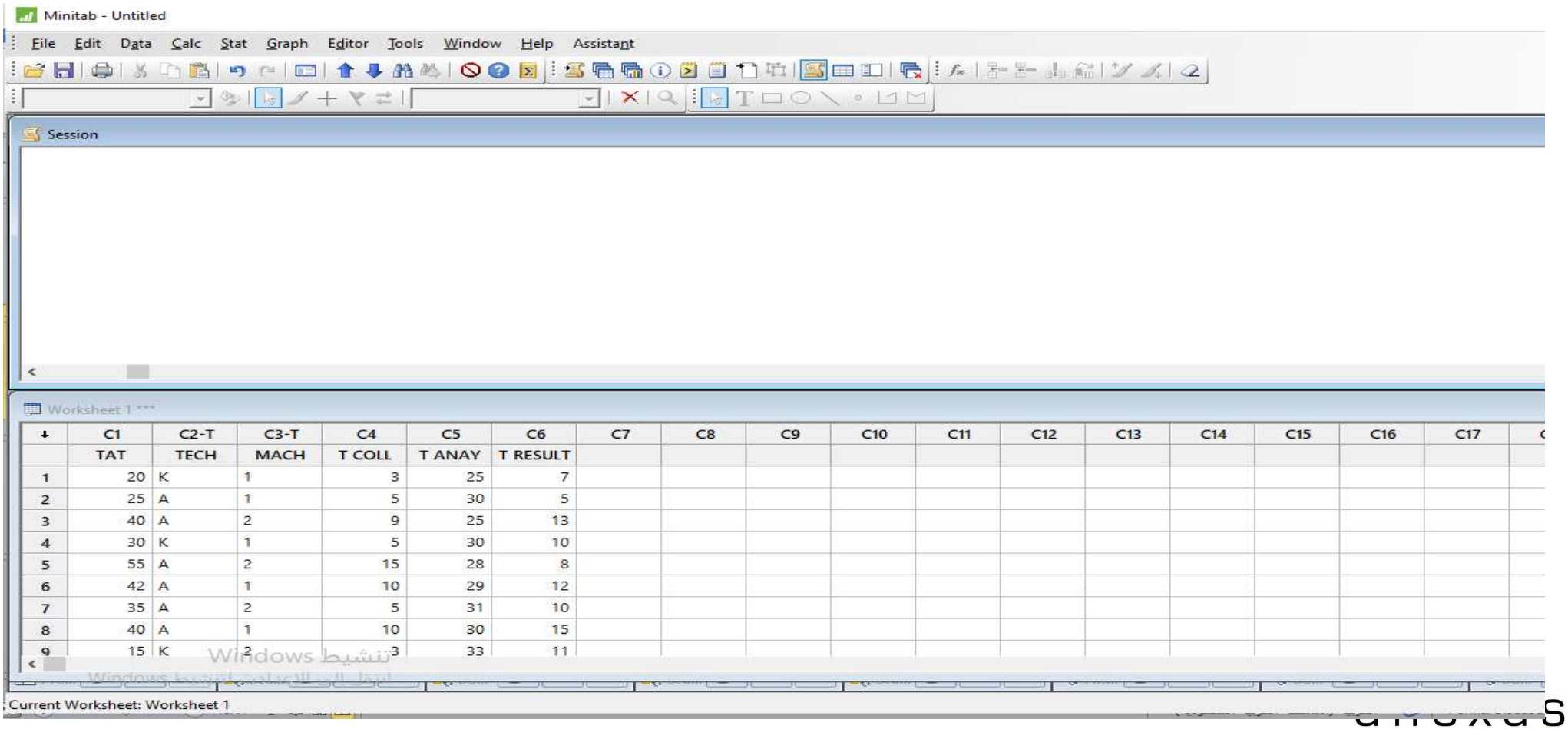
Example

3 , 4 , 5 , 5 , 5 , 6 , 6 , 7 , 8 , 8 , 9

Range= Highest Value – Lowest Value

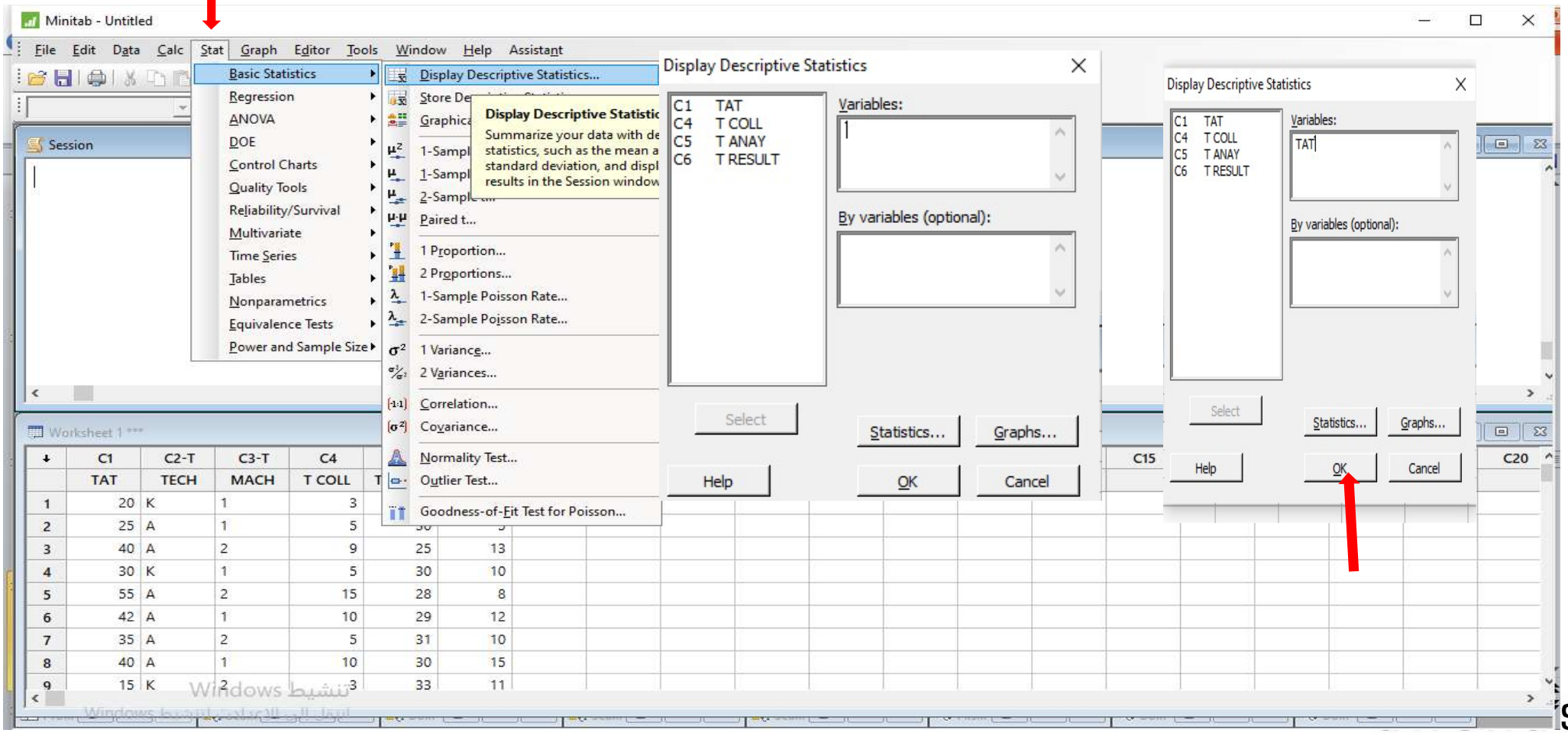
= 9 – 3 = 6

How to get Descriptive Statistics



	C1	C2-T	C3-T	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17
	TAT	TECH	MACH	T COLL	T ANAY	T RESULT											
1	20	K	1	3	25	7											
2	25	A	1	5	30	5											
3	40	A	2	9	25	13											
4	30	K	1	5	30	10											
5	55	A	2	15	28	8											
6	42	A	1	10	29	12											
7	35	A	2	5	31	10											
8	40	A	1	10	30	15											
9	15	K	2	3	33	11											

How to get Descriptive Statistics



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Descriptive Statistics (Mean , Median , Mode , Range, SD)

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Descriptive Statistics: TAT

Variable	Mean	StDev	Variance	Minimum	Q1	Median	Q3	Maximum	Range	Mode
TAT	33.20	11.75	137.96	15.00	23.75	32.50	40.50	55.00	40.00	30; 40

Variable	N for Mode
TAT	2

Worksheet 1 ***

	C1	C2-T	C3-T	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
	TAT	TECH	MACH	T COLL	T ANAY	T RESULT														
1	20	K	1	3	25	7														
2	25	A	1	5	30	5														
3	40	A	2	9	25	13														

Measurement System Analysis (MSA)

MSA

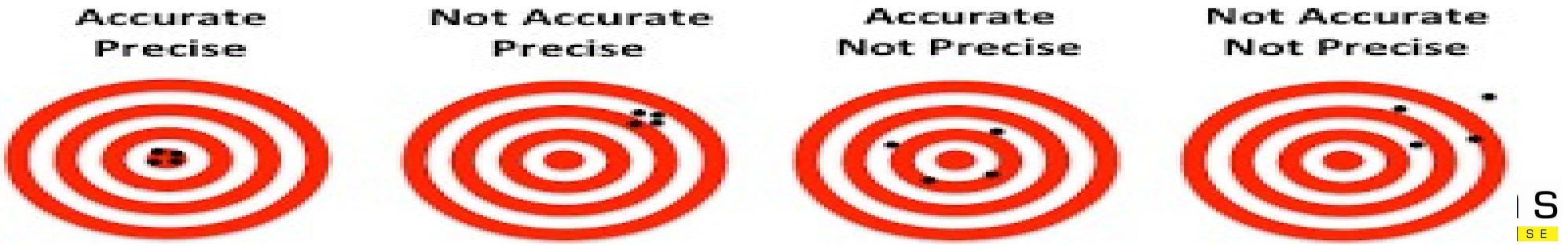
Accuracy

Stability

Bias

Precision

- **Reproducibility**
- **Repeatability**



Common Problems with Measurements

Problems with the measurements:

1. Bias or inaccuracy
2. Not Repeatable
3. Not reproducible
4. Unstable measurement system over time
5. Lack of resolution

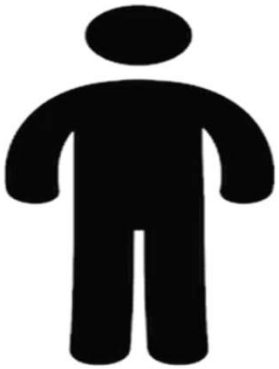
(Next slides contain the details about the problems listed above)

INACCURACY

GOOD MEASUREMENT SYSTEM

ACCURATE

80 KG



70 KG

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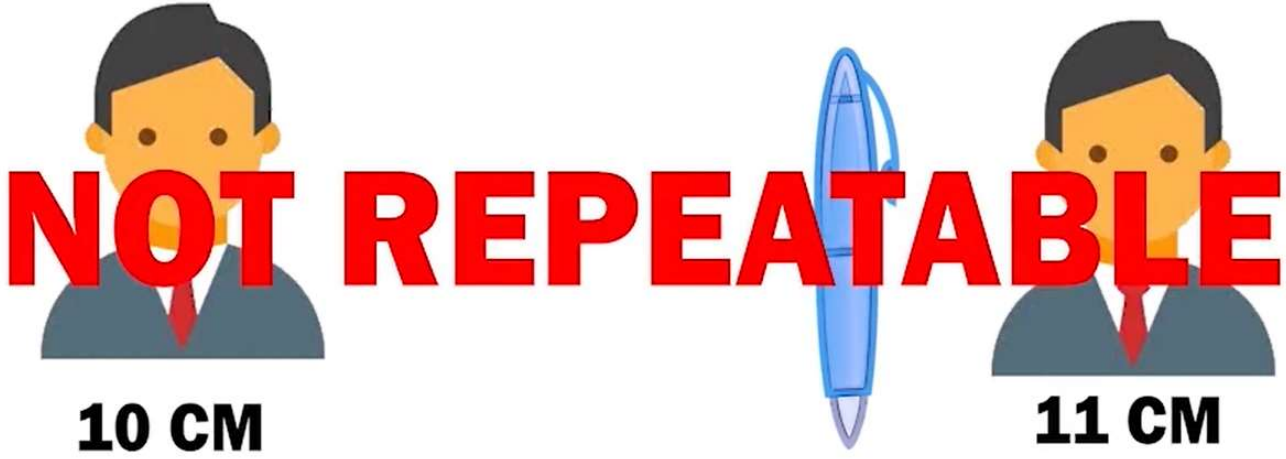
NOT REPEATBLE



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NOT REPRODCIBILE

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NOT REPRODCIBILE

Different People , Machines , etc

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UNSTABLE MEASURMENT

LITTLE OVER TIME

Improving a Measurement System

- A measurement system consists of:
  - Measuring devices
  - Procedures
  - Definitions
  - People
- To improve a measurement system, you need to:
  - Evaluate how well it works now (by asking "How much of the variation we see in our data is due to the measurement system?")
  - Evaluate the results and develop improvement strategies

Calculate process sigma : formula

Calculate the number of Defects Per Million Opportunities

$$DPMO = \frac{\text{(No. of Defects)}}{\text{No. Of Units x No. of opportunities}} \times 1\,000\,000$$

In the Sigma table, look at the Sigma value relating to the DPMO determined

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Calculate process sigma : formula

Calculate the number of Defects Per Million Opportunities

$$DPMO = \frac{\text{(No. of Defects)}}{\text{No. Of Units x No. of opportunities}} \times 1\,000\,000$$

In the Sigma table, look at the Sigma value relating to the DPMO determined

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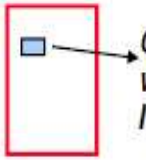
Compute process sigma

Key Definitions

Unit: the item produced or processed

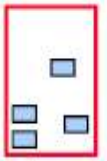
Form

Defect: any event that does not meet the specification of a CTQ as defined by the customer



Critical field with missing Information

Defect opportunity: any event which can be measured that provides a chance of not meeting a customer requirement (specification)

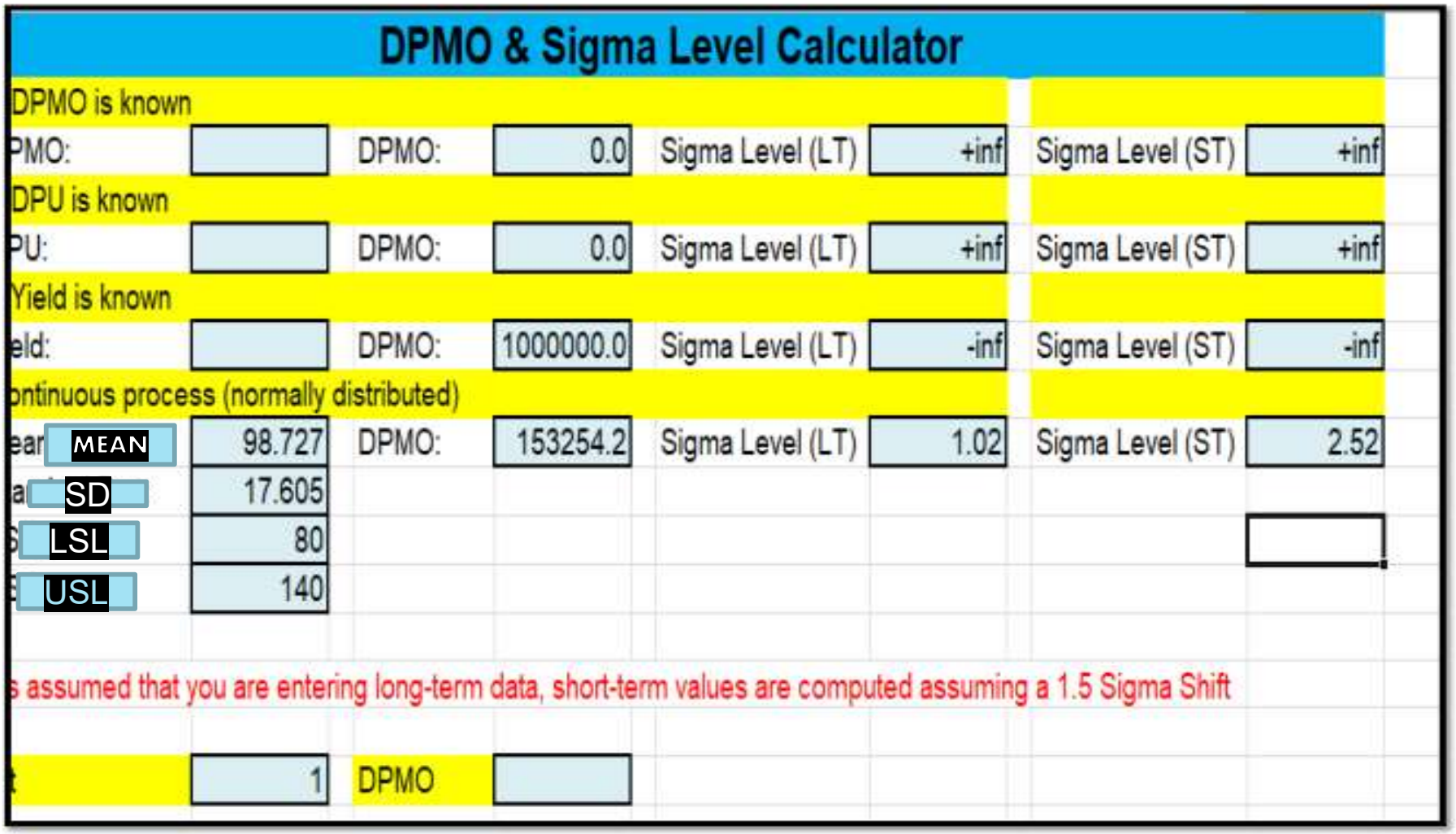


 # Critical fields on the form

CONVERSION TABLE

Process Sigma Level Conversion Table		
Yield %	DPMO	Sigma Level
6.68000	933,200	0.000
8.45500	915,450	0.125
10.56000	894,400	0.250
13.03000	869,700	0.375
15.87000	841,300	0.500
19.08000	809,200	0.625
22.66000	773,400	0.750
26.59500	734,050	0.875
30.85000	**691,500**	**1.000**
35.43500	645,650	1.125
40.13000	598,700	1.250
45.02500	549,750	1.375
50.00000	500,000	1.500
54.97500	450,250	1.625
59.87000	401,300	1.750
64.56500	354,350	1.875
69.15000	**308,500**	**2.000**
73.40500	265,950	2.125
77.34000	226,600	2.250
80.92000	190,800	2.375
84.13000	158,700	2.500
86.97000	130,300	2.625
89.44000	105,600	2.750
91.54500	84,550	2.875
93.32000	**66,800**	**3.000**

Process Sigma Level Conversion Table		
Yield %	DPMO	Sigma Level
94.79000	52,100	3.125
95.99000	40,100	3.250
96.96000	30,400	3.375
97.73000	22,700	3.500
98.32000	16,800	3.625
98.78000	12,200	3.750
99.12000	8,800	3.875
99.38000	**6,200**	**4.000**
99.56500	4,350	4.125
99.70000	3,000	4.250
99.79500	2,050	4.375
99.87000	1,300	4.500
99.91000	900	4.625
99.94000	600	4.750
99.96000	400	4.875
99.97700	**230**	**5.000**
99.98200	180	5.125
99.98700	130	5.250
99.99200	80	5.375
99.99700	30	5.500
99.99767	23	5.625
99.99833	17	5.750
99.99900	10	5.875
99.99966	**3**	**6.000**



DPMO & Sigma Level Calculator

DPMO is known							
PMO:		DPMO:	0.0	Sigma Level (LT)	+inf	Sigma Level (ST)	+inf
DPU is known							
PU:		DPMO:	0.0	Sigma Level (LT)	+inf	Sigma Level (ST)	+inf
Yield is known							
eld:		DPMO:	1000000.0	Sigma Level (LT)	-inf	Sigma Level (ST)	-inf
ntinuous process (normally distributed)							
ear MEAN	98.727	DPMO:	153254.2	Sigma Level (LT)	1.02	Sigma Level (ST)	2.52
a SD	17.605						
S LSL	80						
S USL	140						

s assumed that you are entering long-term data, short-term values are computed assuming a 1.5 Sigma Shift

	1	DPMO	

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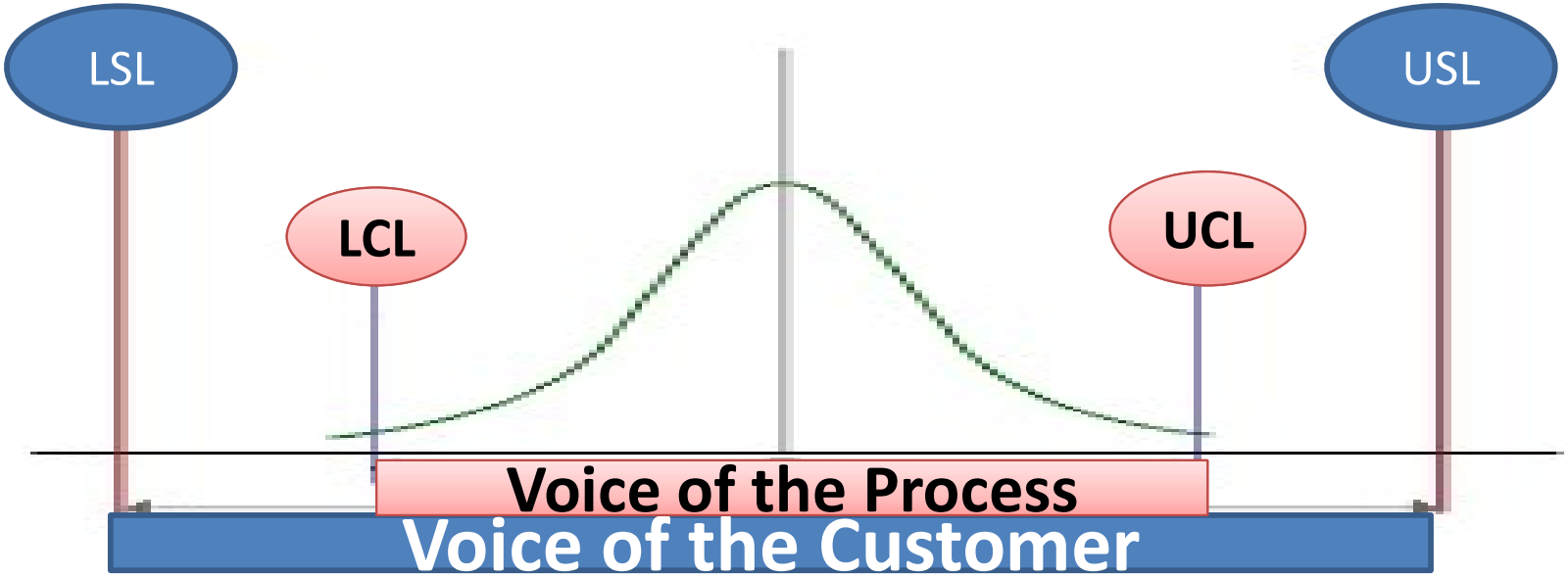
(Cp) Process Capability

Voice of the customer vs. Voice of the Process



$$Cp = \frac{VOC}{VOP}$$

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Process Capability

Process Performance Index

Process Capability Index

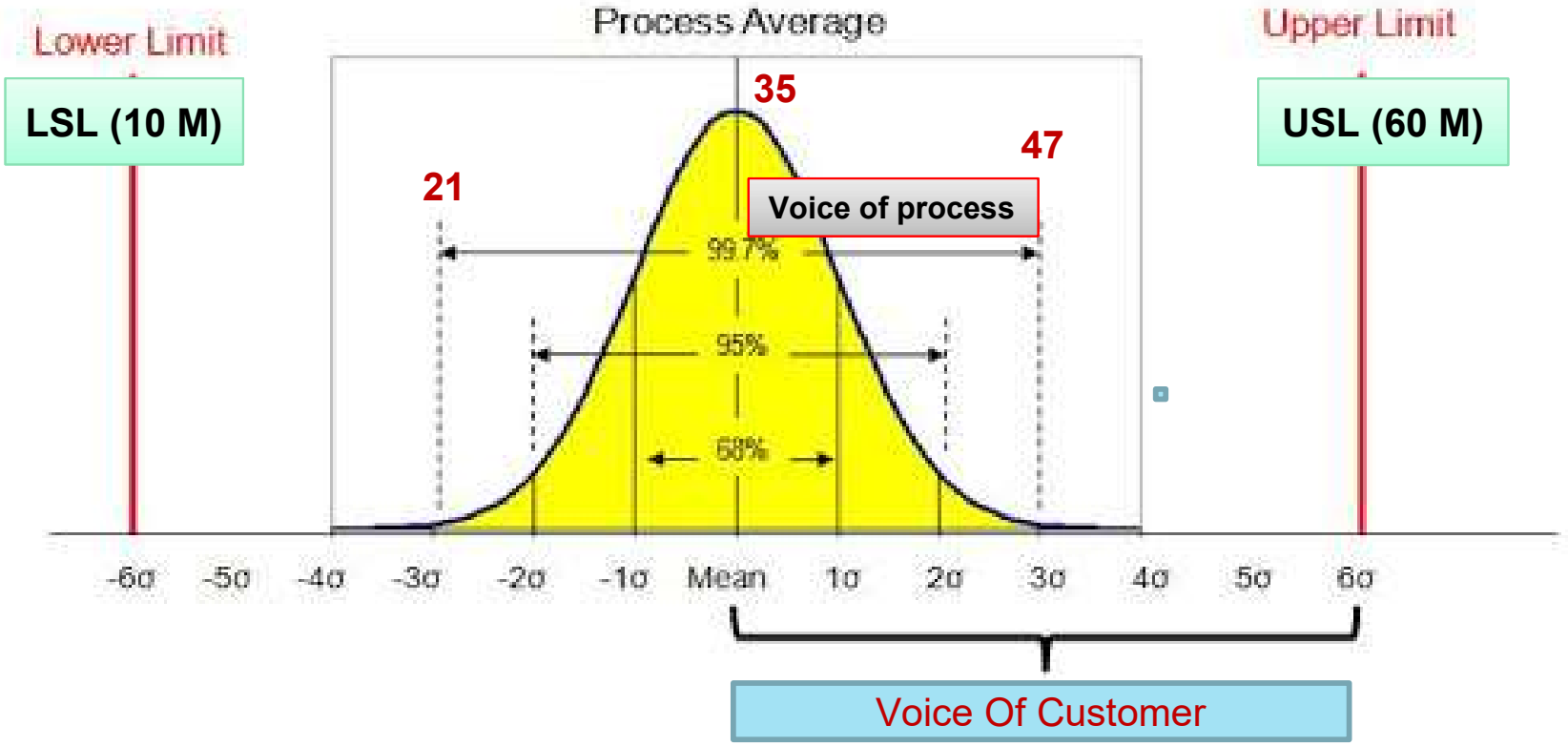
Cpk

Cpk > 0 = Good
Cpk = 0 = 50% Outside
Cpk < -1 = Totally Outside

Cp

Cp = 2 (6 Sigma)
Cp = 1.66 (5 Sigma)
Cp = 1.33 (4 Sigma)
Cp == 1 (3 Sigma)

This Six in six sigma implies that there are six standard deviations (also called sigma) between the average of the process and the allowed service level limits by customer.



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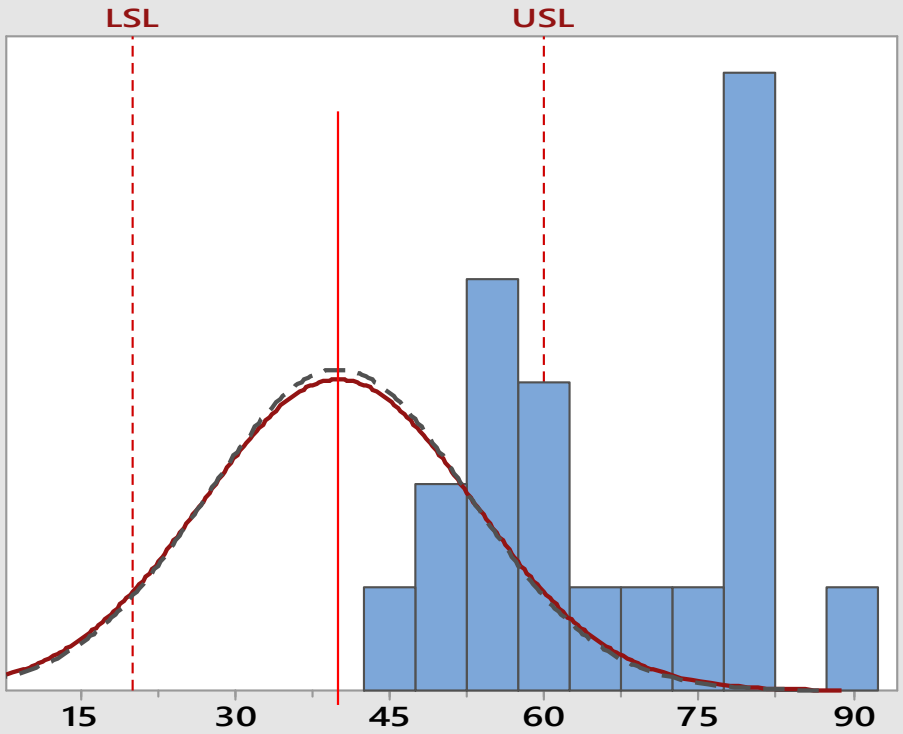
Process Capability Report for TAT.

Process Data	
LSL	20
Target	*
USL	60
Sample Mean	40
Sample N	20
StDev(Overall)	13.188
StDev(Within)	12.7846

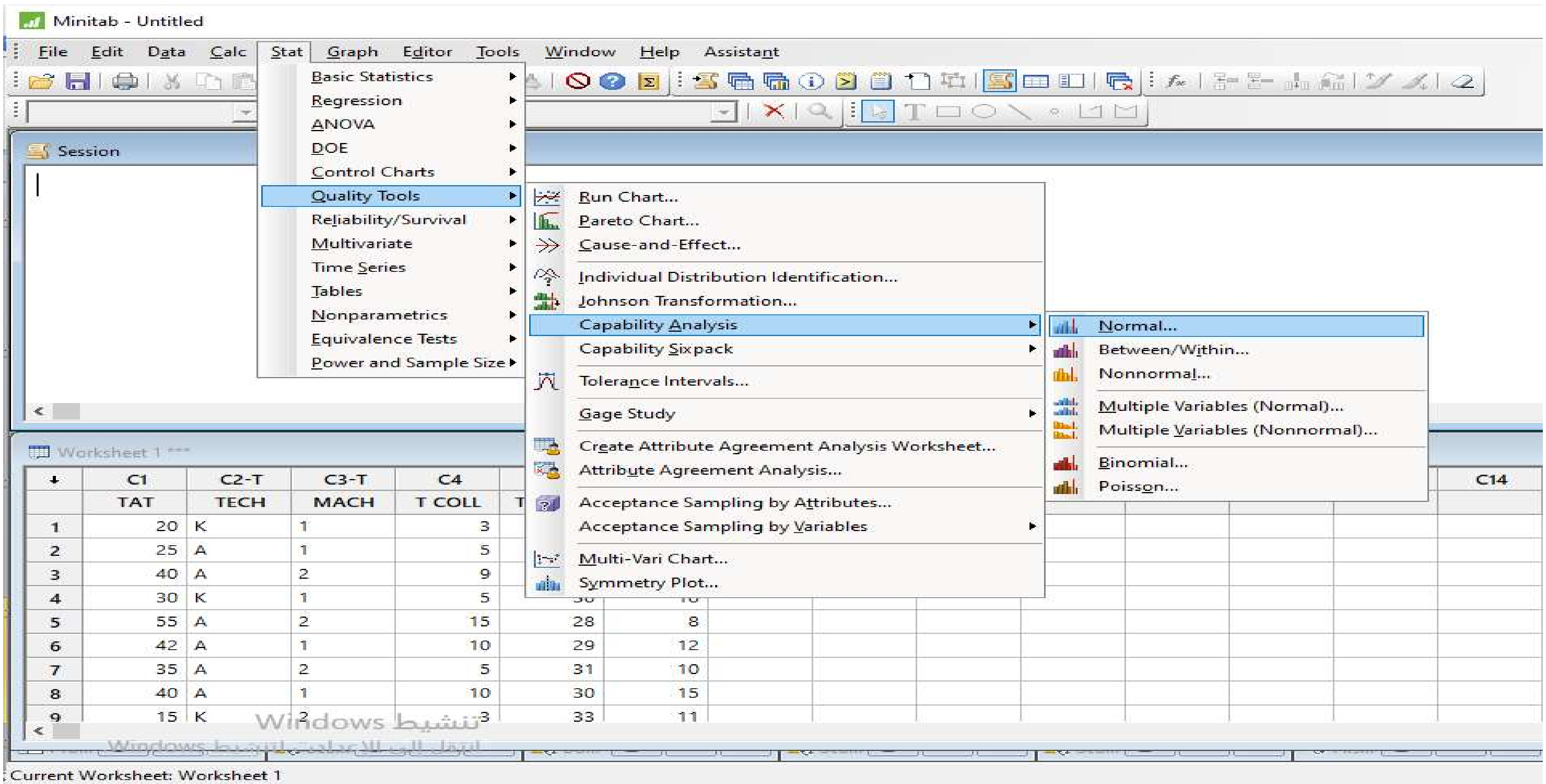


Overall
Within

Overall Capability	
Pp	0.51
PPL	0.51
PPU	0.51
Ppk	0.51
Cpm	*

Potential (Within) Capability	
Cp	0.52
CPL	0.52
CPU	0.52
Cpk	0.52

Performance			
	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	64692.86	58864.23
PPM > USL	500000.00	64692.86	58864.23
PPM Total	500000.00	129385.72	117728.46



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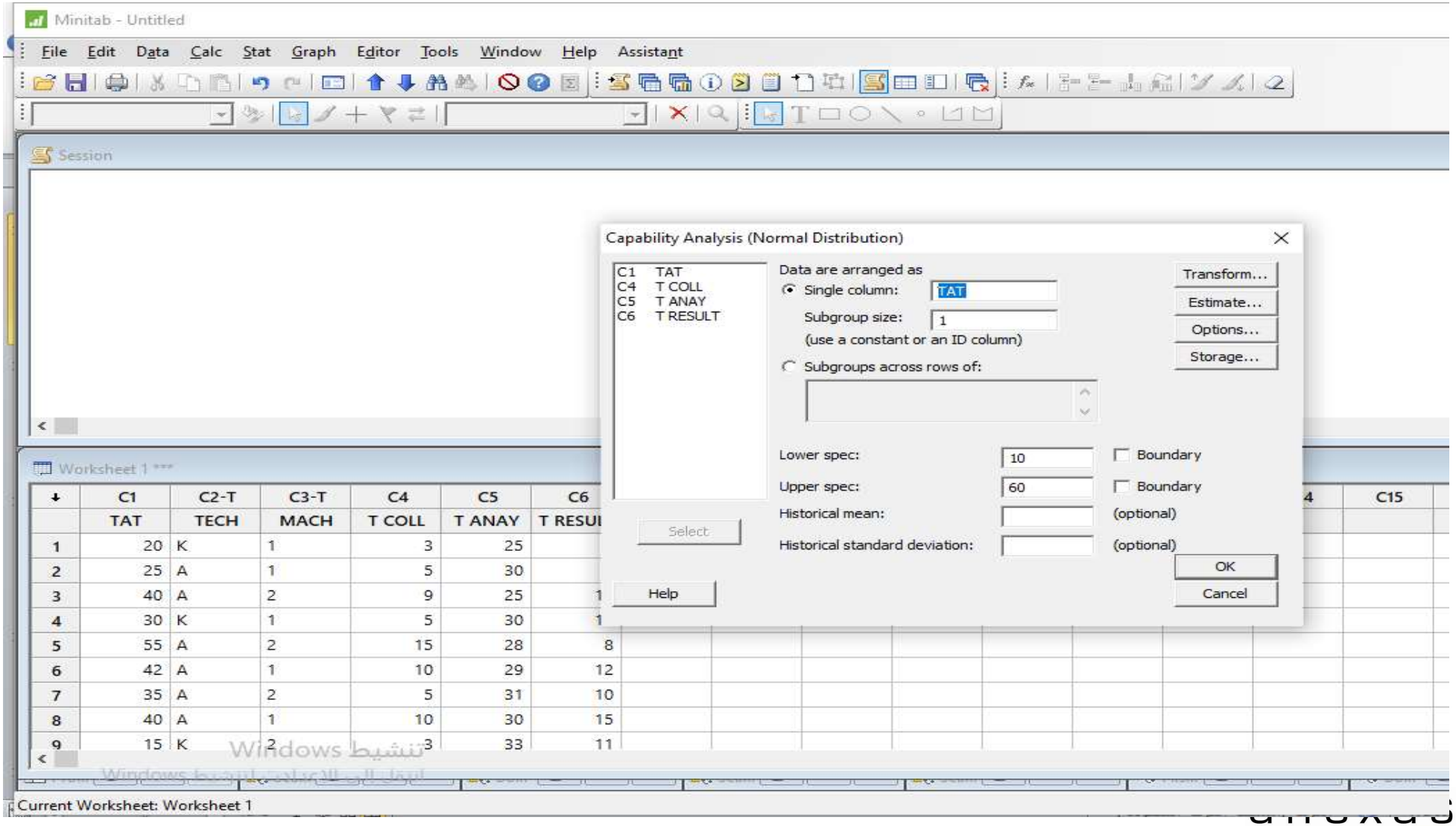
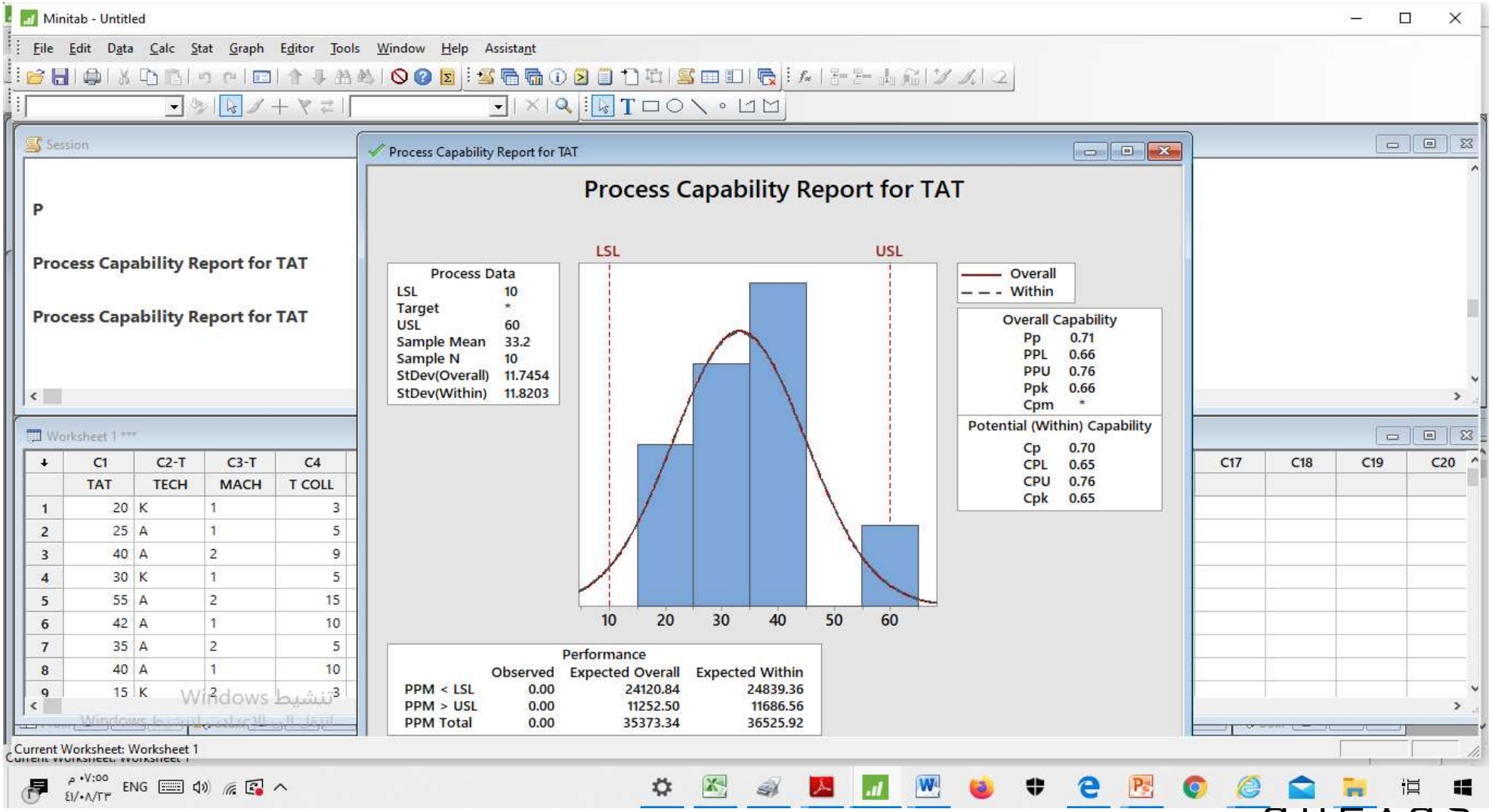
Session
Basic Statistics
Regression
ANOVA
DOE
Control Charts
Quality Tools
Reliability/Survival
Multivariate
Time Series
Tables
Nonparametrics
Equivalence Tests
Power and Sample Size
Run Chart...
Pareto Chart...
Cause-and-Effect...
Individual Distribution Identification...
Johnson Transformation...
Capability Analysis
Capability Sixpack
Tolerance Intervals...
Gage Study
Create Attribute Agreement Analysis Worksheet...
Attribute Agreement Analysis...
Acceptance Sampling by Attributes...
Acceptance Sampling by Variables
Multi-Vari Chart...
Symmetry Plot...
Normal...
Between/Within...
Nonnormal...
Multiple Variables (Normal)...
Multiple Variables (Nonnormal)...
Binomial...
Poisson...
Worksheet 1 ***
C1 C2-T C3-T C4 C14
TAT TECH MACH T COLL
1 20 K 1 3
2 25 A 1 5
3 40 A 2 9
4 30 K 1 5
5 55 A 2 15 28 8
6 42 A 1 10 29 12
7 35 A 2 5 31 10
8 40 A 1 10 30 15
9 15 K 2 3 33 11
Current Worksheet: Worksheet 1



	C1	C2-T	C3-T	C4	C5	C6	C15
	TAT	TECH	MACH	T COLL	T ANAY	T RESUL	
1	20	K	1	3	25		
2	25	A	1	5	30		
3	40	A	2	9	25	1	
4	30	K	1	5	30	1	
5	55	A	2	15	28	8	
6	42	A	1	10	29	12	
7	35	A	2	5	31	10	
8	40	A	1	10	30	15	
9	15	K	2	3	33	11	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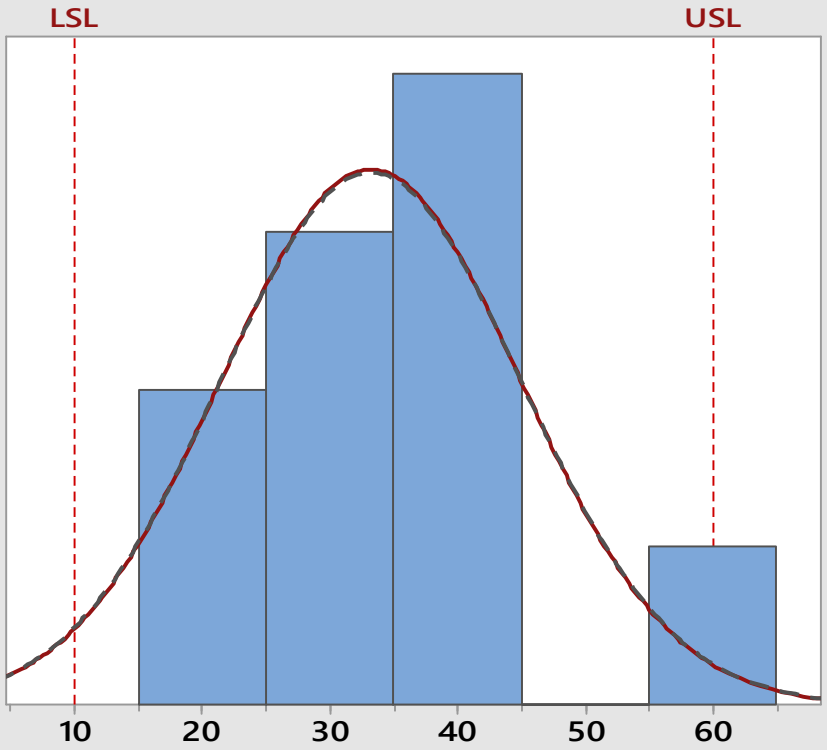
Session
P
Process Capability Report for TAT
Process Capability Report for TAT
Process Capability Report for TAT
Worksheet 1 ***
C1 C2-T C3-T C4
TAT TECH MACH T COLL
1 20 K 1 3
2 25 A 1 5
3 40 A 2 9
4 30 K 1 5
5 55 A 2 15
6 42 A 1 10
7 35 A 2 5
8 40 A 1 10
9 15 K 2 3
C17 C18 C19 C20
Process Capability Report for TAT
Process Capability Report for TAT
LSL
USL
Process Data
LSL 10
Target *
USL 60
Sample Mean 33.2
Sample N 10
StDev(Overall) 11.7454
StDev(Within) 11.8203
Overall
Within
Overall Capability
Pp 0.71
PPL 0.66
PPU 0.76
Ppk 0.66
Cpm *
Potential (Within) Capability
Cp 0.70
CPL 0.65
CPU 0.76
Cpk 0.65
10 20 30 40 50 60
Performance
Observed Expected Overall Expected Within
PPM < LSL 0.00 24120.84 24839.36
PPM > USL 0.00 11252.50 11686.56
PPM Total 0.00 35373.34 36525.92
Current Worksheet: Worksheet 1
ENG

Process Capability Report for TAT

Process Data	
LSL	10
Target	*
USL	60
Sample Mean	33.2
Sample N	10
StDev(Overall)	11.7454
StDev(Within)	11.8203



Overall
Within

Overall Capability	
Pp	0.71
PPL	0.66
PPU	0.76
Ppk	0.66
Cpm	*

Potential (Within) Capability	
Cp	0.70
CPL	0.65
CPU	0.76
Cpk	0.65

Performance	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	24120.84	24839.36
PPM > USL	0.00	11252.50	11686.56
PPM Total	0.00	35373.34	36525.92

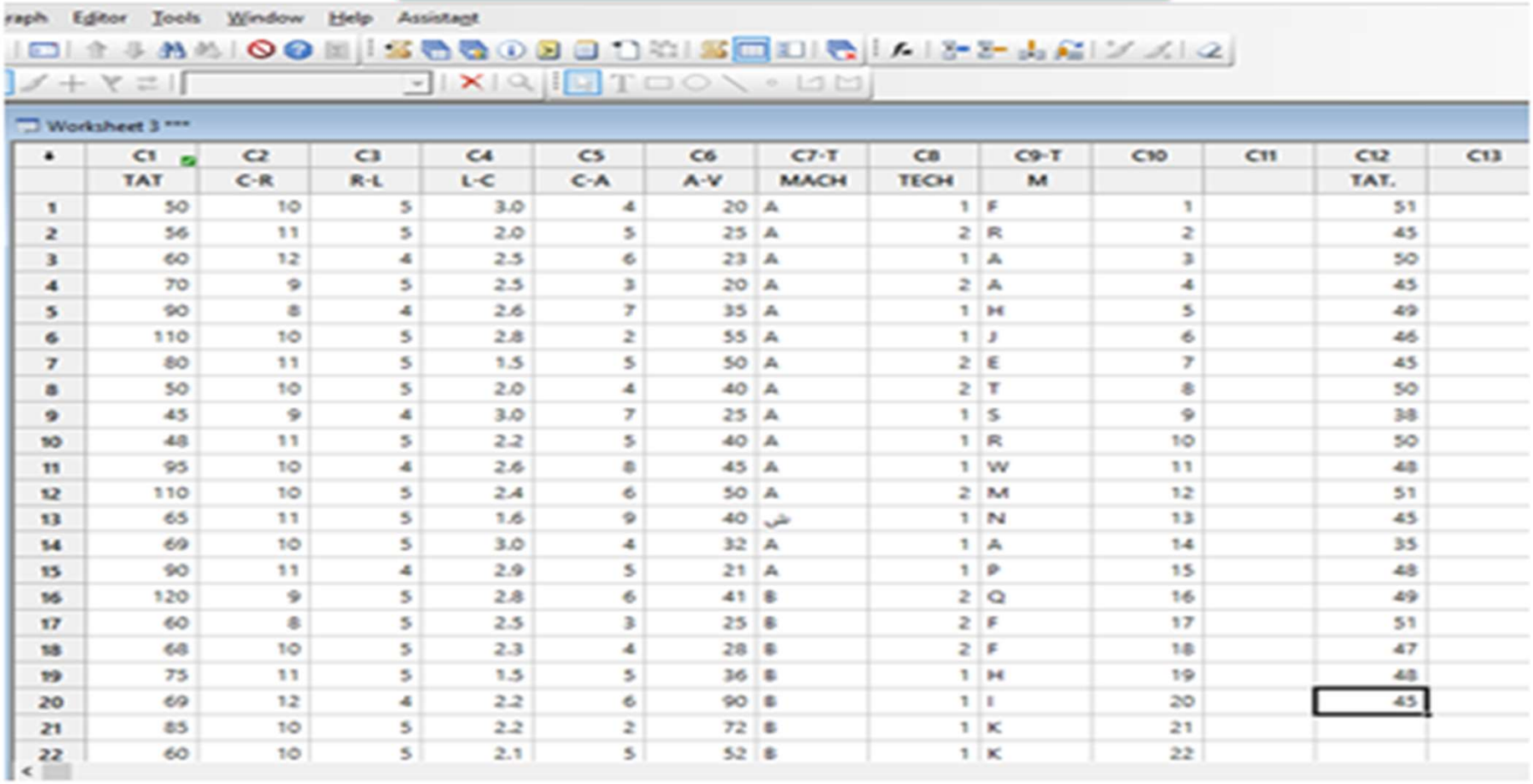
Example

LAB TAT is 60 Minutes

The Patient complains that I am late for more than 100 Min to get the result.

Explain ?

EXAMPLE of TAT



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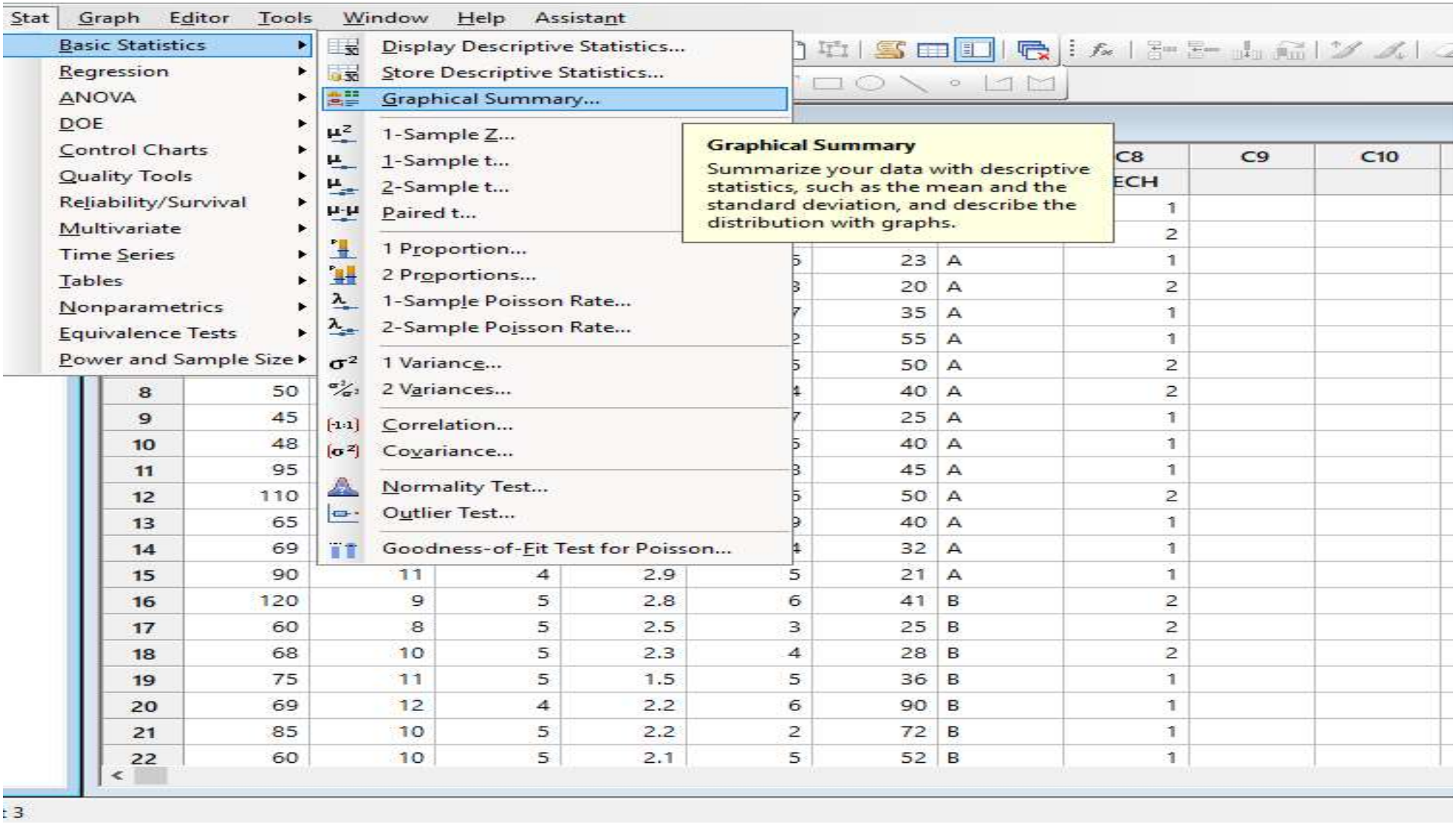
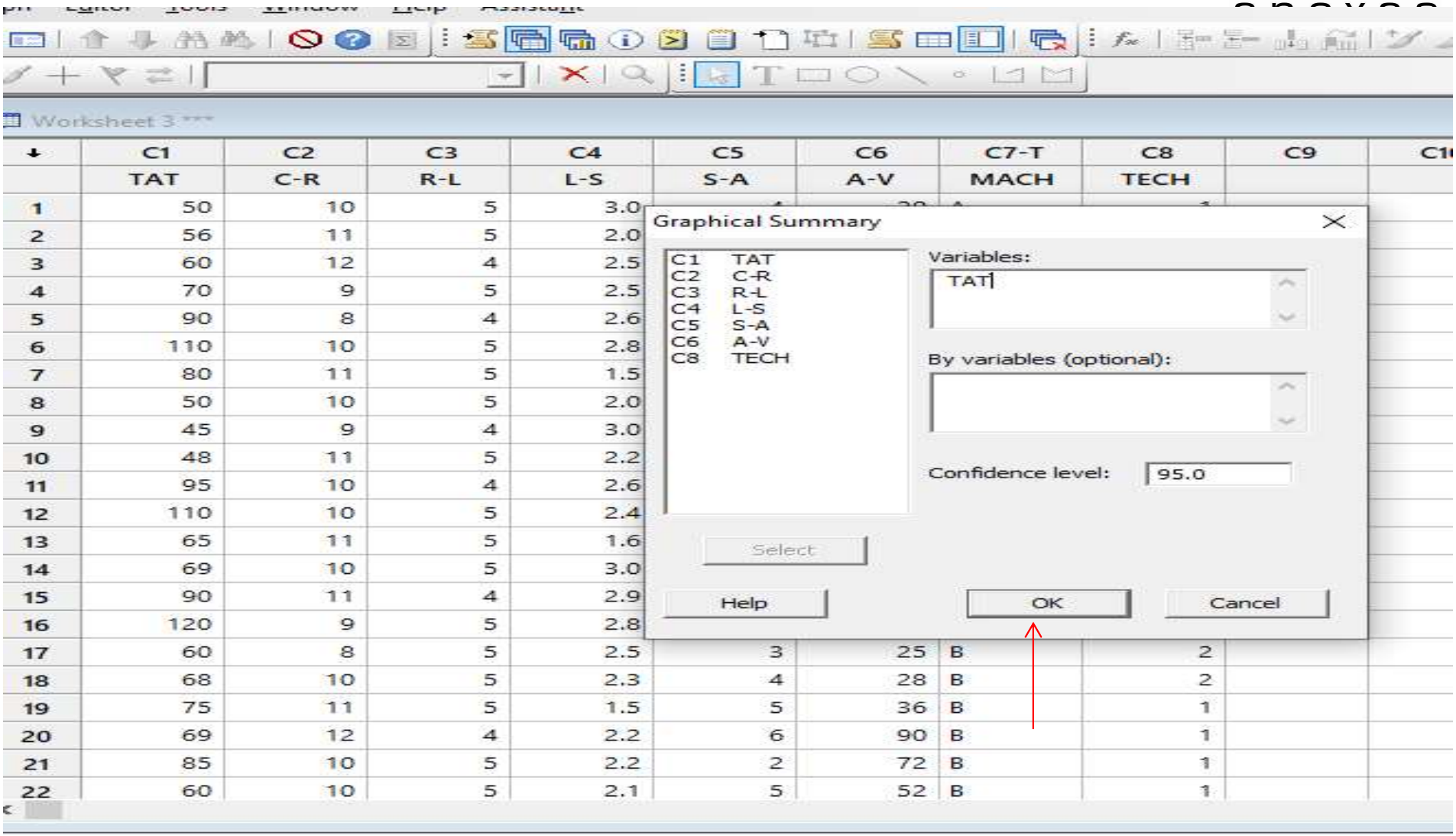
Worksheet 3 ***

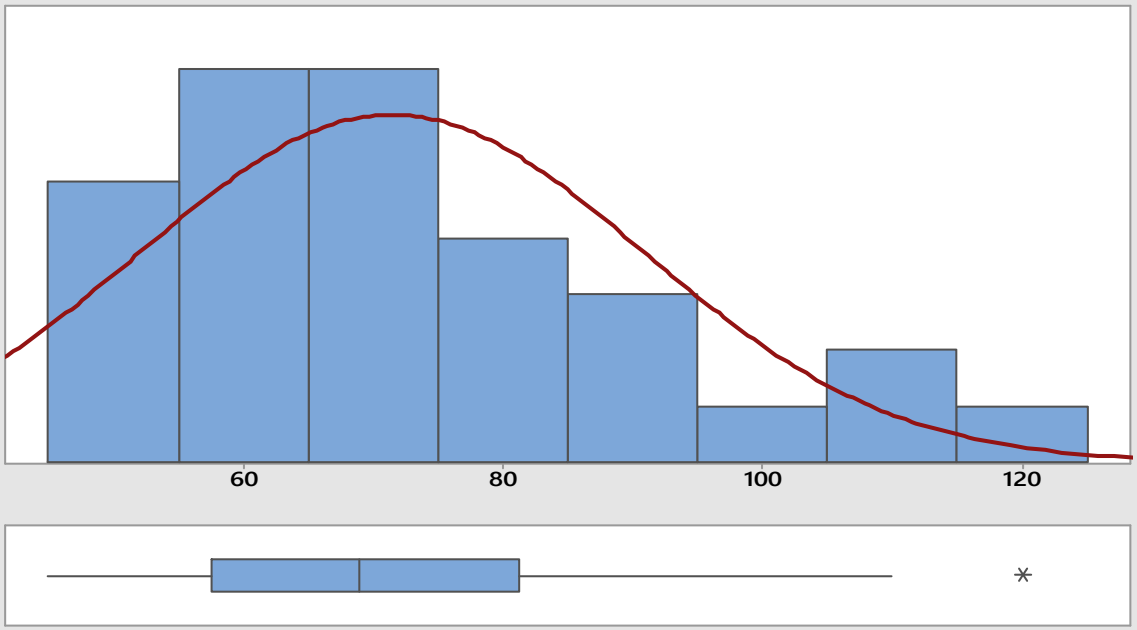
	C1	C2	C3	C4	C5	C6	C7-T	C8	C9-T	C10	C11	C12	C13
	TAT	C-R	R-L	L-C	C-A	A-V	MACH	TECH	M			TAT.	
1	50	10	5	3.0	4	20	A	1	F	1		51	
2	56	11	5	2.0	5	25	A	2	R	2		45	
3	60	12	4	2.5	6	23	A	1	A	3		50	
4	70	9	5	2.5	3	20	A	2	A	4		45	
5	90	8	4	2.6	7	35	A	1	H	5		49	
6	110	10	5	2.8	2	55	A	1	J	6		46	
7	80	11	5	1.5	5	50	A	2	E	7		45	
8	50	10	5	2.0	4	40	A	2	T	8		50	
9	45	9	4	3.0	7	25	A	1	S	9		38	
10	48	11	5	2.2	5	40	A	1	R	10		50	
11	95	10	4	2.6	8	45	A	1	W	11		48	
12	110	10	5	2.4	6	50	A	2	M	12		51	
13	65	11	5	1.6	9	40	ش	1	N	13		45	
14	69	10	5	3.0	4	32	A	1	A	14		35	
15	90	11	4	2.9	5	21	A	1	P	15		48	
16	120	9	5	2.8	6	41	B	2	Q	16		49	
17	60	8	5	2.5	3	25	B	2	F	17		51	
18	68	10	5	2.3	4	28	B	2	F	18		47	
19	75	11	5	1.5	5	36	B	1	H	19		48	
20	69	12	4	2.2	6	90	B	1	I	20		45	
21	85	10	5	2.2	2	72	B	1	K	21			
22	60	10	5	2.1	5	52	B	1	K	22			

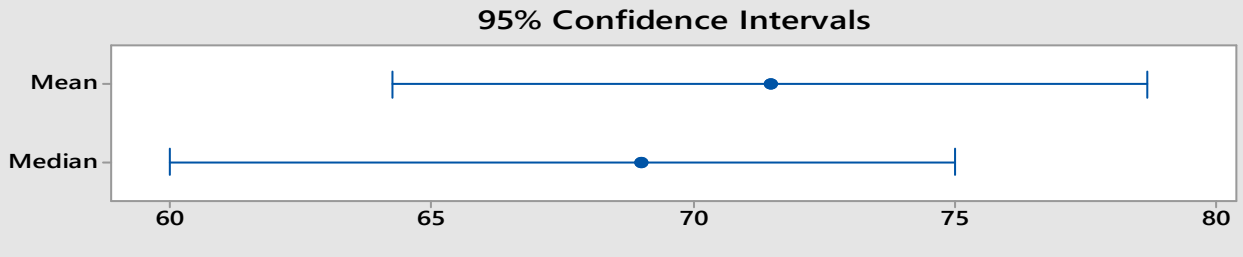


8	50					40	A	2
9	45					25	A	1
10	48					40	A	1
11	95					45	A	1
12	110					50	A	2
13	65					40	A	1
14	69					32	A	1
15	90	11	4	2.9	5	21	A	1
16	120	9	5	2.8	6	41	B	2
17	60	8	5	2.5	3	25	B	2
18	68	10	5	2.3	4	28	B	2
19	75	11	5	1.5	5	36	B	1
20	69	12	4	2.2	6	90	B	1
21	85	10	5	2.2	2	72	B	1
22	60	10	5	2.1	5	52	B	1

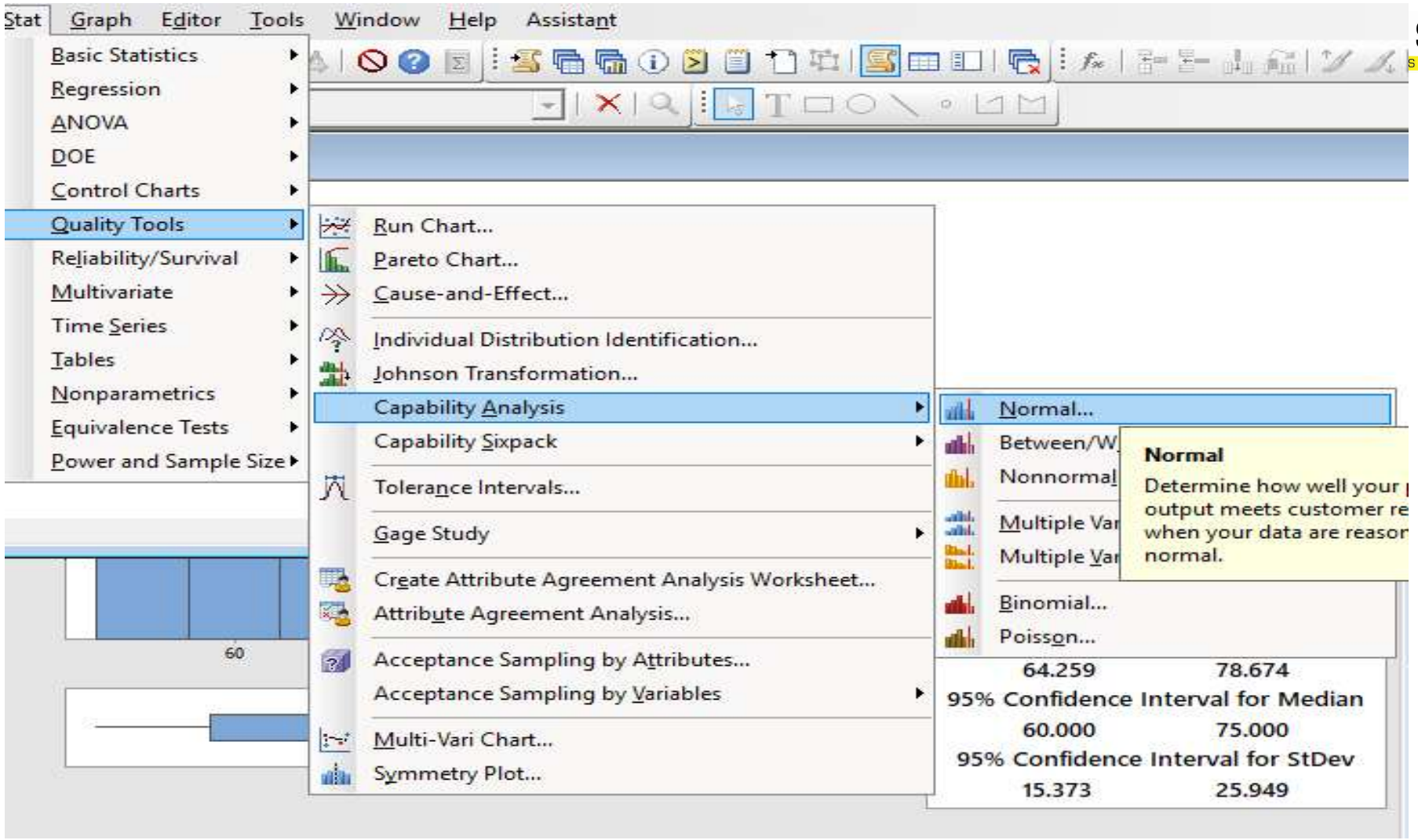

Worksheet 3 ***
C1 TAT
C2 C-R
C3 R-L
C4 L-S
C5 S-A
C6 A-V
C7-T MACH
C8 TECH
1 50 10 5 3.0
2 56 11 5 2.0
3 60 12 4 2.5
4 70 9 5 2.5
5 90 8 4 2.6
6 110 10 5 2.8
7 80 11 5 1.5
8 50 10 5 2.0
9 45 9 4 3.0
10 48 11 5 2.2
11 95 10 4 2.6
12 110 10 5 2.4
13 65 11 5 1.6
14 69 10 5 3.0
15 90 11 4 2.9
16 120 9 5 2.8
17 60 8 5 2.5 3 25 B 2
18 68 10 5 2.3 4 28 B 2
19 75 11 5 1.5 5 36 B 1
20 69 12 4 2.2 6 90 B 1
21 85 10 5 2.2 2 72 B 1
22 60 10 5 2.1 5 52 B 1
Graphical Summary
C1 TAT
C2 C-R
C3 R-L
C4 L-S
C5 S-A
C6 A-V
C8 TECH
Variables:
TAT
By variables (optional):
Confidence level:
95.0
Select
Help
OK
Cancel

Summary Report for TAT



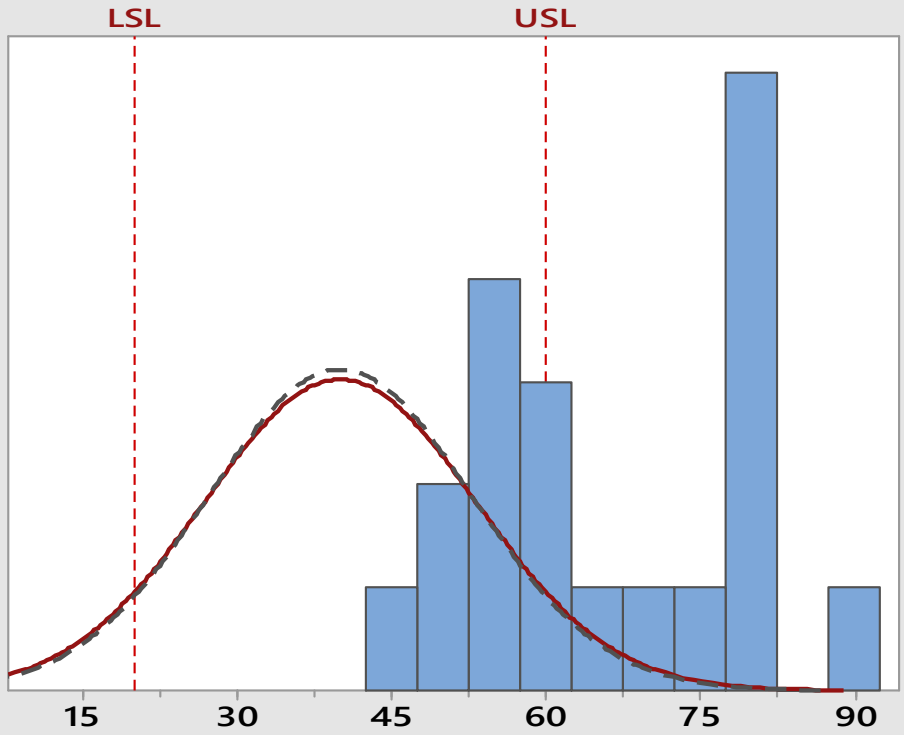


Anderson-Darling Normality Test	
A-Squared	0.73
P-Value	0.051
Mean	71.467
StDev	19.303
Variance	372.602
Skewness	0.928965
Kurtosis	0.390733
N	30
Minimum	45.000
1st Quartile	57.500
Median	69.000
3rd Quartile	81.250
Maximum	120.000
95% Confidence Interval for Mean	
64.259	78.674
95% Confidence Interval for Median	
60.000	75.000
95% Confidence Interval for StDev	
15.373	25.949


Stat
Graph
Editor
Tools
Window
Help
Assistant
Basic Statistics
Regression
ANOVA
DOE
Control Charts
Quality Tools
Reliability/Survival
Multivariate
Time Series
Tables
Nonparametrics
Equivalence Tests
Power and Sample Size
Run Chart...
Pareto Chart...
Cause-and-Effect...
Individual Distribution Identification...
Johnson Transformation...
Capability Analysis
Capability Sixpack
Tolerance Intervals...
Gage Study
Create Attribute Agreement Analysis Worksheet...
Attribute Agreement Analysis...
Acceptance Sampling by Attributes...
Acceptance Sampling by Variables
Multi-Vari Chart...
Symmetry Plot...
Normal...
Between/W
Nonnormal
Multiple Var
Multiple Var
Binomial...
Poisson...
Normal
Determine how well your
output meets customer re
when your data are reason
normal.
60
64.259
78.674
95% Confidence Interval for Median
60.000
75.000
95% Confidence Interval for StDev
15.373
25.949

Process Capability Report for TAT.

Process Data	
LSL	20
Target	*
USL	60
Sample Mean	40
Sample N	20
StDev(Overall)	13.188
StDev(Within)	12.7846



Overall
Within

Overall Capability	
Pp	0.51
PPL	0.51
PPU	0.51
Ppk	0.51
Cpm	*

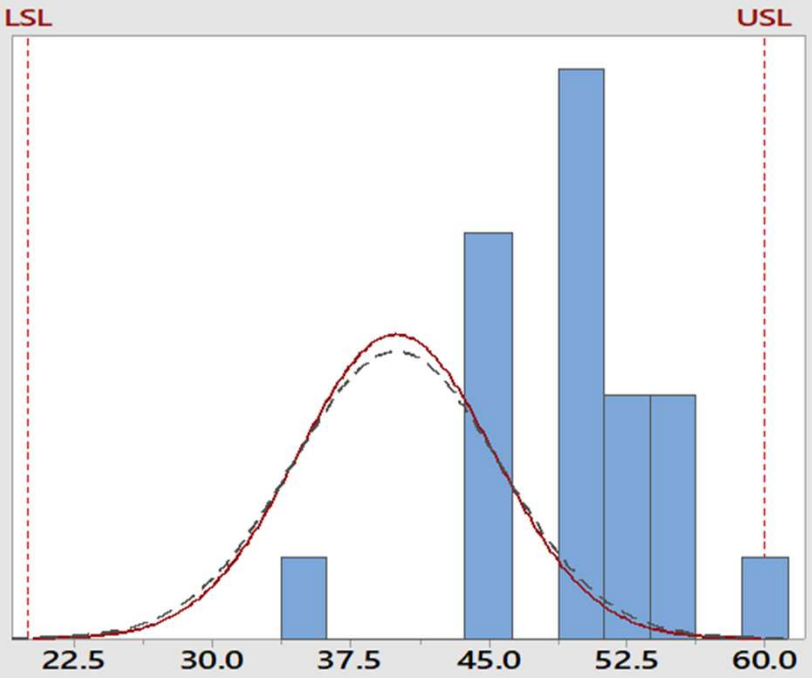
Potential (Within) Capability	
Cp	0.52
CPL	0.52
CPU	0.52
Cpk	0.52

Performance			
	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	64692.86	58864.23
PPM > USL	500000.00	64692.86	58864.23
PPM Total	500000.00	129385.72	117728.46

Sigma Level = 1.5

Process Capability Report for TAT.

Process Data	
LSL	20
Target	*
USL	60
Sample Mean	40
Sample N	20
StDev(Overall)	5.3262
StDev(Within)	5.64576



Overall
Within

Overall Capability	
Pp	1.25
PPL	1.25
PPU	1.25
Ppk	1.25
Cpm	*

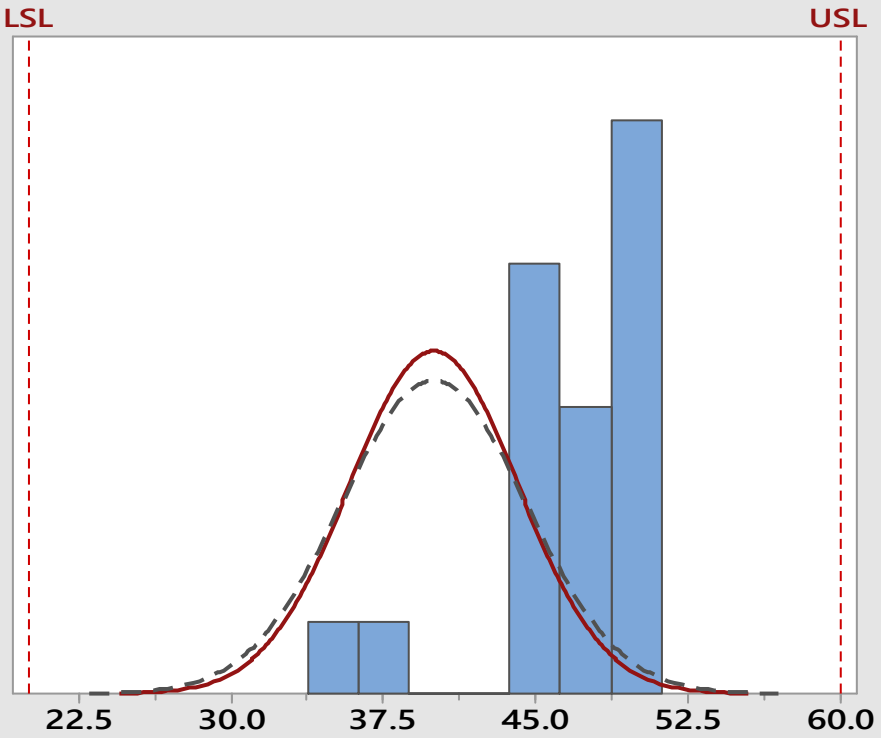
Potential (Within) Capability	
Cp	1.18
CPL	1.18
CPU	1.18
Cpk	1.18

Performance	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	86.66	198.19
PPM > USL	0.00	86.66	198.19
PPM Total	0.00	173.33	396.38

3 SIGMA (CP = 1.18)

Process Capability Report for TAT.

Process Data	
LSL	20
Target	*
USL	60
Sample Mean	40
Sample N	20
StDev(Overall)	4.17511
StDev(Within)	4.5726



Overall
Within

Overall Capability	
Pp	1.60
PPL	1.60
PPU	1.60
Ppk	1.60
Cpm	*

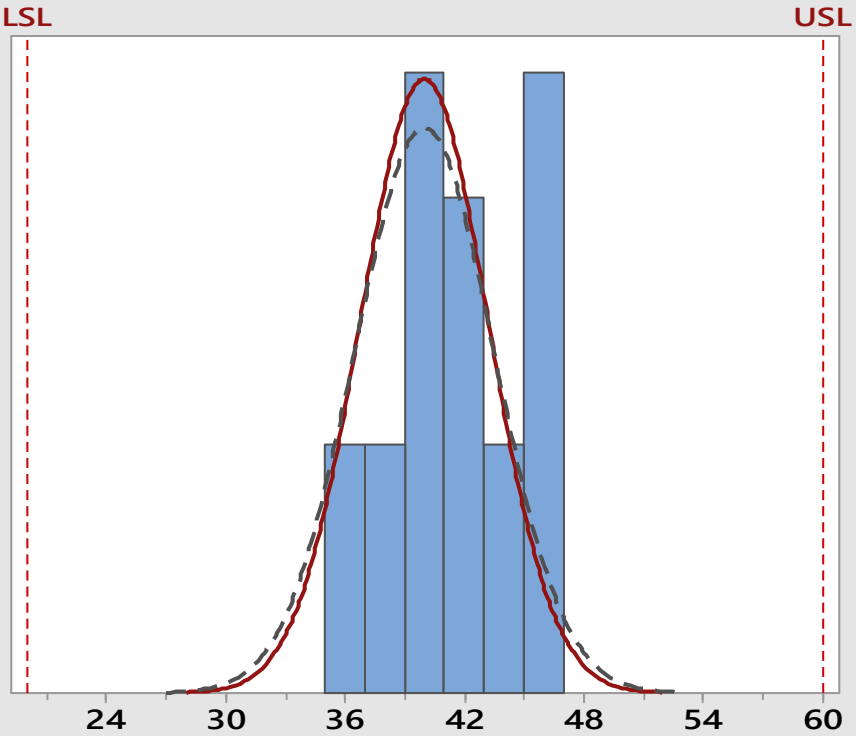
Potential (Within) Capability	
Cp	1.46
CPL	1.46
CPU	1.46
Cpk	1.46

Performance	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	0.83	6.10
PPM > USL	0.00	0.83	6.10
PPM Total	0.00	1.67	12.21

SIGMA LEVEL = 4.6

Process Capability Report for TAT.

Process Data	
LSL	20
Target	*
USL	60
Sample Mean	40
Sample N	20
StDev(Overall)	3.22164
StDev(Within)	3.49944



Overall
Within

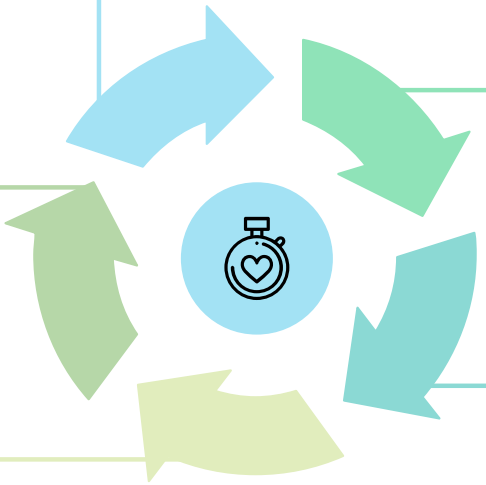
Overall Capability	
Pp	2.07
PPL	2.07
PPU	2.07
Ppk	2.07
Cpm	*

Potential (Within) Capability	
Cp	1.91
CPL	1.91
CPU	1.91
Cpk	1.91

Performance	Observed	Expected Overall	Expected Within
PPM < LSL	0.00	0.00	0.01
PPM > USL	0.00	0.00	0.01
PPM Total	0.00	0.00	0.01

5.6 SIGMA

DMAIC : An Improvement Methodology



Define
Set direction for improvement.

Measure
Collect reliable data to understand current process performance

Analyse
Identify problem's root causes through process and data analysis.

Improve
Determine new improved process design.

Control
Ensure improvement effectiveness over time.

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Analyse

Objective :

- Identify problem's root causes through process and data analysis

Steps :

- Pareto chart
- Value analysis in using process map
- Root causes validation

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Root Cause Analysis

Above the surface you see the
Symptoms
of the problem

Dig deeper to find the
Root Cause
of the problem

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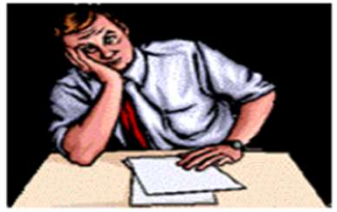
الأعراض-الأسباب الجذرية

العرض - الصداع



السبب الجذري

مشاكل في

الإبصار

لا تأخذ مسكنات الألم؛ بل افحص نظرك

العرض – آلام المعده

السبب الجذري

طعام سيء

لا تأخذ مسكن للألم؛ ولكن غير عادات طعامك

عالج الأسباب الجذرية، وليس الأعراض فقط

Analyze Phase (Summary)

Analyze

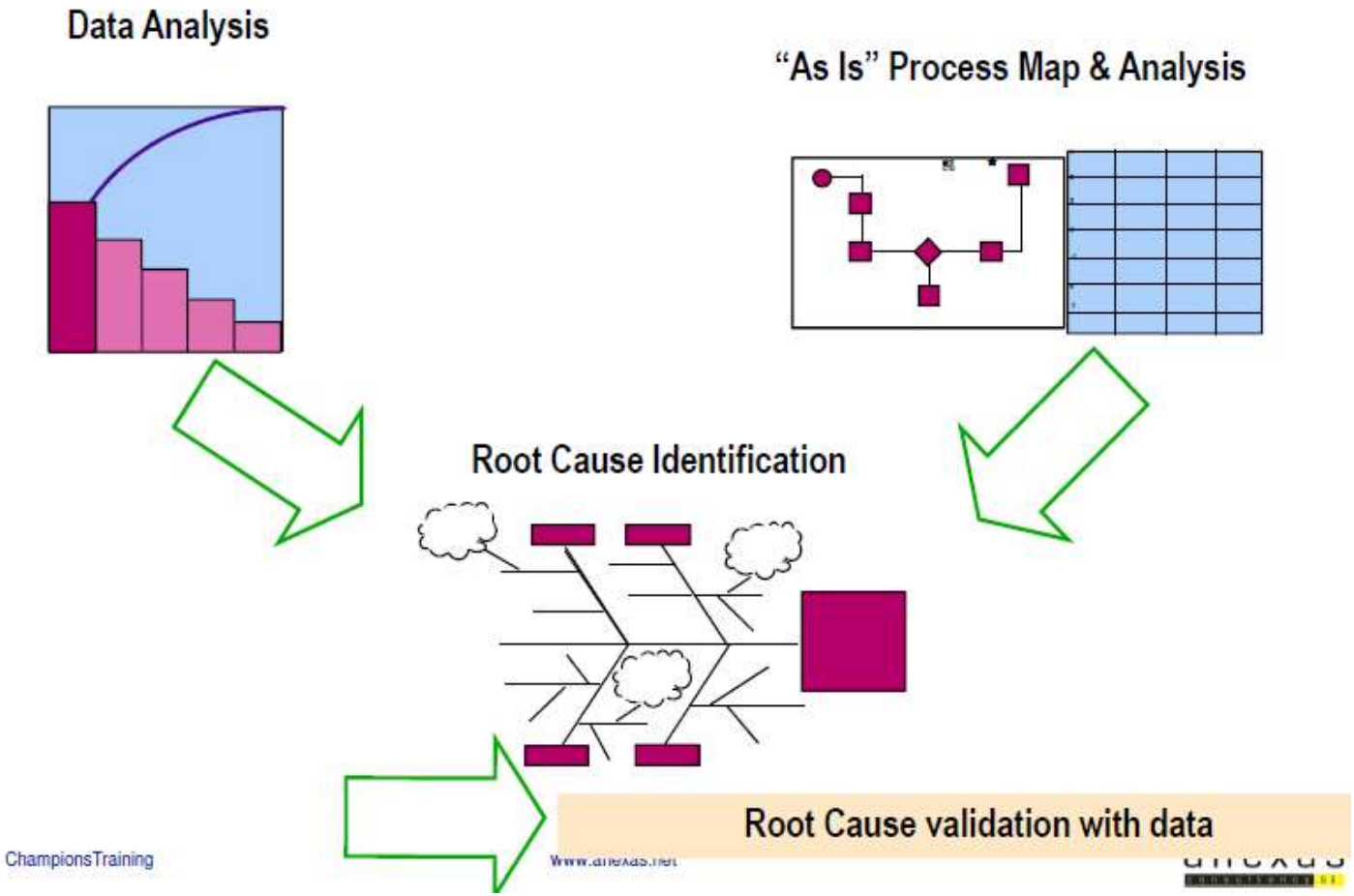
Process Door

- As-is process map
- Gemba walk
- Value Added and Non Value Added Analysis

Data Door

- Cause and Effect Diagram
- Control Impact Matrix
- Pareto Chart
- Box Plots and Scatter Plots

Analyze roadmap



ANALYZE: Analyze to Identify Causes

- Goal:
  - Identify root causes and confirm them with data
- Output:
  - A theory that has been tested and confirmed

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Analysis Doors

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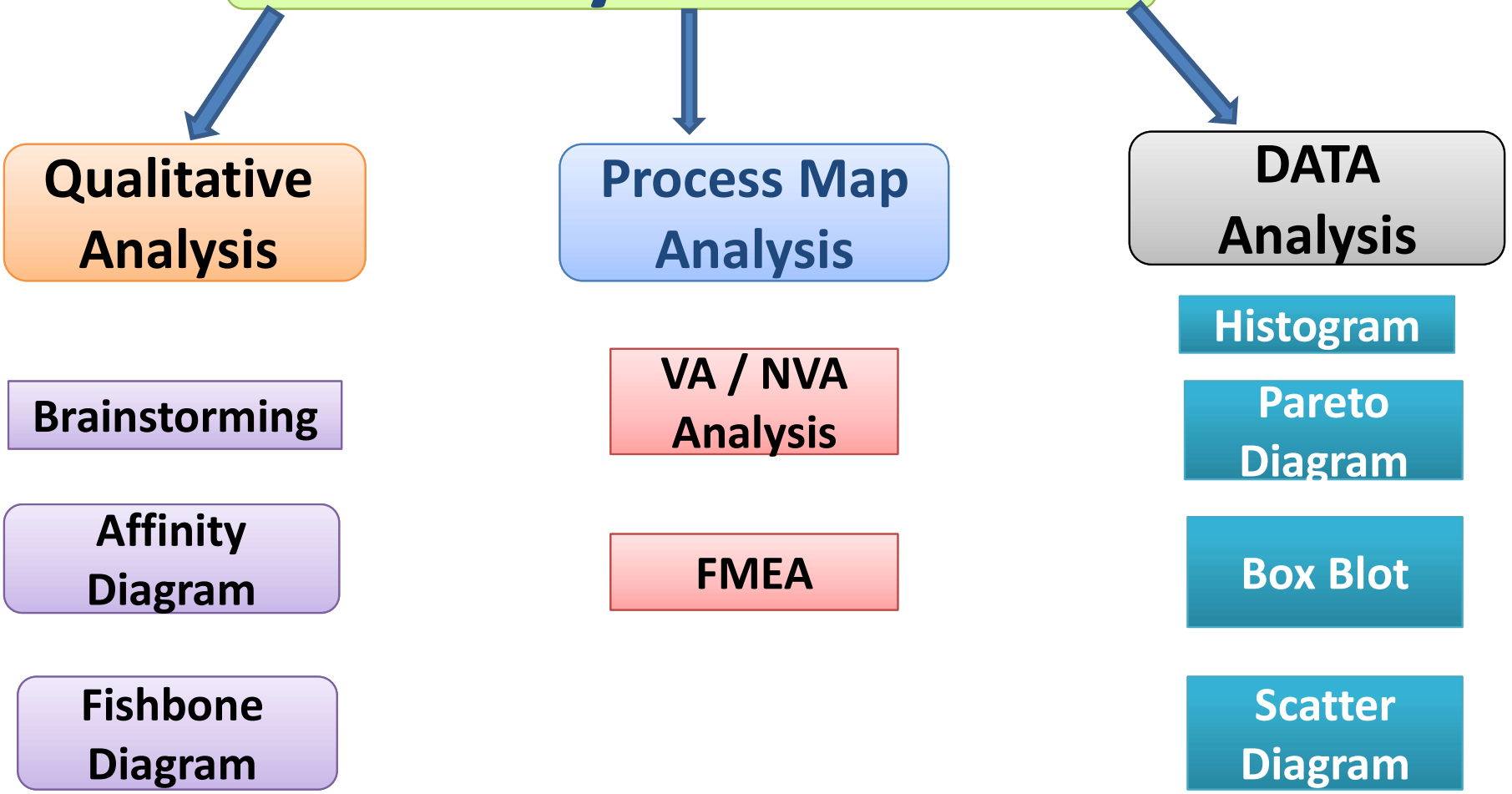
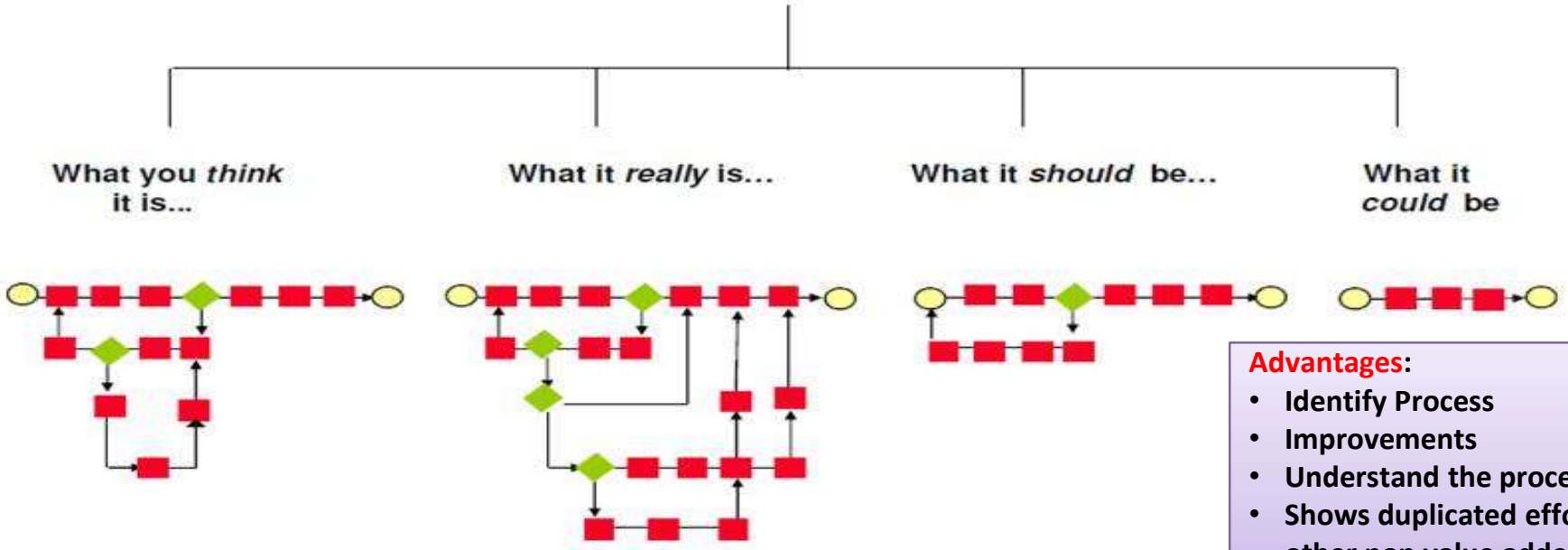


Process Door

Process Door:
Value Stream Mapping

Versions of a process



Flow Chart

It is a visual illustration of the sequence of operations required to complete a task

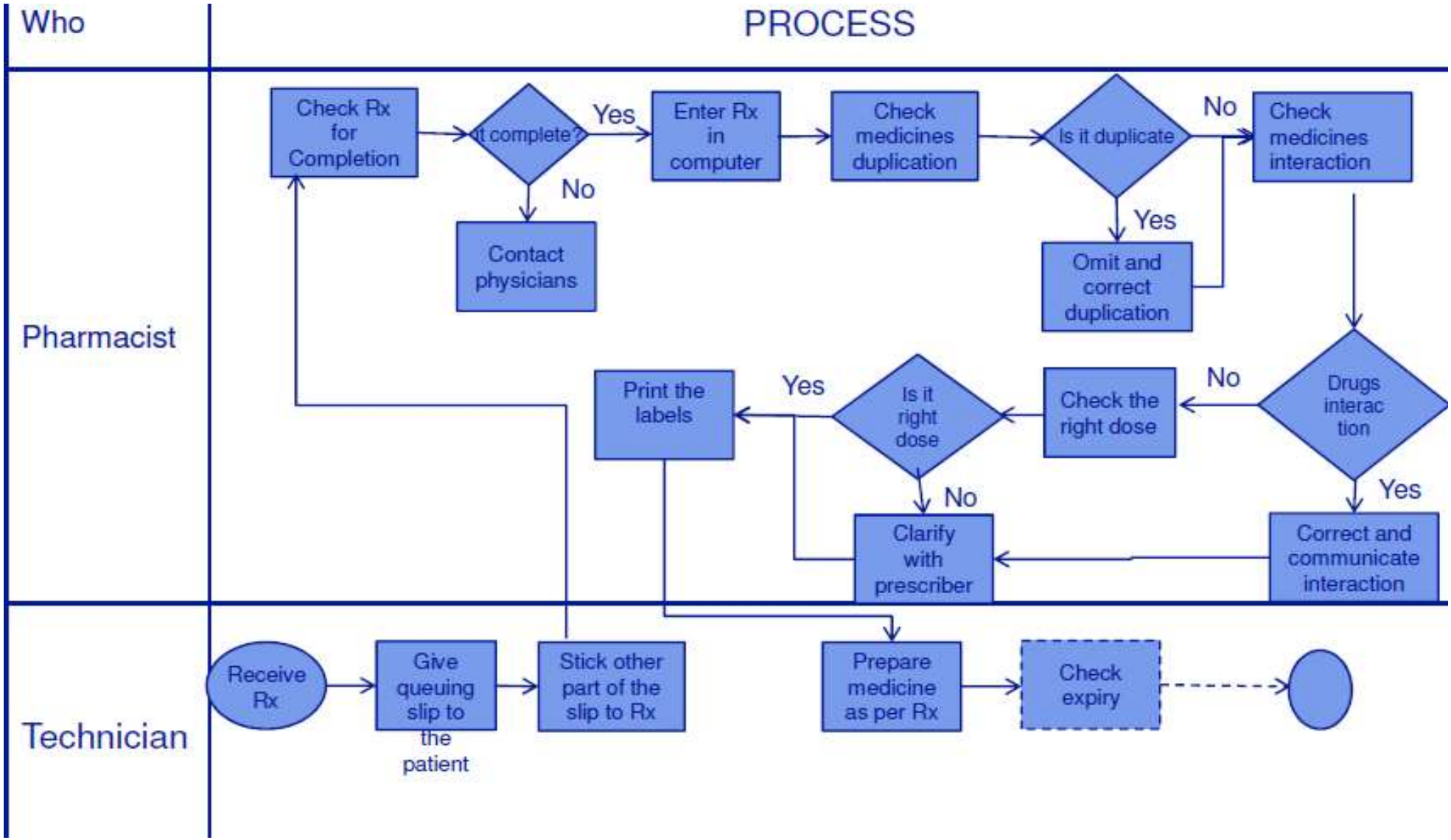
It is used to help employees and organization the finite details and obtain a through description of the process

Advantages:

- **Identify Process**
- **Improvements**
- **Understand the process**
- **Shows duplicated effort and other non value added steps**

METHODOLOGY AND TOOLS

Concepts	Meaning
7(8) waste	Intellect - scrap(rework) waiting Inventory Motion and Movement Transportation Over production Over processing
ESCA	Eliminate Simplify Combine Automate parallel
5s	SORTING SET IN ORDER SHINE STANDARDIZE SUSTAIN


Who
PROCESS
Pharmacist
Technician
Check Rx for Completion
It complete?
Yes
No
Contact physicians
Enter Rx in computer
Check medicines duplication
Is it duplicate
No
Yes
Omit and correct duplication
Check medicines interaction
Drugs interac tion
No
Yes
Check the right dose
Is it right dose
Yes
No
Print the labels
Clarify with prescriber
Correct and communicate interaction
Receive Rx
Give queuing slip to the patient
Stick other part of the slip to Rx
Prepare medicine as per Rx
Check expiry

Data Door

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1. Brain storming:

- **Use:**
  - To Generate Ideas from all members
- **Steps:**
  - Define the topic
  - Ask members to generate ideas
  - Record the answers
  - Combine similar or redundant ideas
  - Document your session
- **Types:**
  - - Round Robin
  - - Anti Solution
  - 6-3-5
  - 6 Hats

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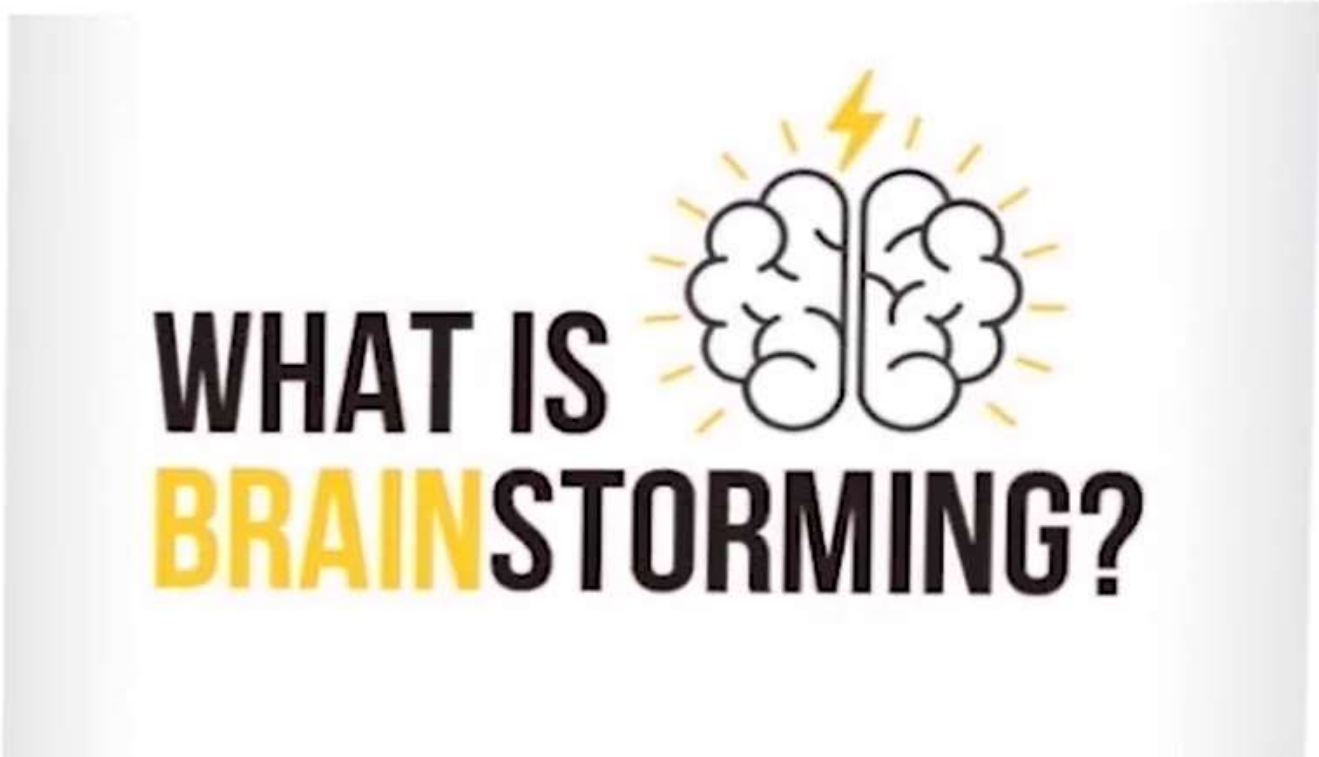
Brainstorming



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Brainstorming Potential Causes

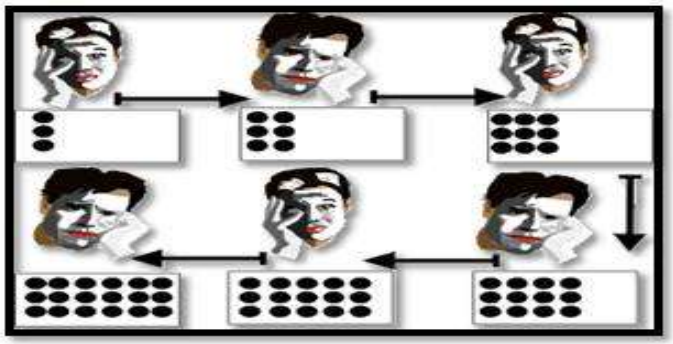
- Purpose: Brainstorming is a method of generating lots of ideas quickly by:
  - Encouraging creativity
  - Involving everyone
  - Generating excitement and energy
  - Separating people from ideas they suggest

Brainstorming

Types of Brainstorming

Round Robin

6-3-5



Anti Solution

List of Anti-Solutions

- Put products on the wrong aisles
- Don't have employees to assist shoppers
- Don't train employees where products belong
- Move products on an hourly basis
- Train the employees to tell the shopper that "if they don't see it, we don't have it".
- Don't mark the aisles well

6 Hats

Brainstorming

Pre-requisites of Brainstorming

- Purpose of Brainstorming
- Participants (From the process / not from the process)
- Facilitator
- Stationery
- Selection of tool of brainstorming
- Meeting room
- Facilities
- Communication to participants about time, venue, topic in advance

Brainstorming

Rules of Brainstorming

- Equal opportunity to everyone to participate
- Capture all the ideas (Document)
- Leave your designation and ego along with your shoes outside meeting room
- Non threatening environment to be created
- Ensure that there are no disturbances
- Focus on the topic (Create parting lot)
- Fantasize freely (Do not put breaks on your thoughts)
- Watch your time!
- Defer evaluation (Do not discuss ideas)
- Generate Quantity, do not worry about Quality


MARKETING
STRATEGY
TRENDS
ANALYSIS
marketing
segmentation
str
ate
gy-

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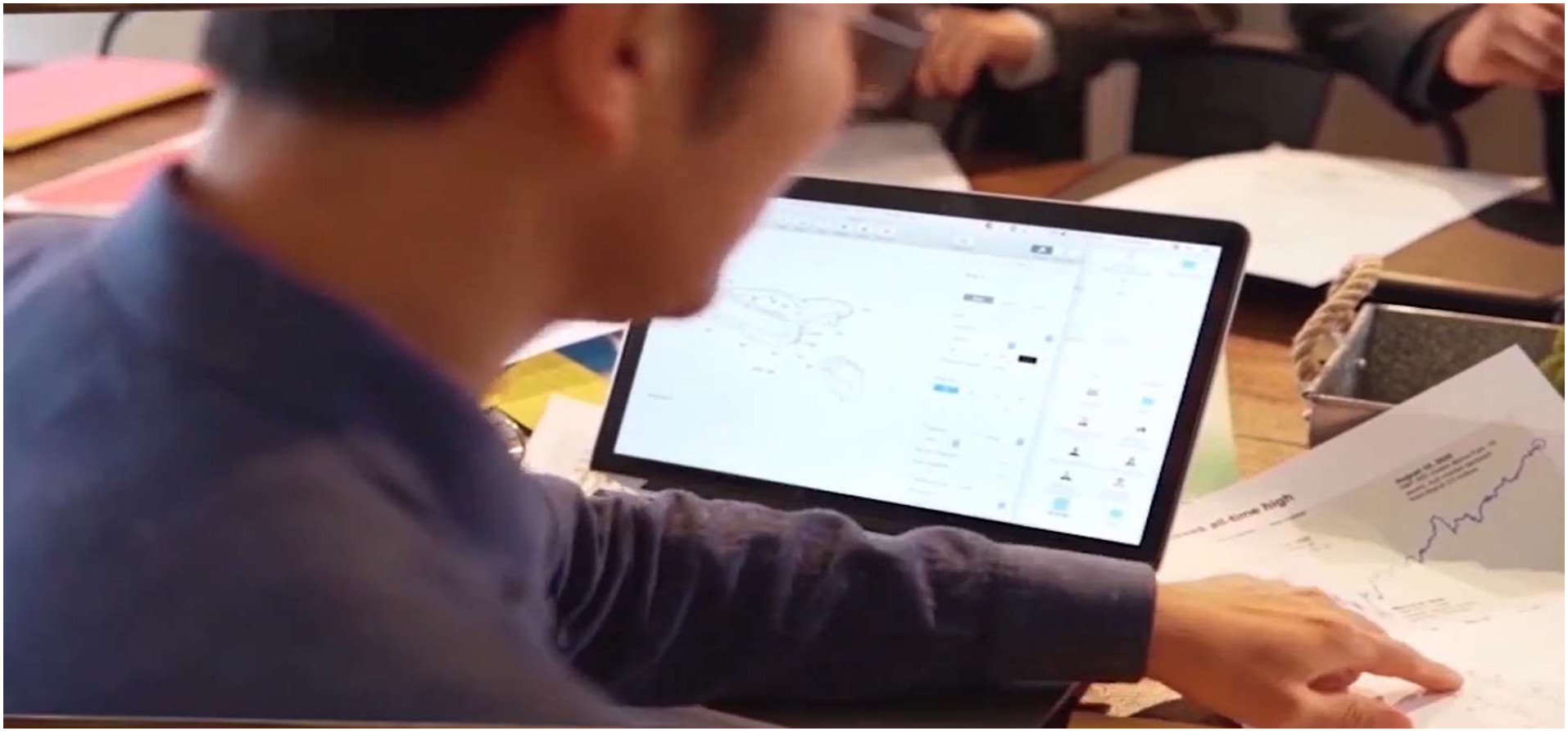

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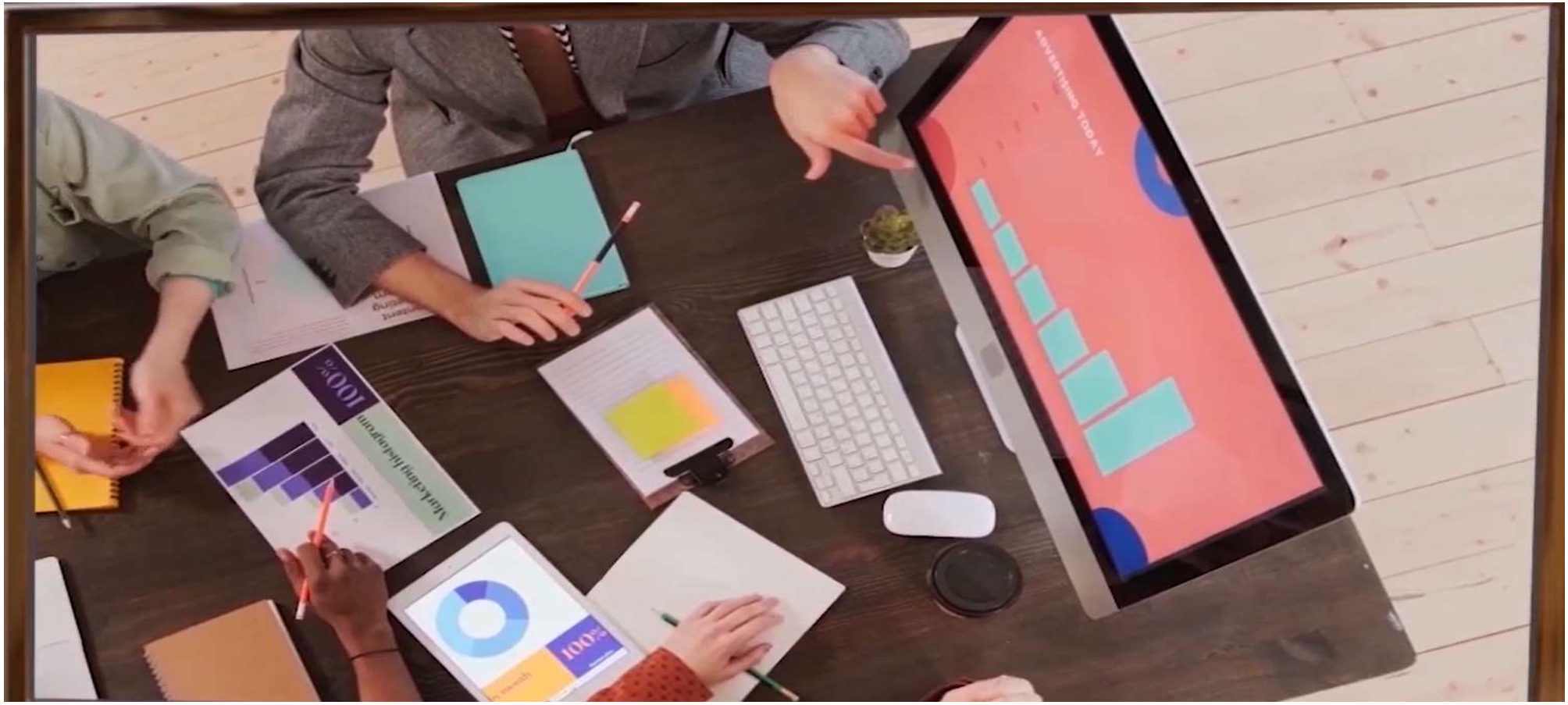

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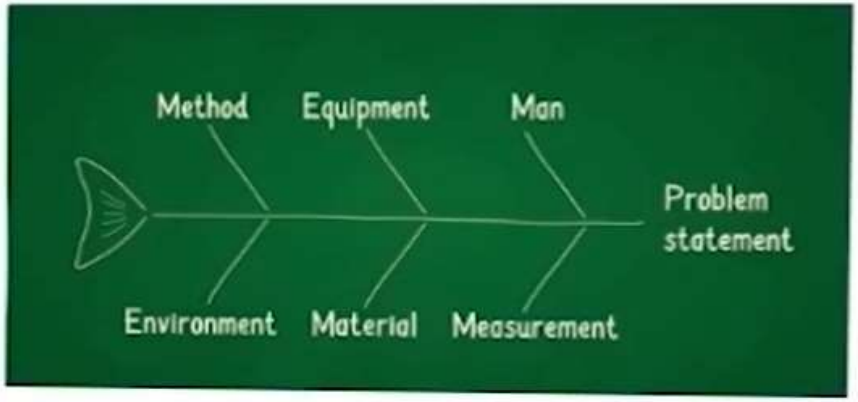
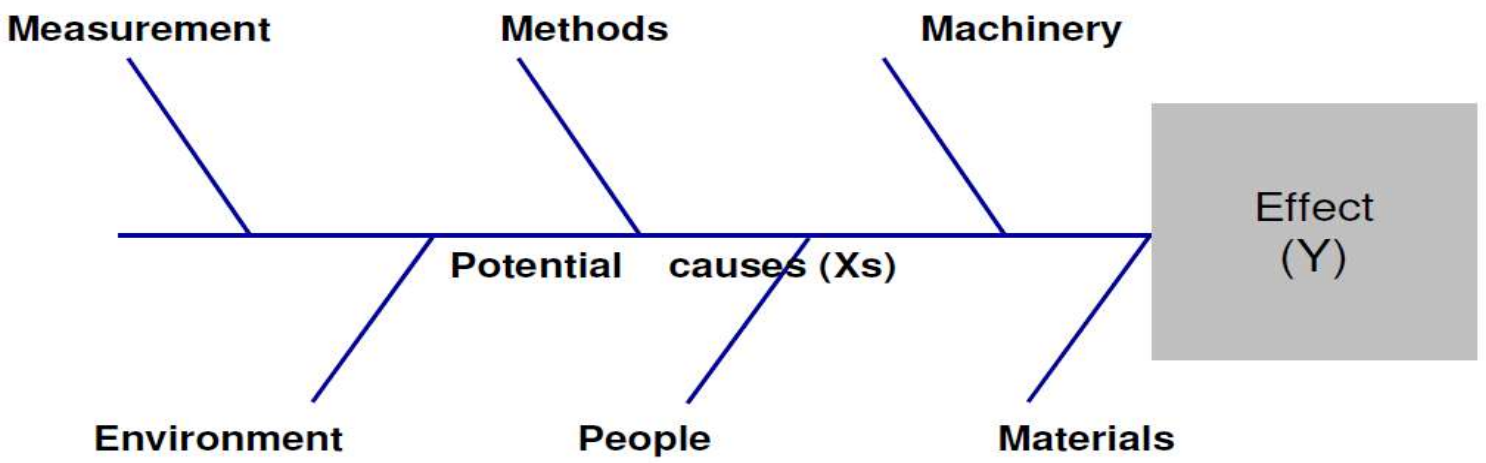
Looking for Relationships

- Graphic displays can help you structure possible causes to find relationships that will shed new light on your problem

Cause-and-Effect Diagram

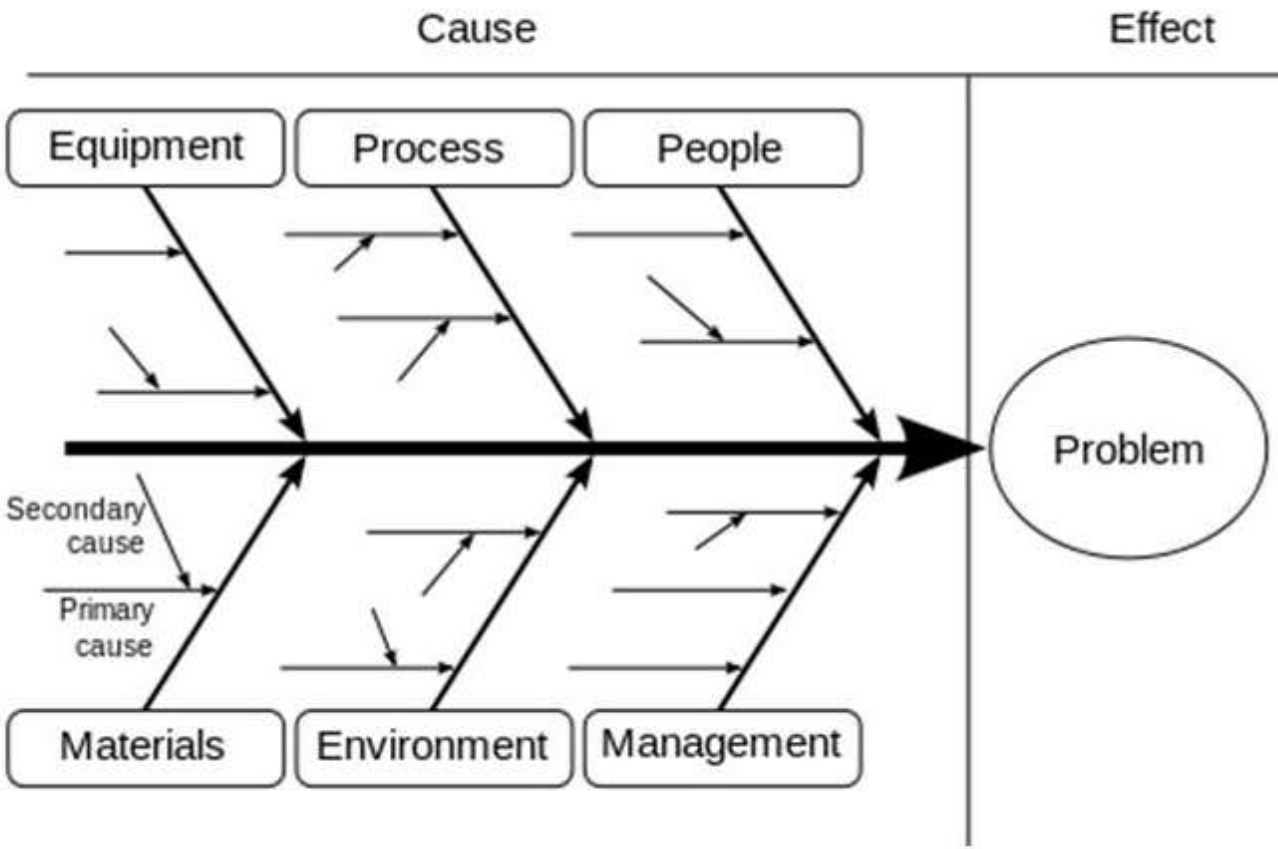


Cause & effect diagram



- Summarise potential causes
- Allows identification of root causes
- Potential root causes need to be validated by data

2. Fish bone:



Advantages

- Breaks Problems down into bite-size pieces to find root cause
- Fosters team work
- Understanding of factors causing the problem
- Road map to verify picture of the process
- Follows brainstorming relationship

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Pharmacy Project

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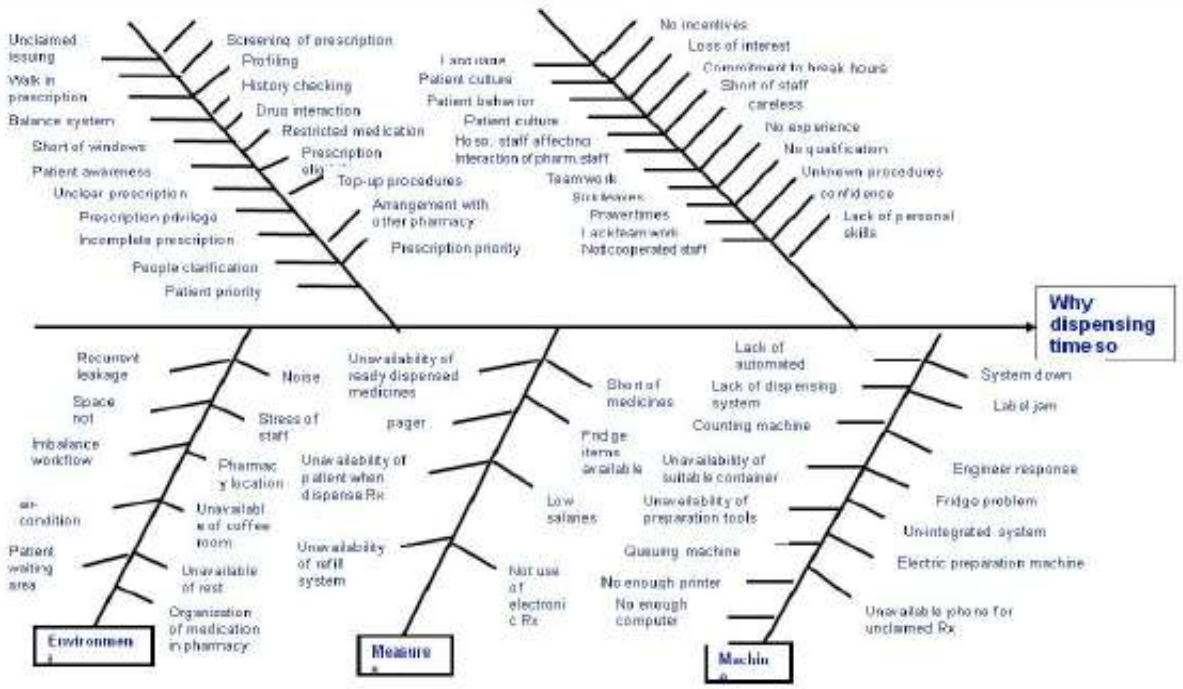
D M A I C

Identification of Potential Causes

C& E Diagram

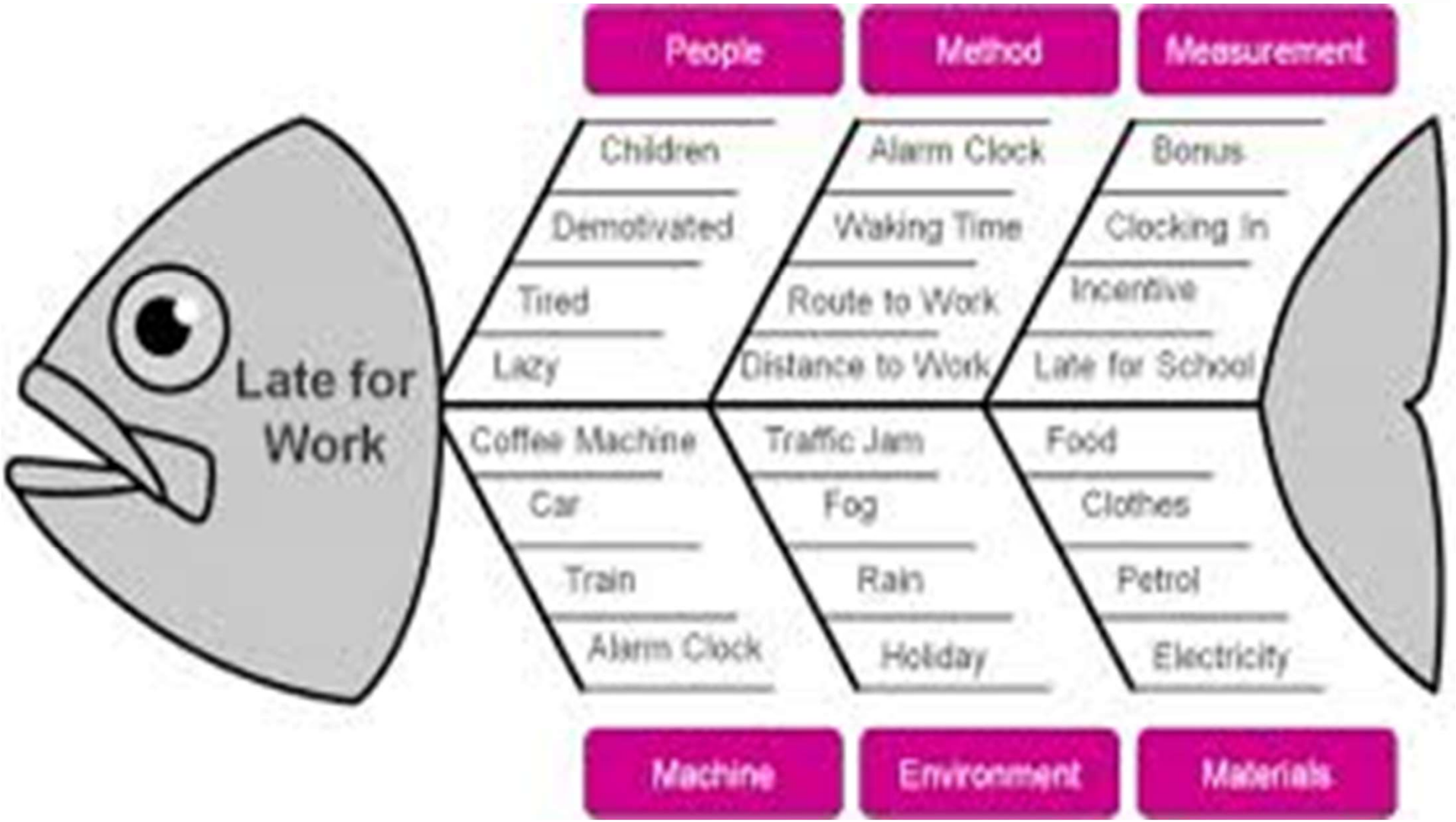


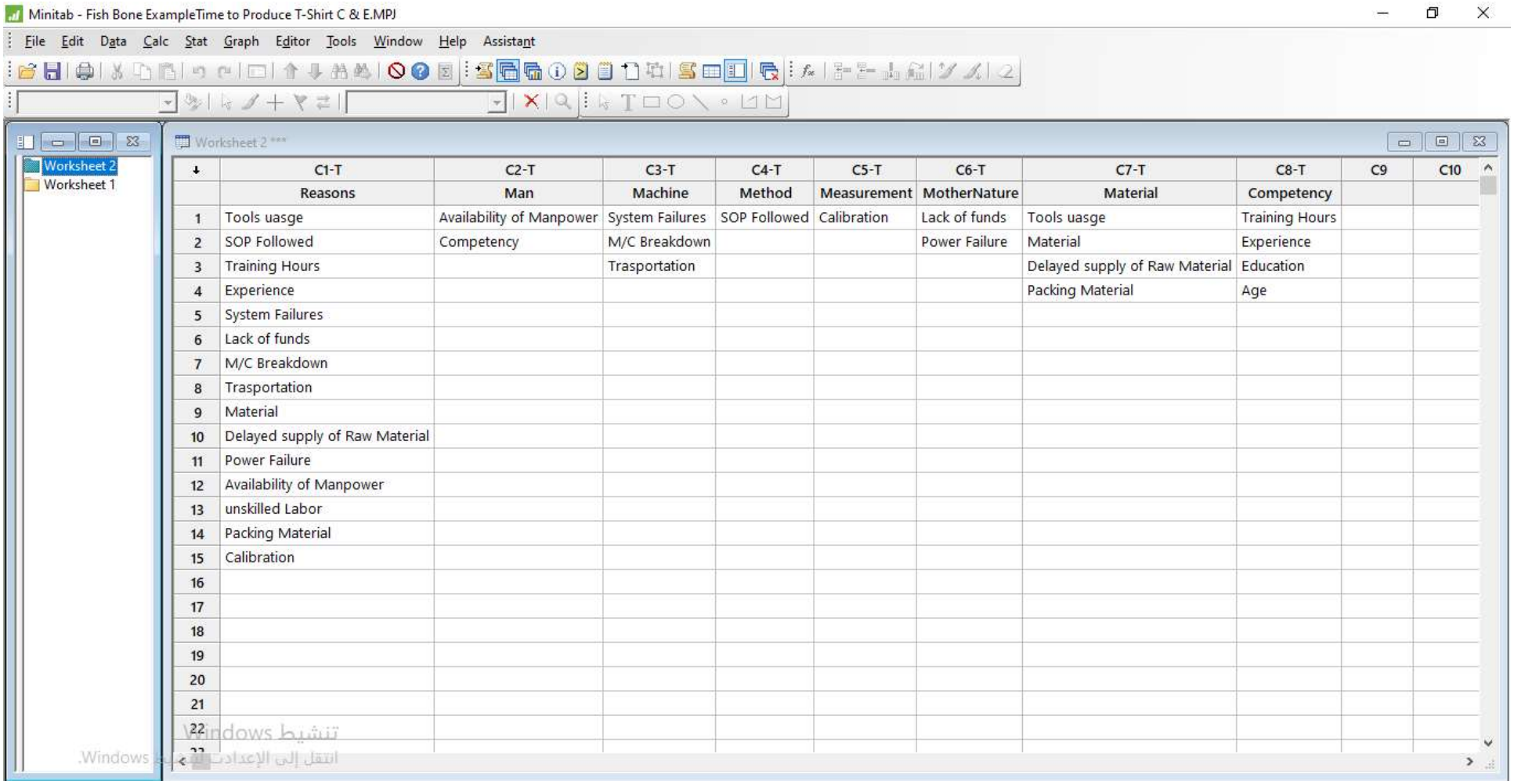
High control High Impact Causes

From Control impact matrix following causes were identified as high control high impact causes:

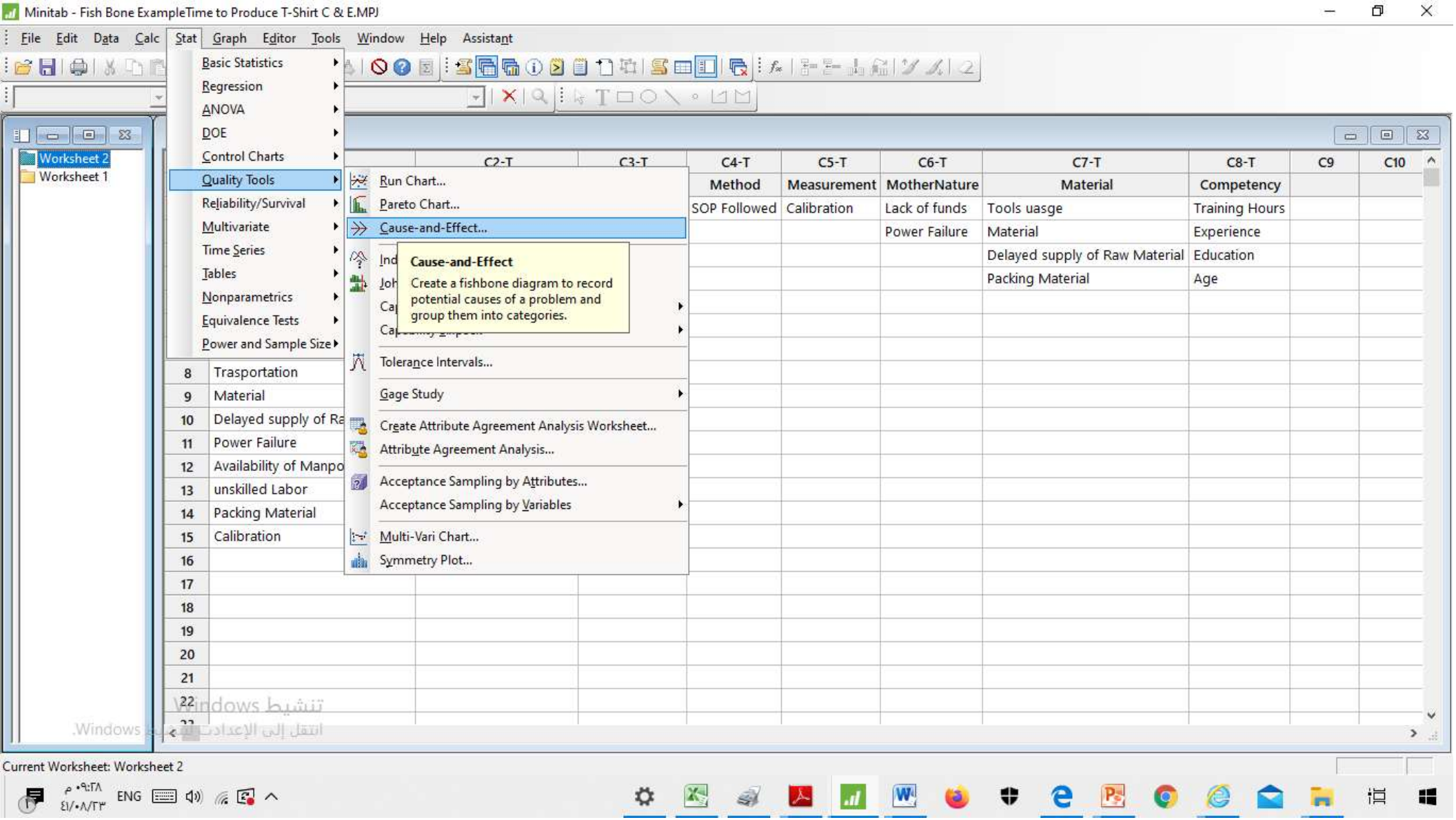
- Encoding time
- Encoder
- Preparation time
- Preparer
- Type of clinic/ specialty
- No. of items per Rx
- Issuer

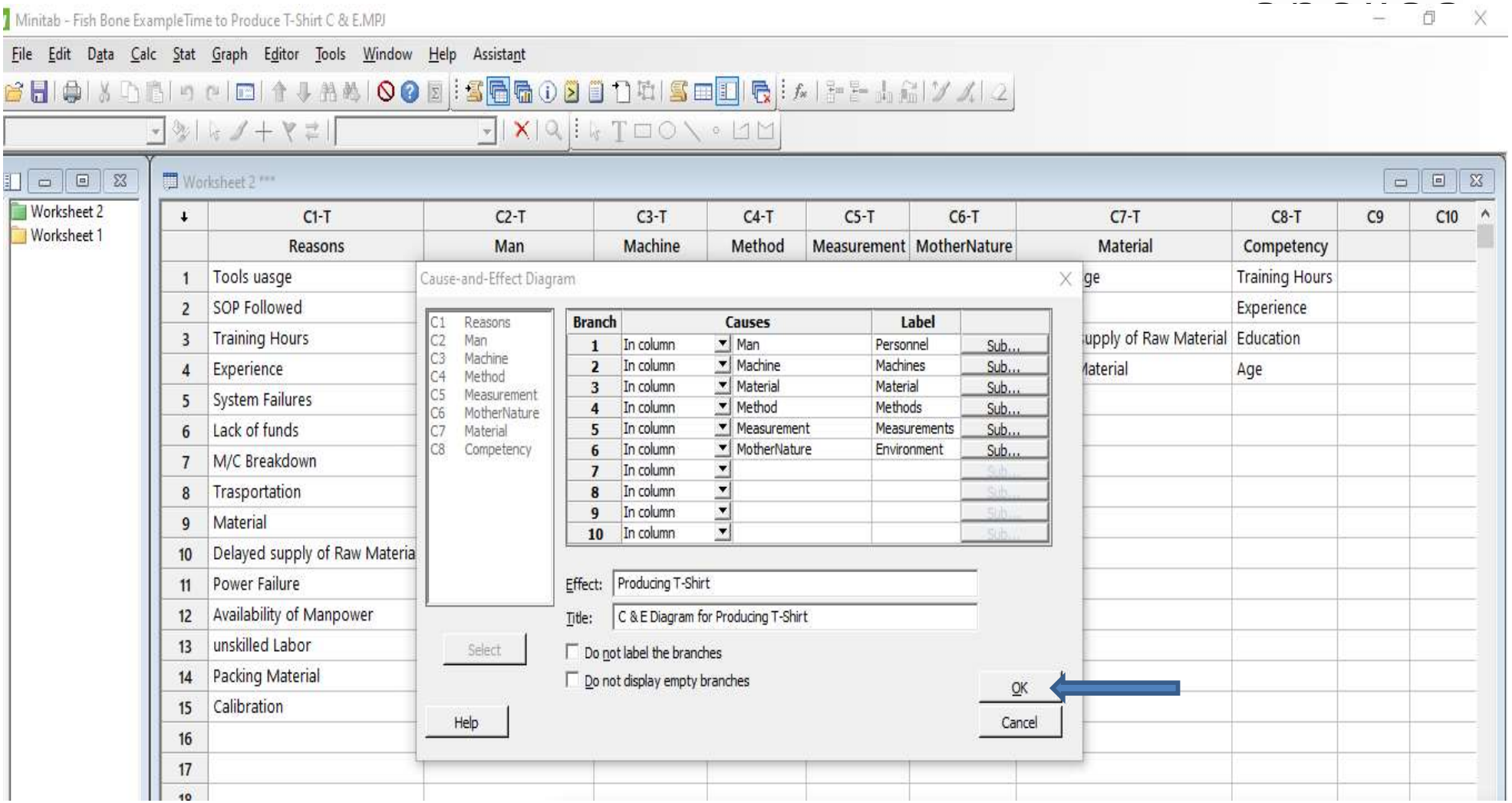
Inference


People
Method
Measurement
Children
Demotivated
Tired
Lazy
Alarm Clock
Waking Time
Route to Work
Distance to Work
Bonus
Clocking In
Incentive
Late for School
Late for Work
Coffee Machine
Car
Train
Alarm Clock
Traffic Jam
Fog
Rain
Holiday
Food
Clothes
Petrol
Electricity
Machine
Environment
Materials



↓	C1-T	C2-T	C3-T	C4-T	C5-T	C6-T	C7-T	C8-T	C9	C10
	Reasons	Man	Machine	Method	Measurement	MotherNature	Material	Competency		
1	Tools uasge	Availability of Manpower	System Failures	SOP Followed	Calibration	Lack of funds	Tools uasge	Training Hours		
2	SOP Followed	Competency	M/C Breakdown			Power Failure	Material	Experience		
3	Training Hours		Trasportation				Delayed supply of Raw Material	Education		
4	Experience						Packing Material	Age		
5	System Failures									
6	Lack of funds									
7	M/C Breakdown									
8	Trasportation									
9	Material									
10	Delayed supply of Raw Material									
11	Power Failure									
12	Availability of Manpower									
13	unskilled Labor									
14	Packing Material									
15	Calibration									
16										
17										
18										
19										
20										
21										
22										


Minitab - Fish Bone ExampleTime to Produce T-Shirt C & E.MPJ
File Edit Data Calc Stat Graph Editor Tools Window Help Assistant
Basic Statistics
Regression
ANOVA
DOE
Control Charts
Quality Tools
Reliability/Survival
Multivariate
Time Series
Tables
Nonparametrics
Equivalence Tests
Power and Sample Size
Run Chart...
Pareto Chart...
Cause-and-Effect...
Cause-and-Effect
Create a fishbone diagram to record potential causes of a problem and group them into categories.
Tolerance Intervals...
Gage Study
Create Attribute Agreement Analysis Worksheet...
Attribute Agreement Analysis...
Acceptance Sampling by Attributes...
Acceptance Sampling by Variables
Multi-Vari Chart...
Symmetry Plot...
Worksheet 2
Worksheet 1
C4-T Method
C5-T Measurement
C6-T MotherNature
C7-T Material
C8-T Competency
C9
C10
SOP Followed
Calibration
Lack of funds
Tools uasge
Training Hours
Power Failure
Material
Experience
Delayed supply of Raw Material
Education
Packing Material
Age
8 Trasportation
9 Material
10 Delayed supply of Ra
11 Power Failure
12 Availability of Manpo
13 unskilled Labor
14 Packing Material
15 Calibration
Current Worksheet: Worksheet 2


Minitab - Fish Bone ExampleTime to Produce T-Shirt C & E.MPJ
File Edit Data Calc Stat Graph Editor Tools Window Help Assistant
Worksheet 2
Worksheet 1
Worksheet 2 ***
C1-T Reasons
C2-T Man
C3-T Machine
C4-T Method
C5-T Measurement
C6-T MotherNature
C7-T Material
C8-T Competency
C9
C10
1 Tools uasge
2 SOP Followed
3 Training Hours
4 Experience
5 System Failures
6 Lack of funds
7 M/C Breakdown
8 Trasportation
9 Material
10 Delayed supply of Raw Materia
11 Power Failure
12 Availability of Manpower
13 unskilled Labor
14 Packing Material
15 Calibration
16
17
Training Hours
Experience
Education
Age
upply of Raw Material
Material
Cause-and-Effect Diagram
C1 Reasons
C2 Man
C3 Machine
C4 Method
C5 Measurement
C6 MotherNature
C7 Material
C8 Competency
Branch
Causes
Label
1 In column Man Personnel Sub...
2 In column Machine Machines Sub...
3 In column Material Material Sub...
4 In column Method Methods Sub...
5 In column Measurement Measurements Sub...
6 In column MotherNature Environment Sub...
7 In column
8 In column
9 In column
10 In column
Effect: Producing T-Shirt
Title: C & E Diagram for Producing T-Shirt
Select
Do not label the branches
Do not display empty branches
OK
Cancel
Help

one ExampleTime to Produce T-Shirt C & E.MPJ

Calc Stat Graph Editor Tools Window Help Assistant

Shirt C & E.MPJ'

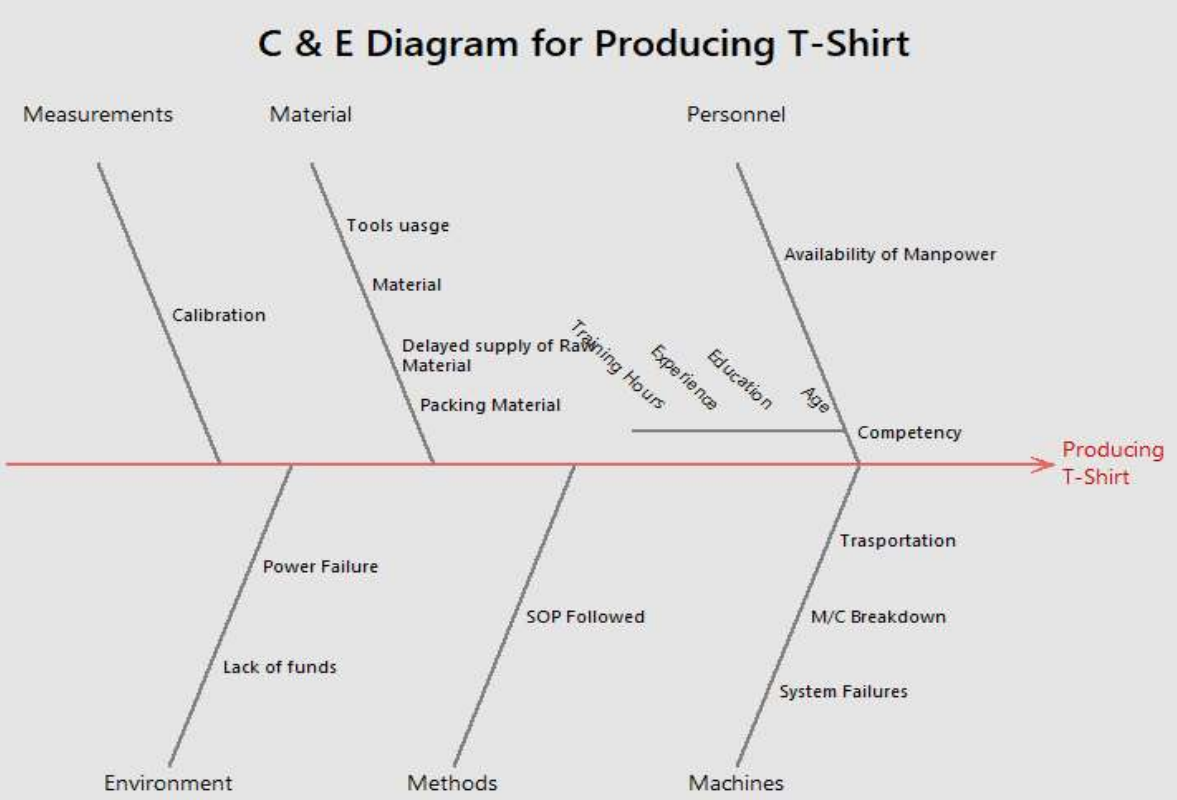
Worksheet 2

Effect Diagram

Effect Diagram

9	Material
10	Delayed supply of Raw
11	Power Failure
12	Availability of Manpow
13	unskilled Labor
14	Packing Material
15	Calibration
16	
17	
18	
19	
20	
21	
22	

Cause-and-Effect Diagram



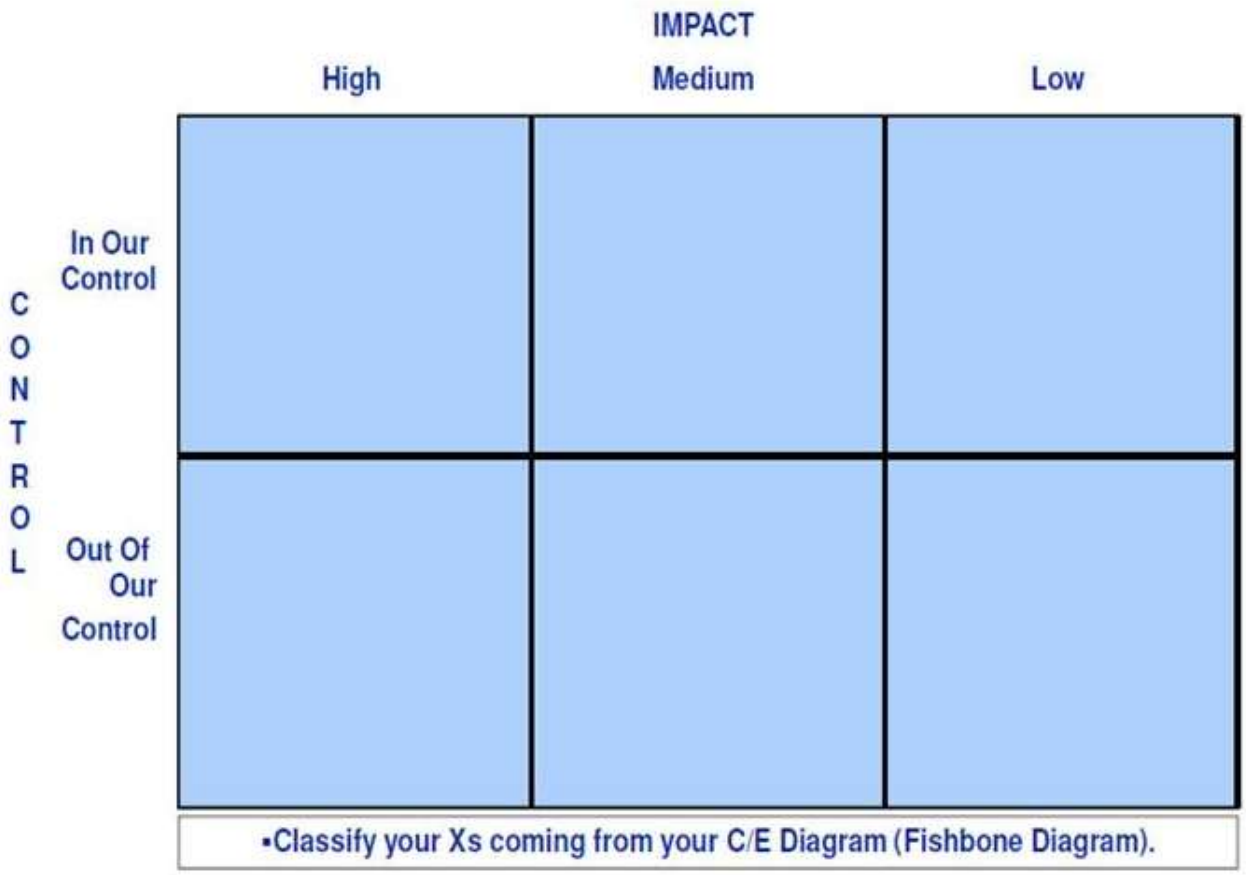
C9	C10

Worksheet 2

ENG

3. Prioritization of Xs

Control / Impact Matrix Y=f (X1, X2, ..., Xn)



•Classify your Xs coming from your C/E Diagram (Fishbone Diagram).

Benefits

- **Facilitate root cause analysis**
- **Sensitizing people to opportunities**
- **Provide a visual of the problem being studied**

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	Continuous	Attribute
Continuous	Scatter plot	Box plot
Attribute	Box Plot	Pareto Chart

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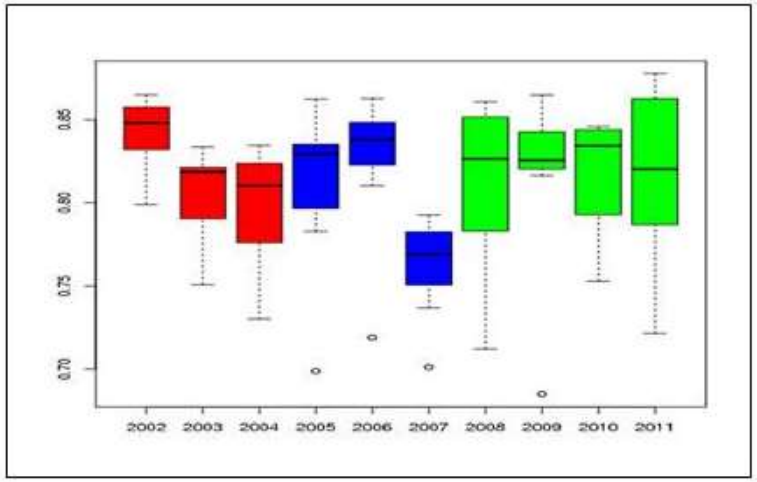
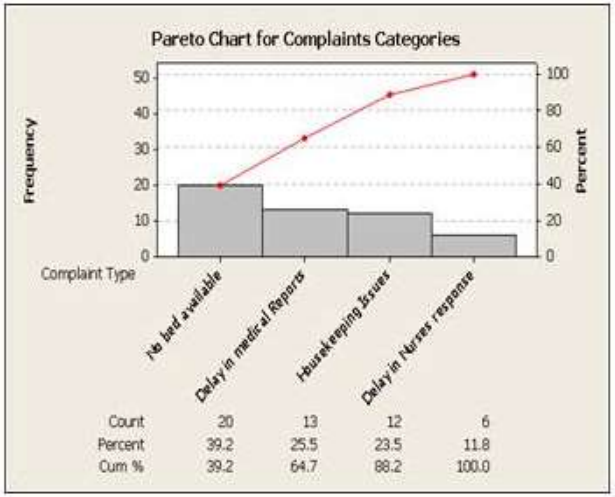
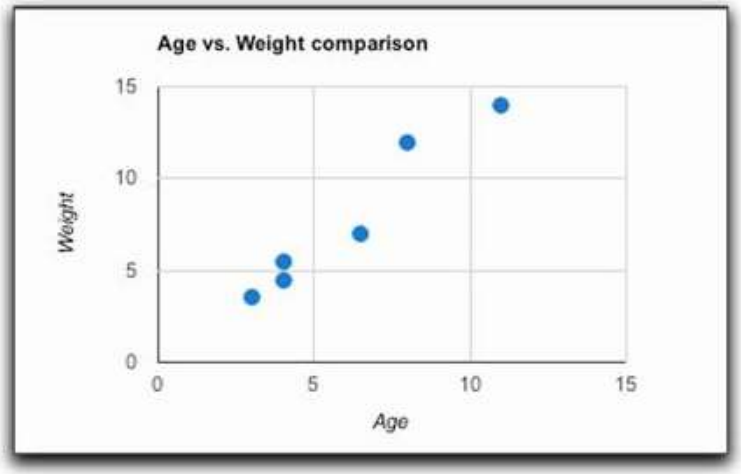
consultancy SE

Root cause validation

1. Box Plot — Cont , Att
2. Scatter Plot — Cont , Cont
3. Pareto chart — Att , Att







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Box plot

Inter Quartile Range

$$IQR = Q_3 - Q_1$$

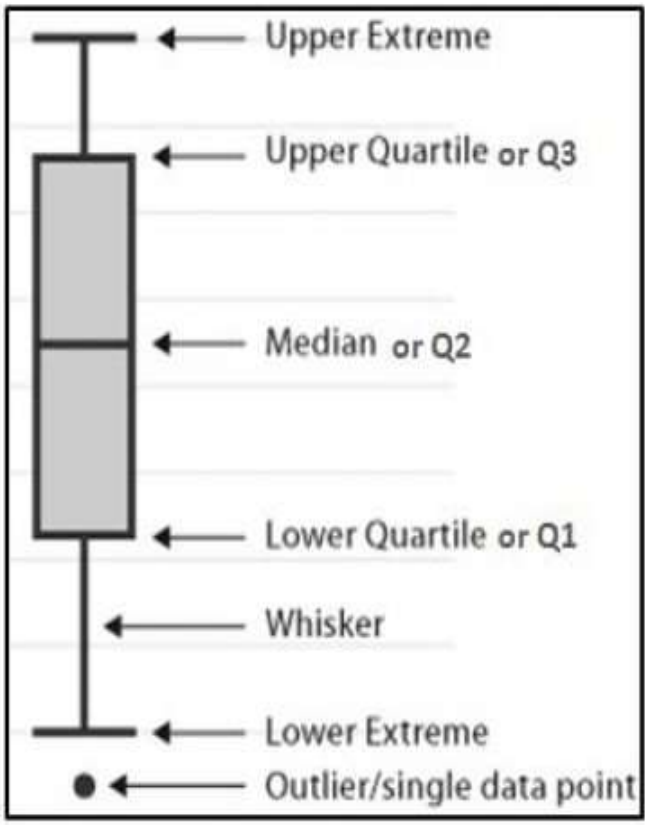
Lower Quartile (Q1)

$$Q_3 + 1.5(IQR)$$

Upper Quartile (Q3)

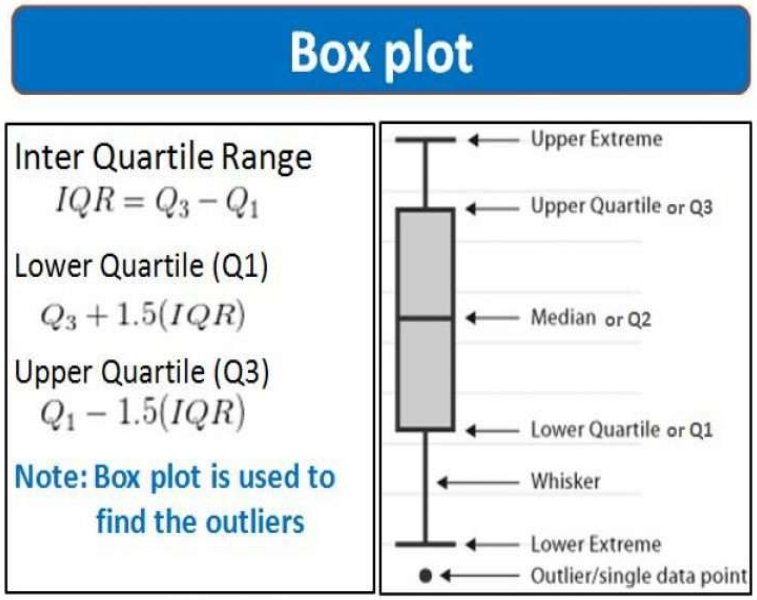
$$Q_1 - 1.5(IQR)$$

Note: Box plot is used to find the outliers



Anderson-Darling Normality Test	
A-Squared	0.55
P-Value	0.116
Mean	33.500
StDev	7.778
Variance	60.500
Skewness	0.66142
Kurtosis	2.19713
N	10
Minimum	20.000
1st Quartile	30.000
Median	32.000
3rd Quartile	37.750
Maximum	50.000
95% Confidence Interval for Mean	
27.936	39.064
95% Confidence Interval for Median	
30.000	38.027
95% Confidence Interval for StDev	
5.350	14.200

Box Plots

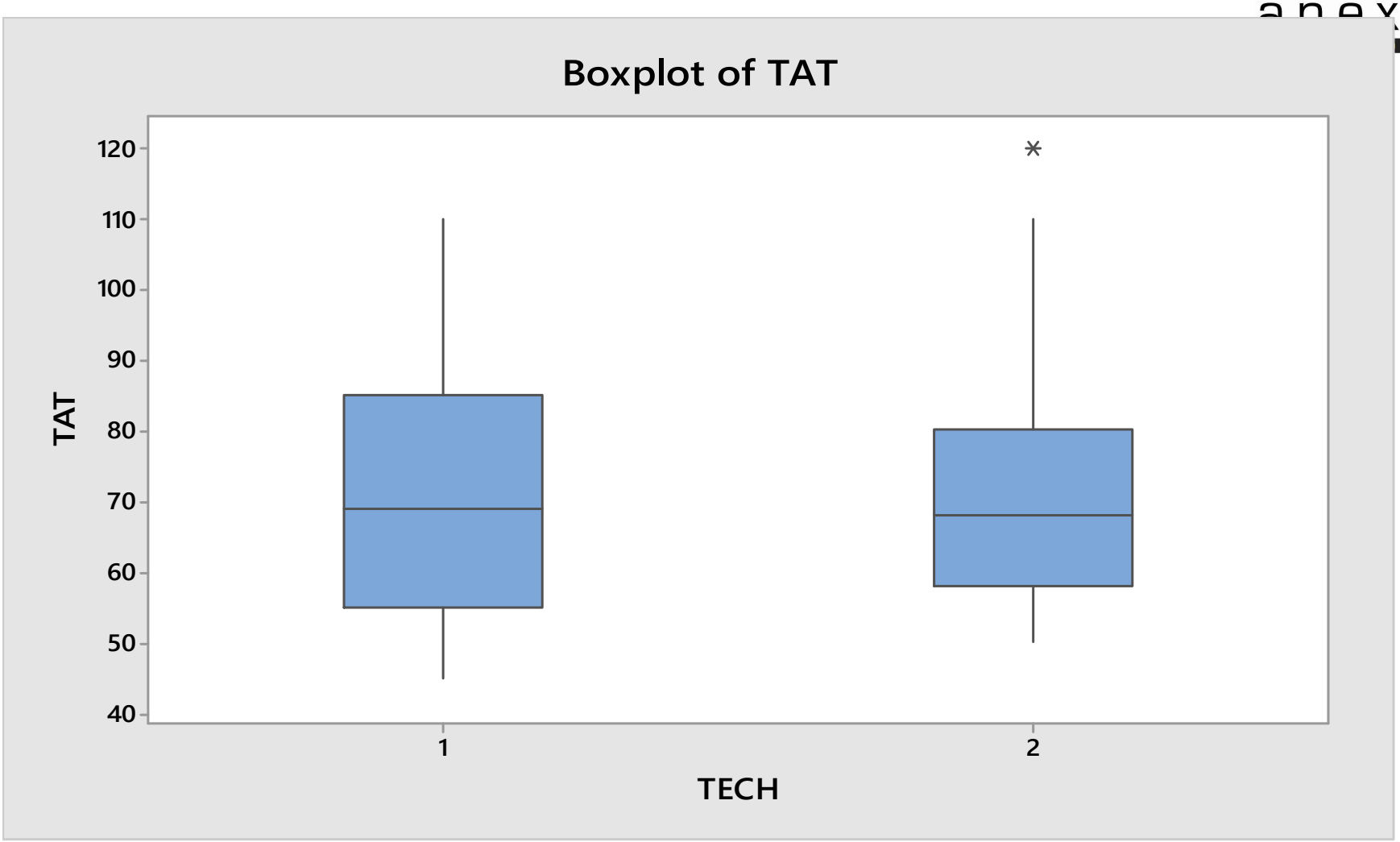


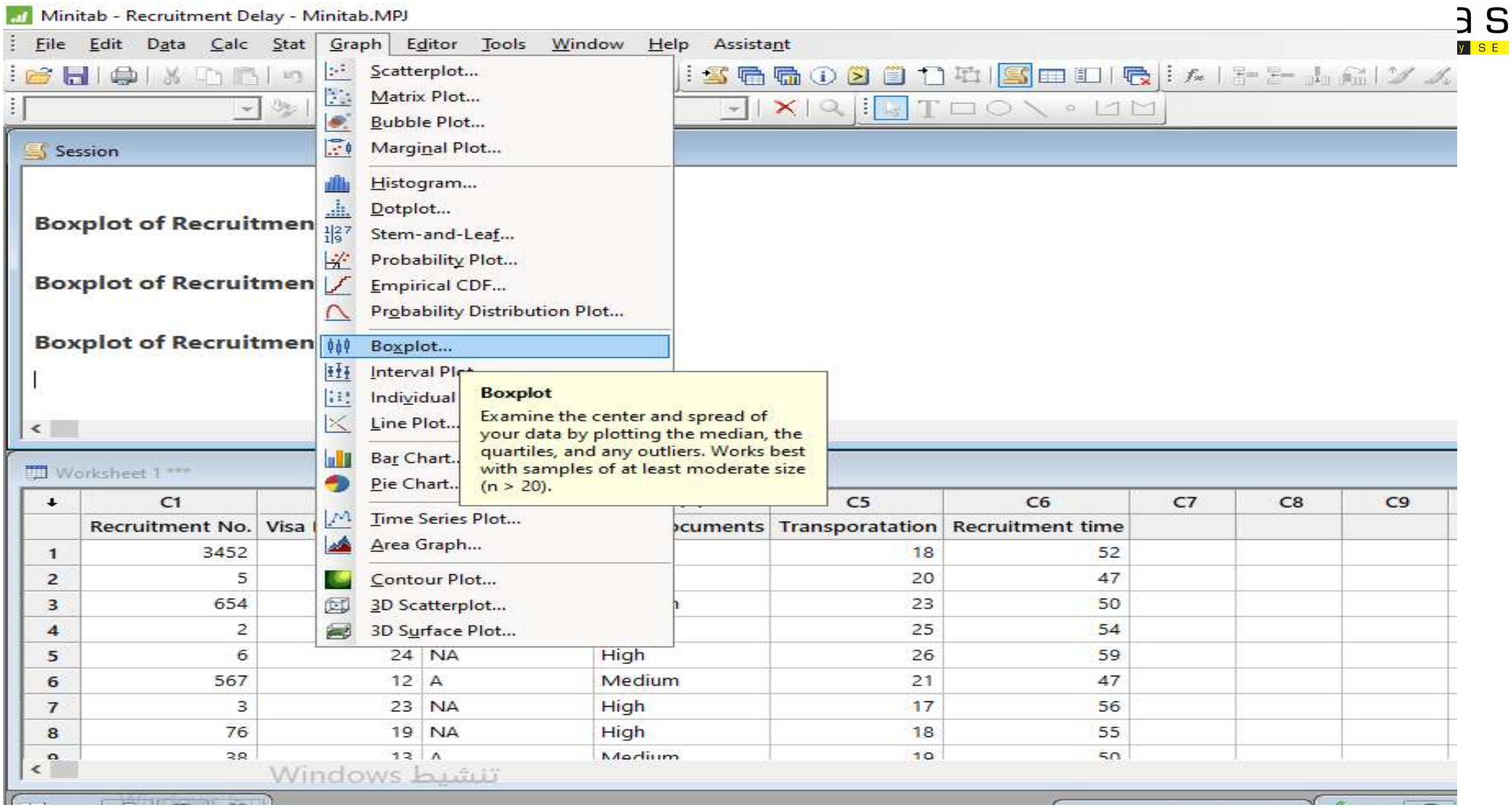
Rectangles are drawn for showing the second and third quartiles .

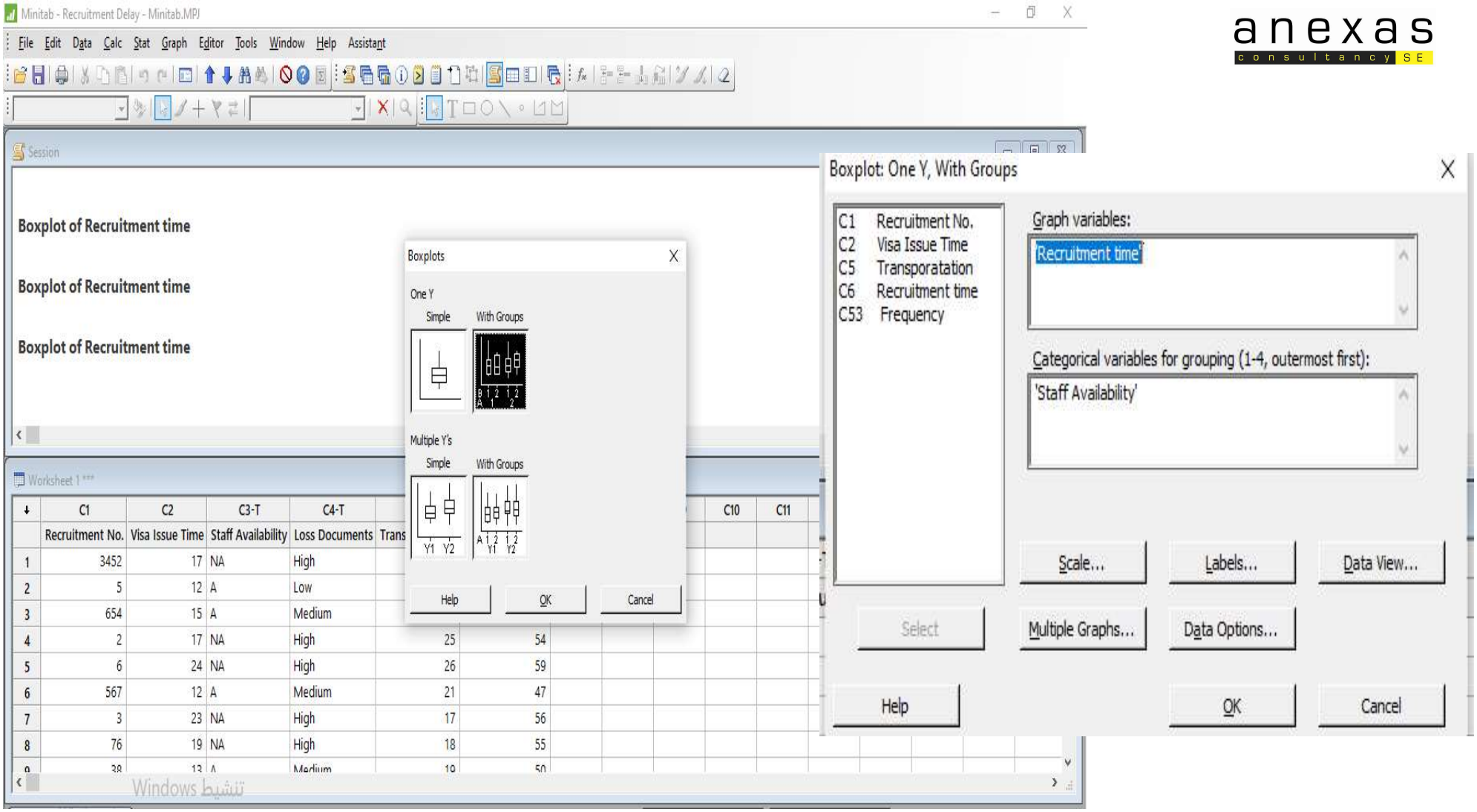
There is vertical line which shows the Median value

Box Blot are graphical tools that lets you easily visually compare variation between the data sets evaluated.

Also makes comparisons quickly and easily

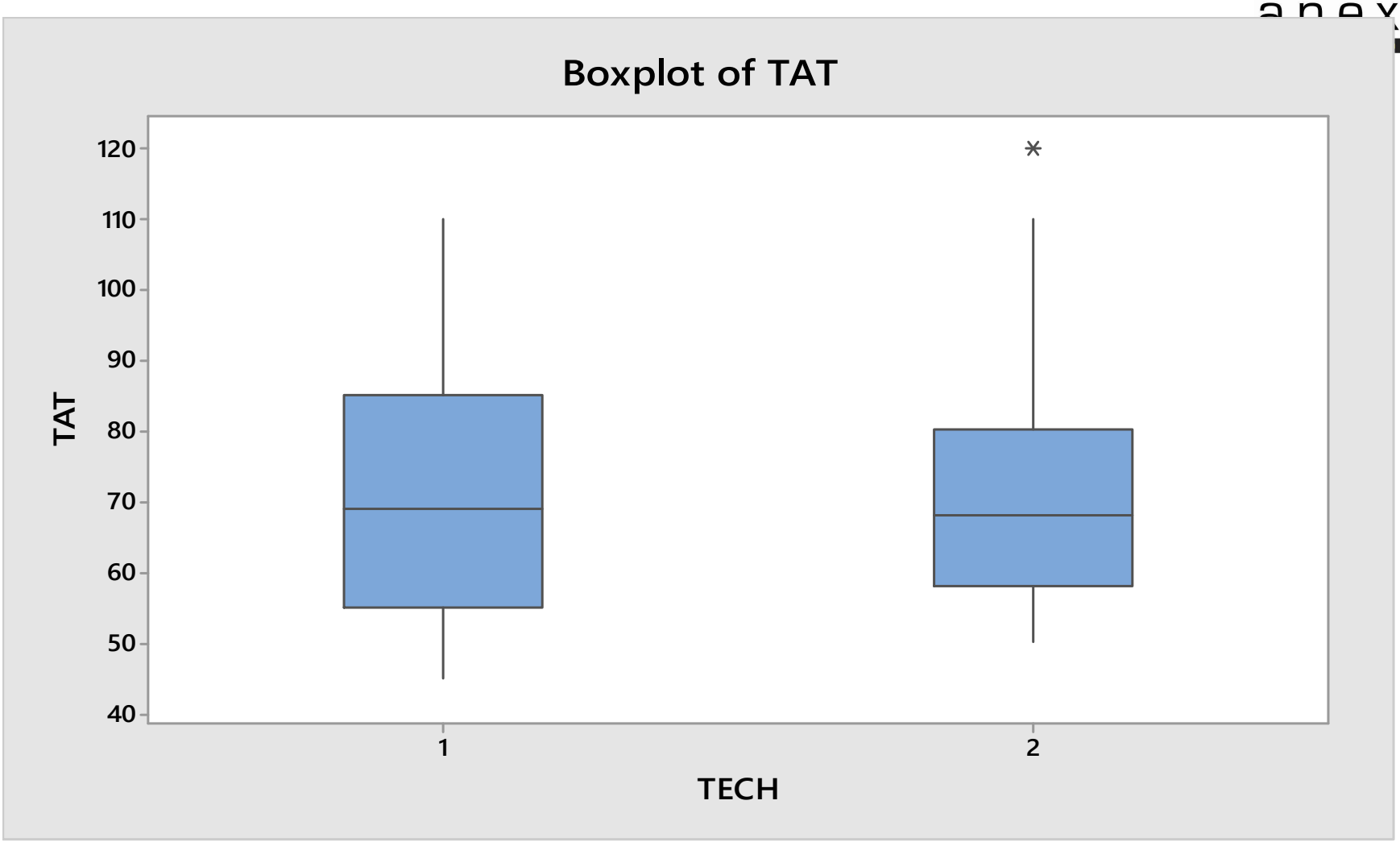

Boxplot of TAT
TAT
120
110
100
90
80
70
60
50
40
1
2
TECH


Minitab - Recruitment Delay - Minitab.MPJ
File Edit Data Calc Stat Graph Editor Tools Window Help Assistant
Scatterplot...
Matrix Plot...
Bubble Plot...
Marginal Plot...
Histogram...
Dotplot...
Stem-and-Leaf...
Probability Plot...
Empirical CDF...
Probability Distribution Plot...
Boxplot...
Interval Plot...
Individual...
Line Plot...
Bar Chart...
Pie Chart...
Time Series Plot...
Area Graph...
Contour Plot...
3D Scatterplot...
3D Surface Plot...
Boxplot
Examine the center and spread of your data by plotting the median, the quartiles, and any outliers. Works best with samples of at least moderate size (n > 20).
Session
Boxplot of Recruitmen
Boxplot of Recruitmen
Boxplot of Recruitmen
Worksheet 1 ***
C1 C5 C6 C7 C8 C9
Recruitment No. Visa Transporatation Recruitment time
1 3452 18 52
2 5 20 47
3 654 23 50
4 2 25 54
5 6 24 NA High 26 59
6 567 12 A Medium 21 47
7 3 23 NA High 17 56
8 76 19 NA High 18 55

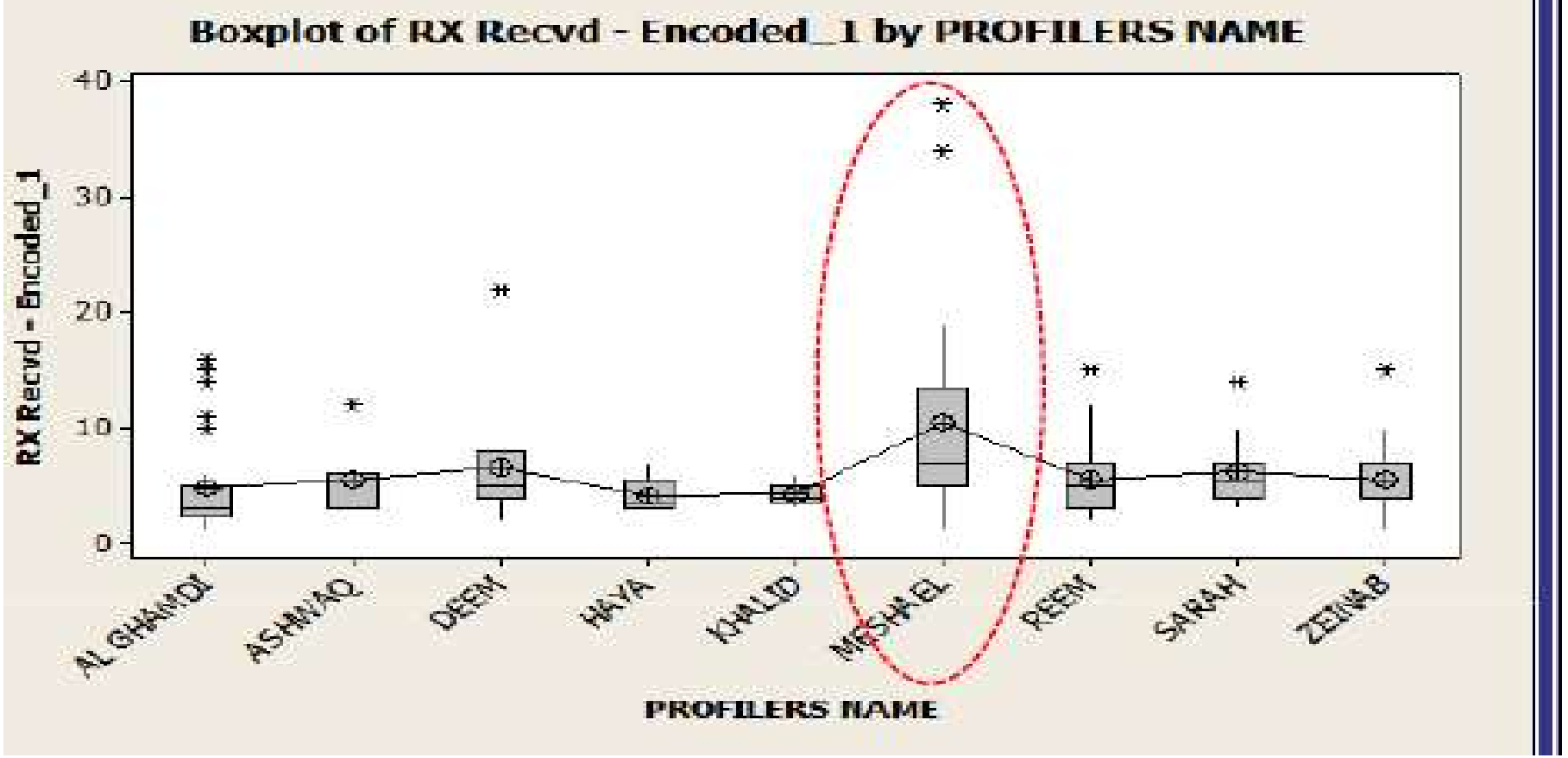


	C1	C2	C3-T	C4-T			C10	C11
	Recruitment No.	Visa Issue Time	Staff Availability	Loss Documents	Trans			
1	3452	17	NA	High				
2	5	12	A	Low				
3	654	15	A	Medium				
4	2	17	NA	High	25	54		
5	6	24	NA	High	26	59		
6	567	12	A	Medium	21	47		
7	3	23	NA	High	17	56		
8	76	19	NA	High	18	55		
9	38	13	A	Medium	19	50		


Boxplot of Recruitment time
Recruitment time
60
55
50
45
40
A
NA
Staff Availability

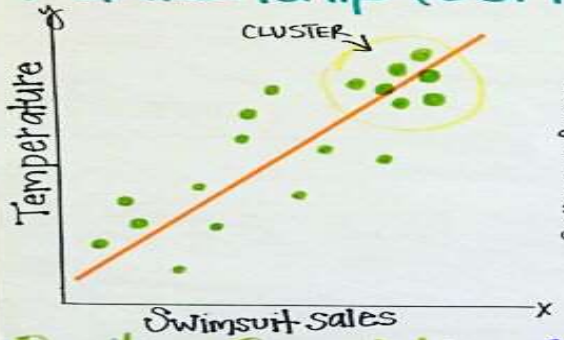

Boxplot of TAT
TAT
120
110
100
90
80
70
60
50
40
1
2
TECH

Profiler Comparison



SCATTERPLOTS

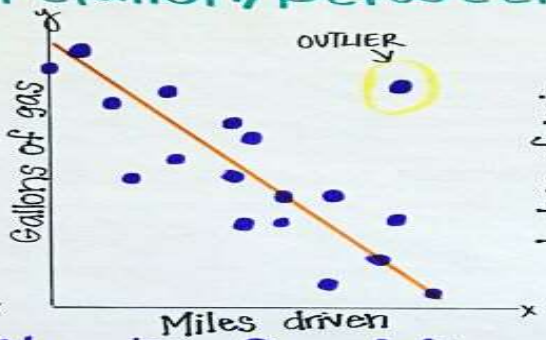
A diagram where points are plotted to show the relationship (correlation) between two variables



Positive Correlation

As one set of values increases, the other set of values increases

As the temperature went up, swimsuit sales went up



Negative Correlation

As one set of values decreases, the other set of values increases

The amount of gas in your car and the number of miles you drive

No Correlation

Points are scattered randomly with no visible pattern

The amount of rain and the day of the week

LINE OF BEST FIT:

A trend line is a straight line drawn through the points that best represents the data.

★ use to make predictions ★

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SCATTER PLOT

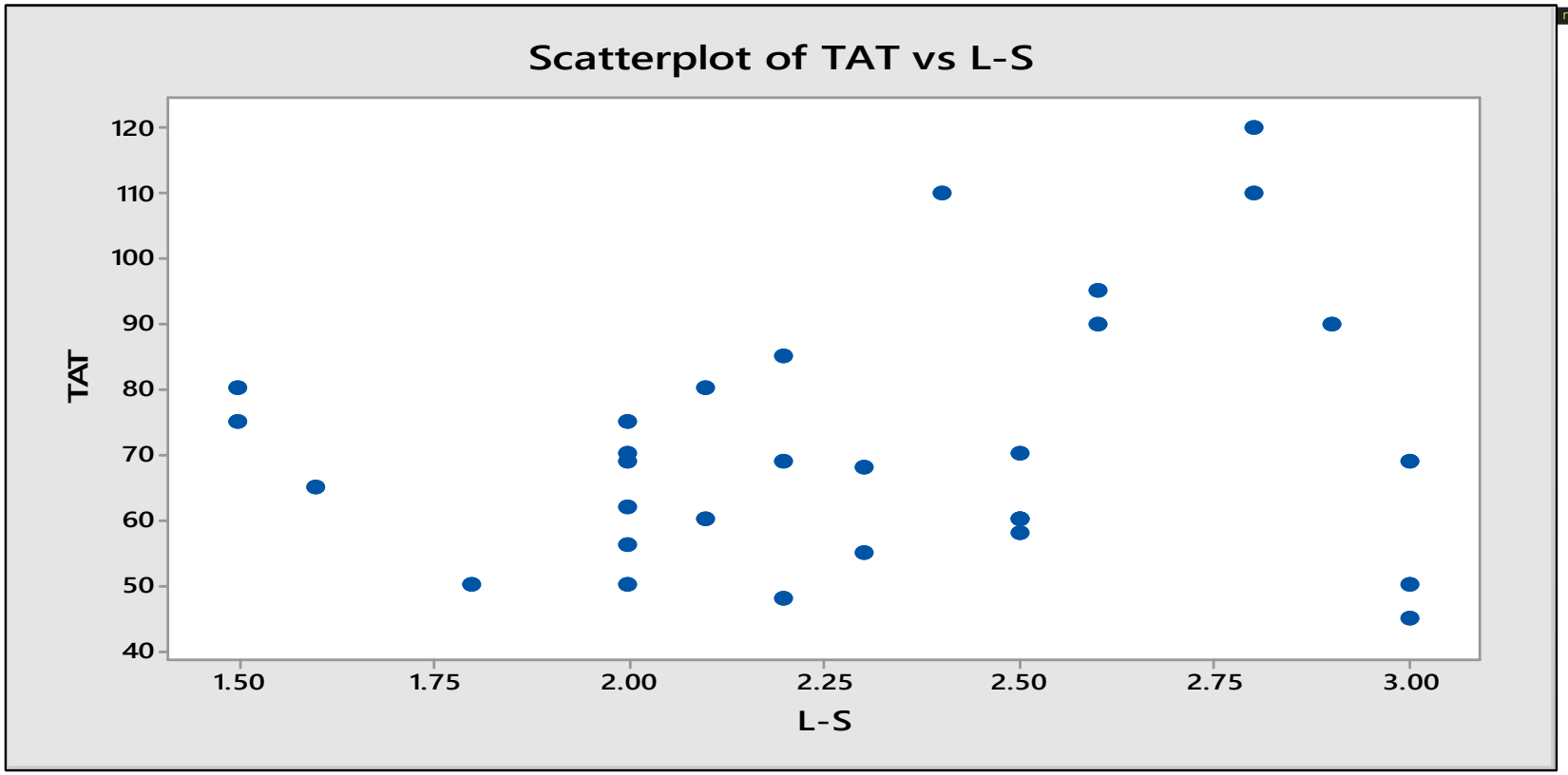
Purpose:

To identify the correlations that might exist between a quality characteristic and a factor that might be driving it

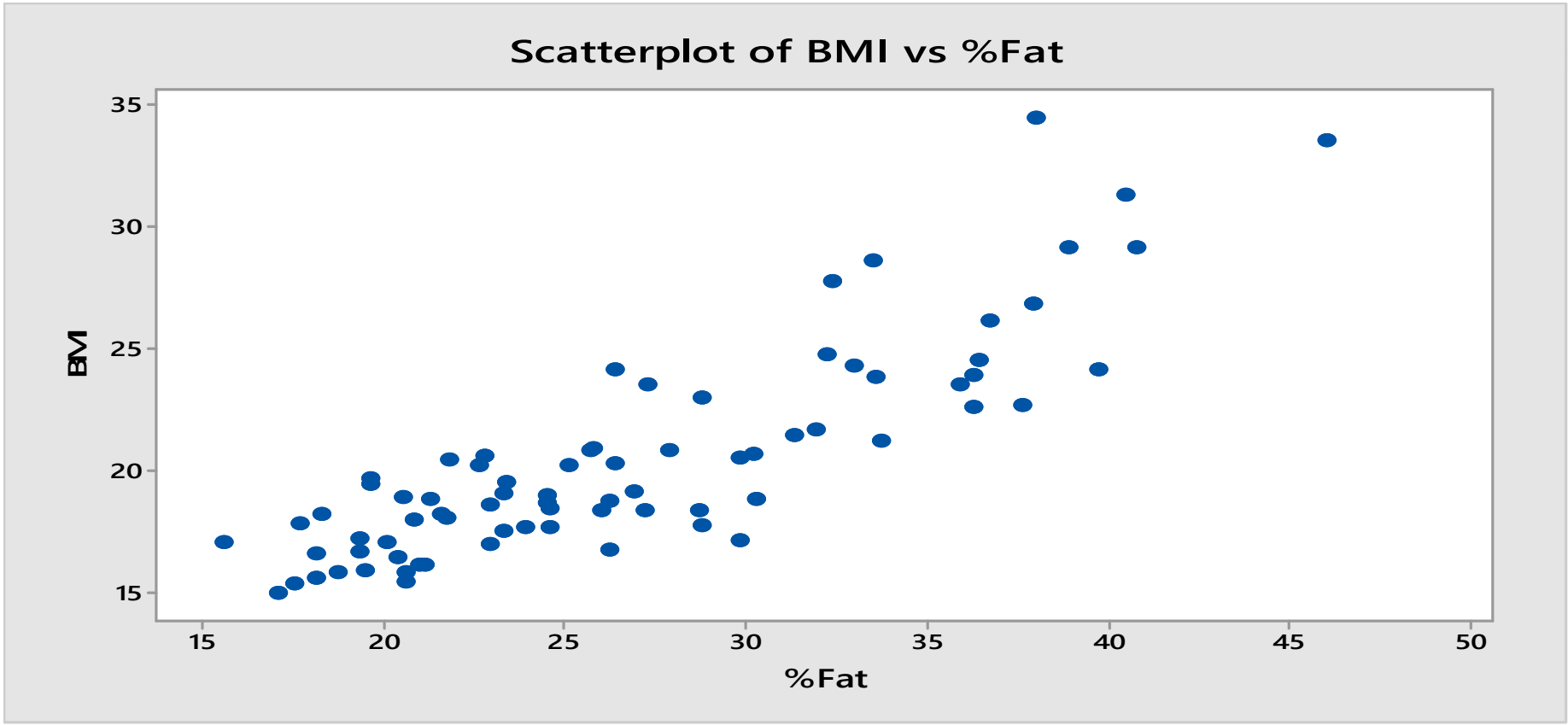
Dots representing data points are scattered on the diagram.
The extent to which the dots cluster together in a line across the diagram shows the strength with which the tow factors are related.

Advantages:

- **Helps identify and test probable causes**
- **By knowing which elements of your process are related and how they are related. You will know what to control or what to vary to affect a quality characteristic**



SCATTERED (No Relation)



Positive Correlation (There is Relation)

es.MPJ

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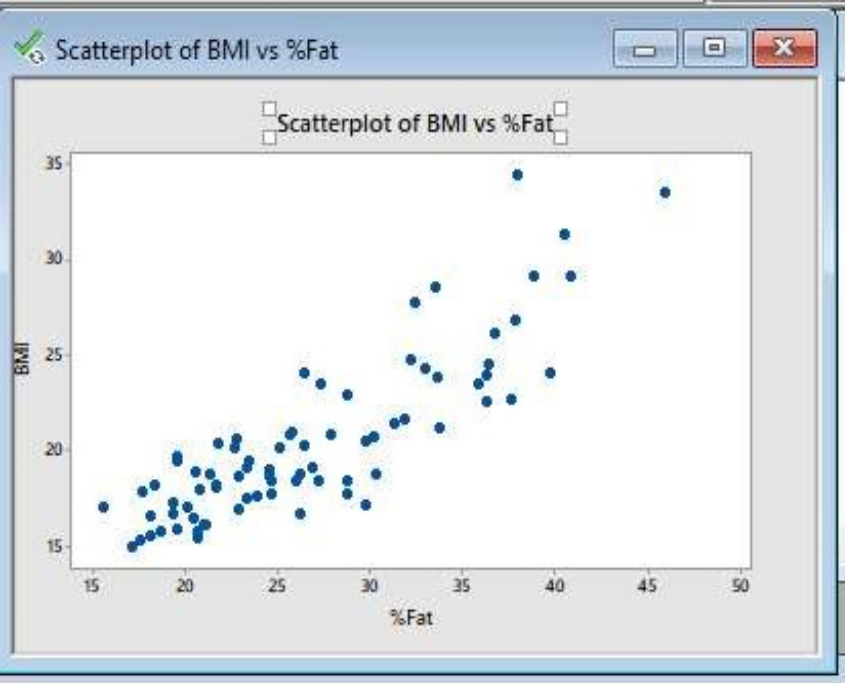
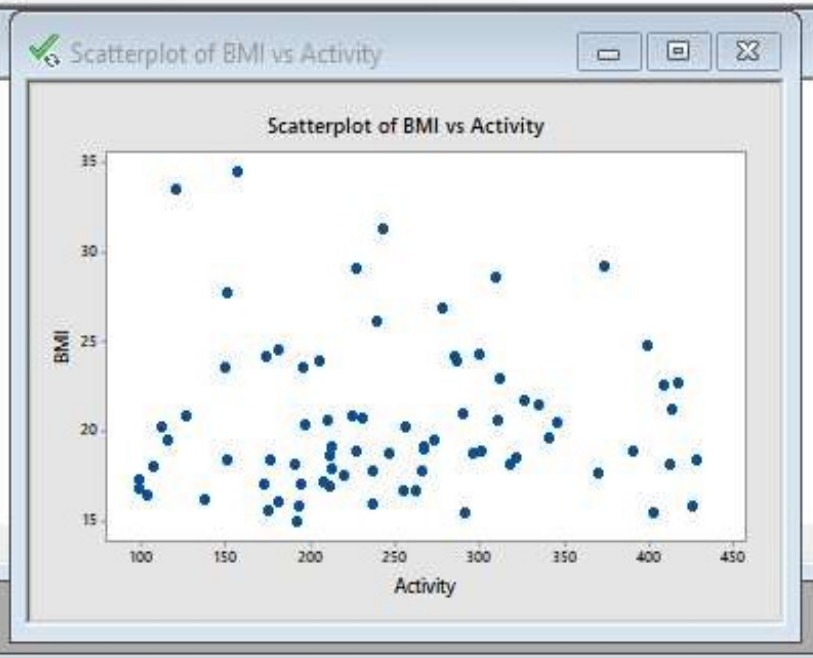
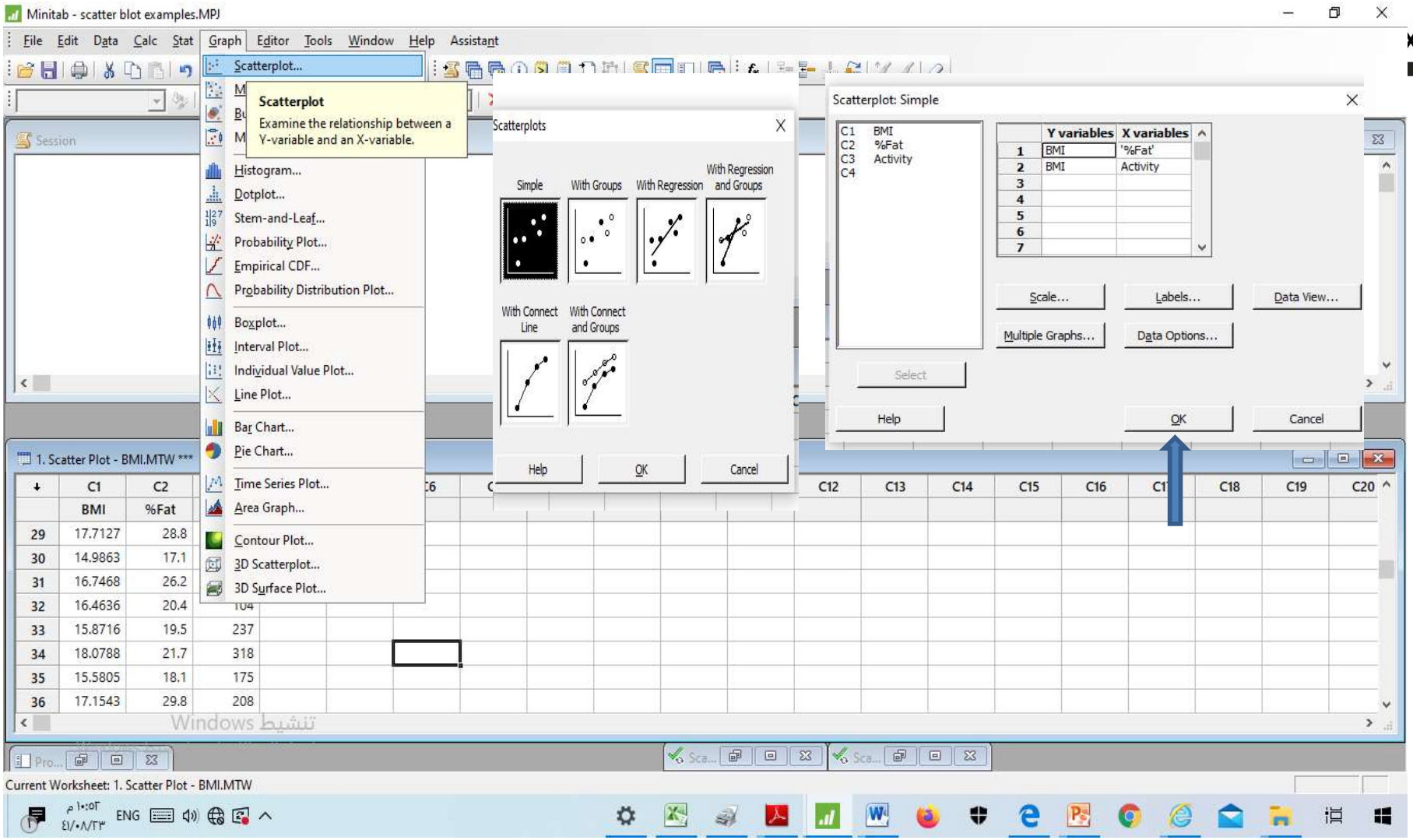




	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18
	Activity															
3	266	450														
	192	320														

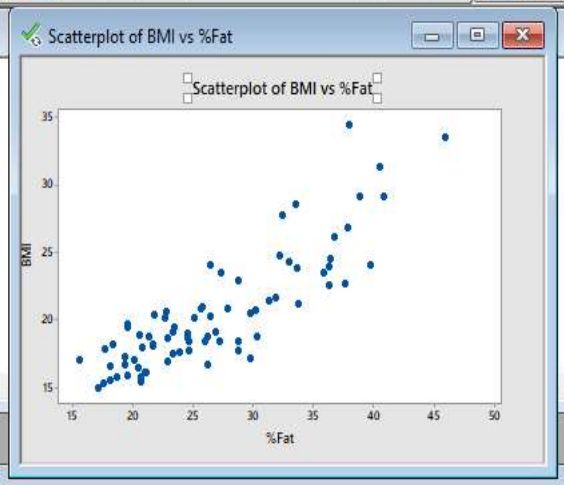

Minitab - scatter blot examples.MPJ
File Edit Data Calc Stat Graph Editor Tools Window Help Assistant
Scatterplot...
Scatterplot
Examine the relationship between a Y-variable and an X-variable.
Histogram...
Dotplot...
Stem-and-Leaf...
Probability Plot...
Empirical CDF...
Probability Distribution Plot...
Boxplot...
Interval Plot...
Individual Value Plot...
Line Plot...
Bar Chart...
Pie Chart...
Time Series Plot...
Area Graph...
Contour Plot...
3D Scatterplot...
3D Surface Plot...
Scatterplots
Simple
With Groups
With Regression
With Regression and Groups
With Connect Line
With Connect and Groups
Help
OK
Cancel
Scatterplot: Simple
C1 BMI
C2 %Fat
C3 Activity
C4
Y variables
X variables
BMI
'%Fat'
BMI
Activity
Scale...
Labels...
Data View...
Multiple Graphs...
Data Options...
Select
Help
OK
Cancel
1. Scatter Plot - BMI.MTW ***
C1 C2
BMI %Fat
29 17.7127 28.8
30 14.9863 17.1
31 16.7468 26.2
32 16.4636 20.4
33 15.8716 19.5 237
34 18.0788 21.7 318
35 15.5805 18.1 175
36 17.1543 29.8 208
Current Worksheet: 1. Scatter Plot - BMI.MTW

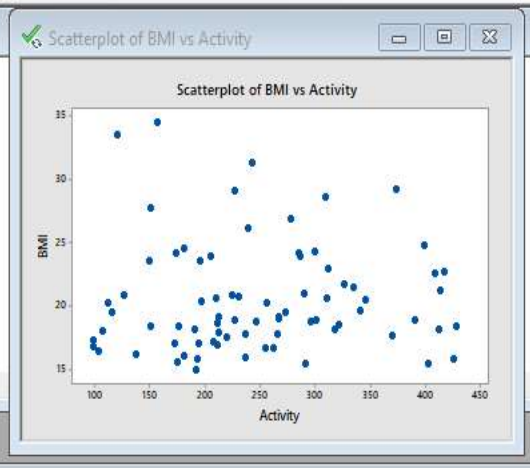
Minitab - scatter blot examples.MPJ

File Edit Data Calc Stat Graph Editor Tools Window Help Assistant

Title: Scatterplot of BMI

Session





1. Scatter Plot - BMI.MTW ***

↓	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20
	BMI	%Fat	Activity																	
29	17.7127	28.8	266	450																
30	14.9863	17.1	192	320																
31	16.7468	26.2	99	250																
32	16.4636	20.4	104																	
33	15.8716	19.5	237																	
34	18.0788	21.7	318																	
35	15.5805	18.1	175																	
36	17.1543	29.8	208																	

Analyse

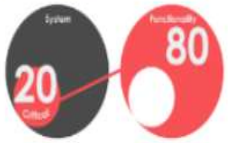
Analyse data : Pareto chart

نستخدم قاعة 20/80

يطلق على قاعدة (20 80) قانون القلة القوية والكثرة الضعيفة.

عليك أن تبحث بذكاء عن الوسائل الـ 20% لتعطيها 80 % من جهودك. ولا يعني هذا أبدا إهمال باقي الـ 80 % بشكل كامل

تقول أن 80 % من أهدافنا يمكن تحقيقها بالتركيز على 20 % من الأسباب



فهي ترى أن ٢٠ % من الجهد الفعال أهم بكثير من ٨٠% من الجهد العادي

وهذا يعني عندكما تحشد 100 وسيلة لتحقيق 100 هدف، فإن 20 وسيلة منها ستحقق تقريبا 80 هدفا، بينما لن تحقق الـ 80 وسيلة الأخرى سوى 20 هدفا فقط

بينما تحقق الـ ٨٠ % الأخرى من الأسباب ٢٠ % فقط من النتائج."

لا يجب أن تتخذ قاعدة (80/20) لبذل 20% من الجهد وتوقع الحصول على ٨٠ % من النتائج، فهذا سوء فهم للقاعدة

ينبغي على المدير تغيير وسائله دائماً وتحديد أهدافه المنجزة وتحديد أي الأهداف المنجزة ثم تحقيقه بأي الوسائل فإن هذا التغيير سيوصل إلى أفضل مستوى للتقدم

فما تقوله قاعدة ٢٠التوازن بين الأسباب والنتائج أو بين المدخلات والمخرجات

فقاعدة 80/20 الحقيقية لا تدعو إلى استبعاد ٨٠ % من الجهد بل لتركيز جهودك ومواردك على أهم ٢٠ % منها

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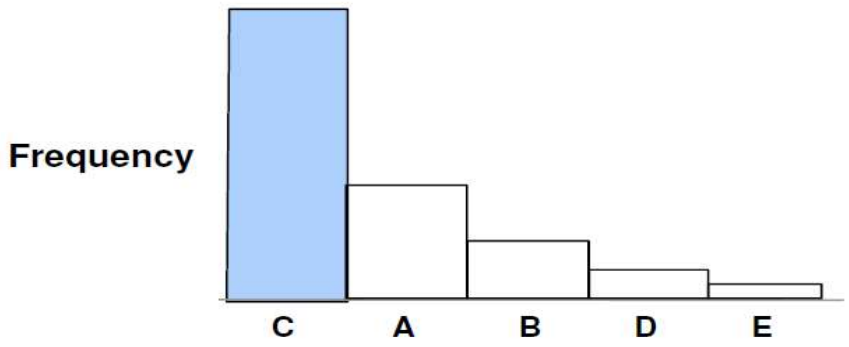
Pareto chart

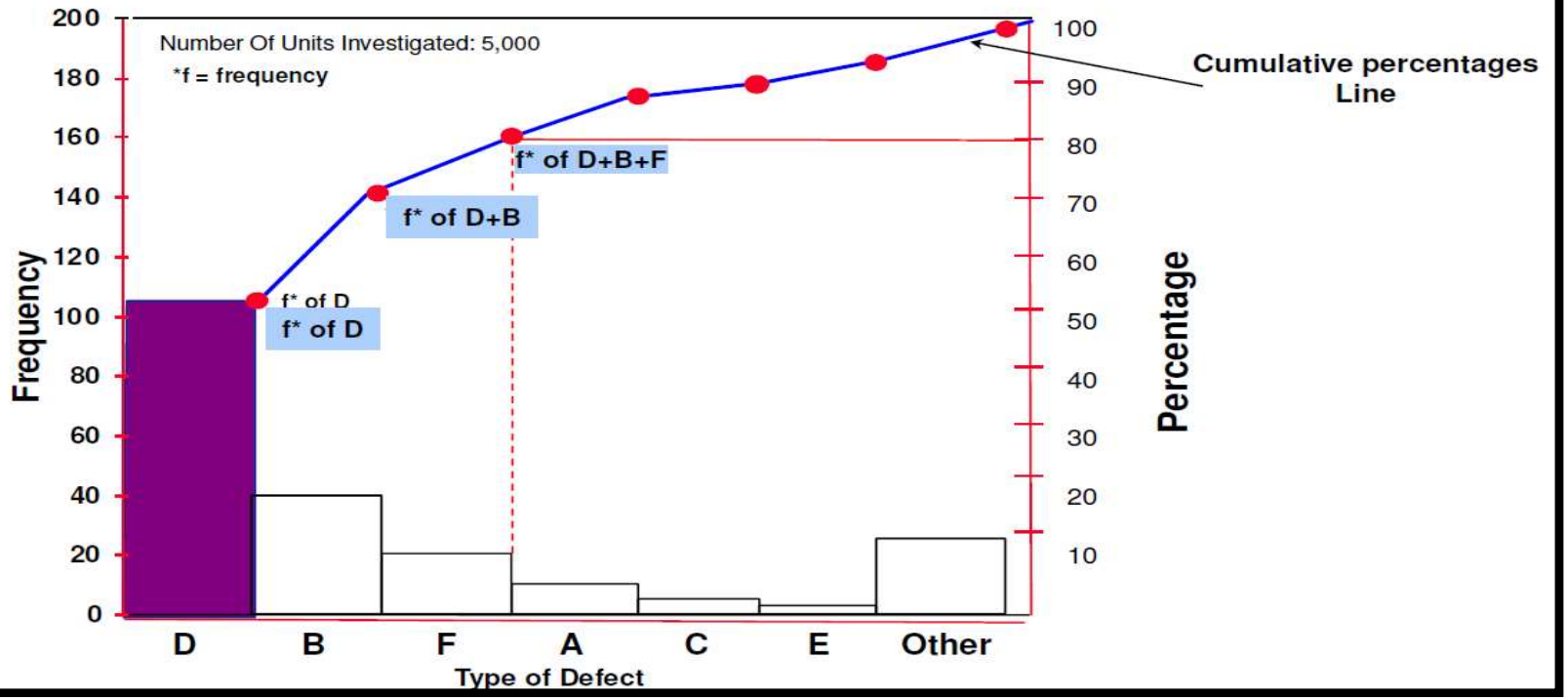
Definition

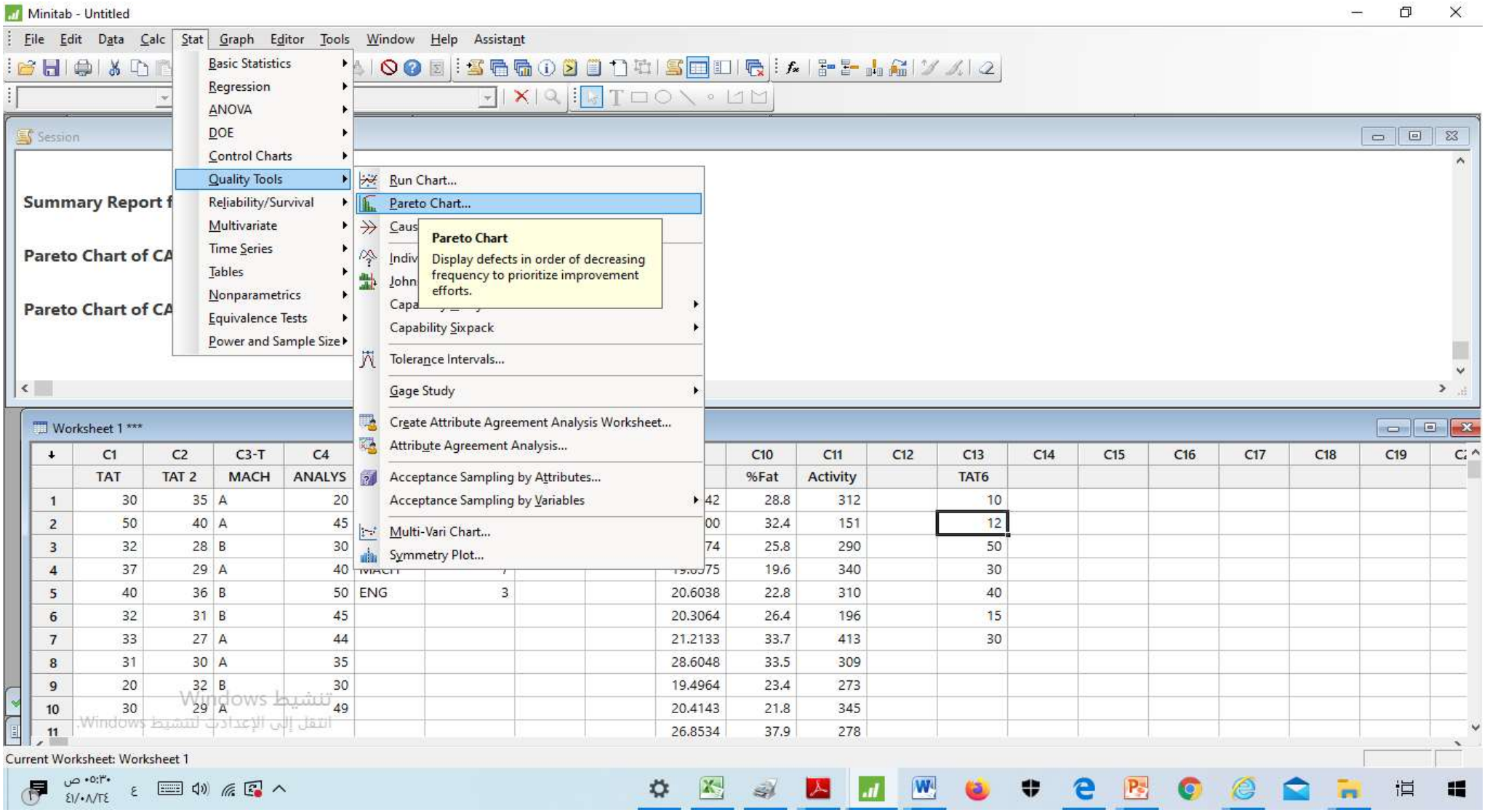
A tool to graphically represent the discrete data in categories and identify the few causes basic to most of the defects (the 80 / 20 principle)



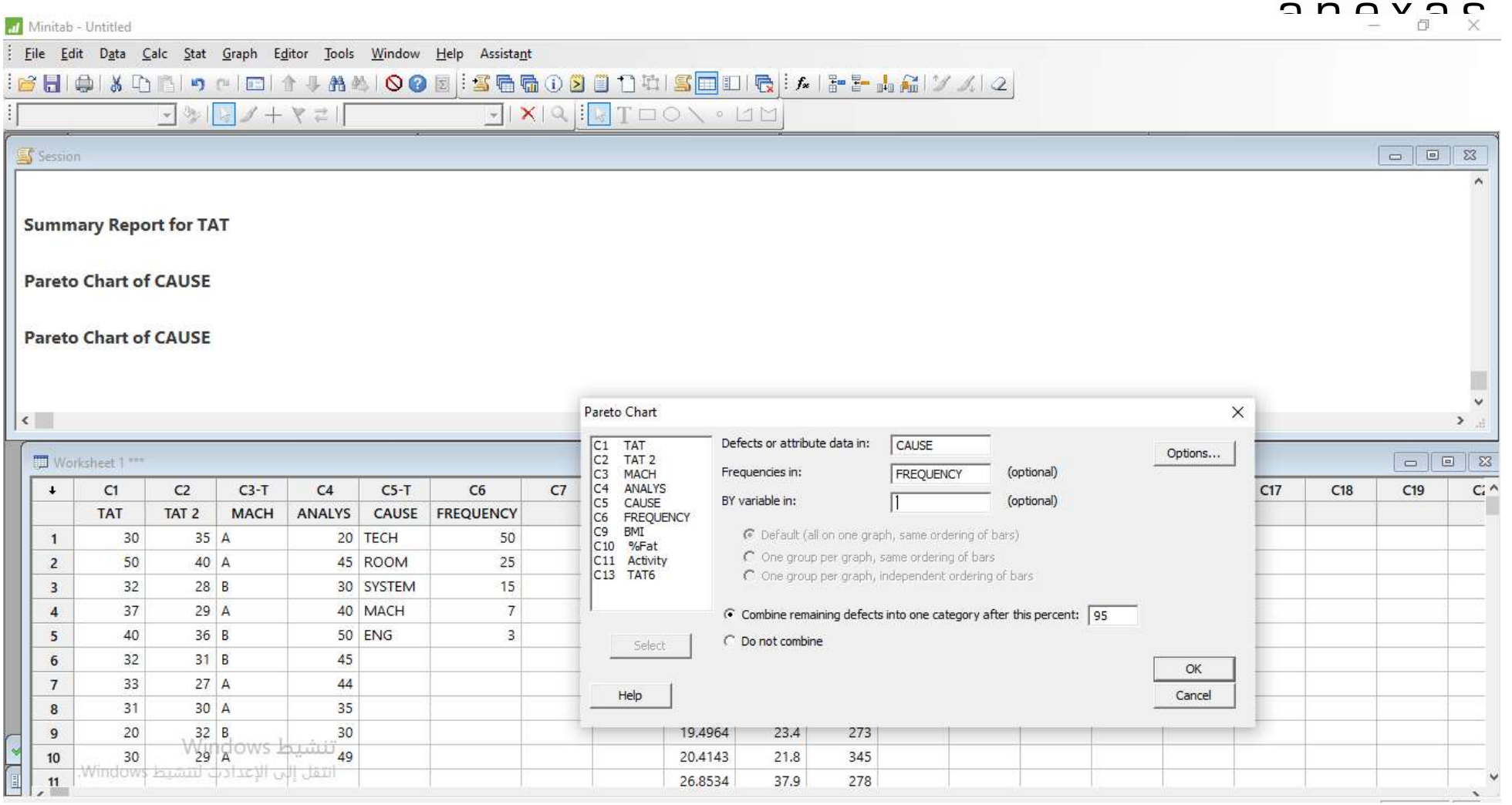
Example

Pareto chart example





	C1	C2	C3-T	C4					C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C
	TAT	TAT 2	MACH	ANALYS					%Fat	Activity		TAT6							
1	30	35	A	20				42	28.8	312		10							
2	50	40	A	45				00	32.4	151		12							
3	32	28	B	30				74	25.8	290		50							
4	37	29	A	40	MACH	7		19.6075	19.6	340		30							
5	40	36	B	50	ENG	3		20.6038	22.8	310		40							
6	32	31	B	45				20.3064	26.4	196		15							
7	33	27	A	44				21.2133	33.7	413		30							
8	31	30	A	35				28.6048	33.5	309									
9	20	32	B	30				19.4964	23.4	273									
10	30	29	A	49				20.4143	21.8	345									
11								26.8534	37.9	278									


Minitab - Untitled
File Edit Data Calc Stat Graph Editor Tools Window Help Assistant
Session
Summary Report for TAT
Pareto Chart of CAUSE
Pareto Chart of CAUSE
Worksheet 1 ***
C1 TAT
C2 TAT 2
C3-T MACH
C4 ANALYS
C5-T CAUSE
C6 FREQUENCY
C7
C17 C18 C19
1 30 35 A 20 TECH 50
2 50 40 A 45 ROOM 25
3 32 28 B 30 SYSTEM 15
4 37 29 A 40 MACH 7
5 40 36 B 50 ENG 3
6 32 31 B 45
7 33 27 A 44
8 31 30 A 35
9 20 32 B 30
10 30 29 A 49
11
19.4964 23.4 273
20.4143 21.8 345
26.8534 37.9 278
Pareto Chart
C1 TAT
C2 TAT 2
C3 MACH
C4 ANALYS
C5 CAUSE
C6 FREQUENCY
C9 BMI
C10 %Fat
C11 Activity
C13 TAT6
Defects or attribute data in: CAUSE
Frequencies in: FREQUENCY (optional)
BY variable in: (optional)
Options...
Default (all on one graph, same ordering of bars)
One group per graph, same ordering of bars
One group per graph, independent ordering of bars
Combine remaining defects into one category after this percent: 95
Do not combine
Select
Help
OK
Cancel

Minitab - Untitled

File Edit Data Calc Stat Graph Editor Tools Window Help Assistant

Session

Pareto Chart of CAUSE

Pareto Chart of CAUSE

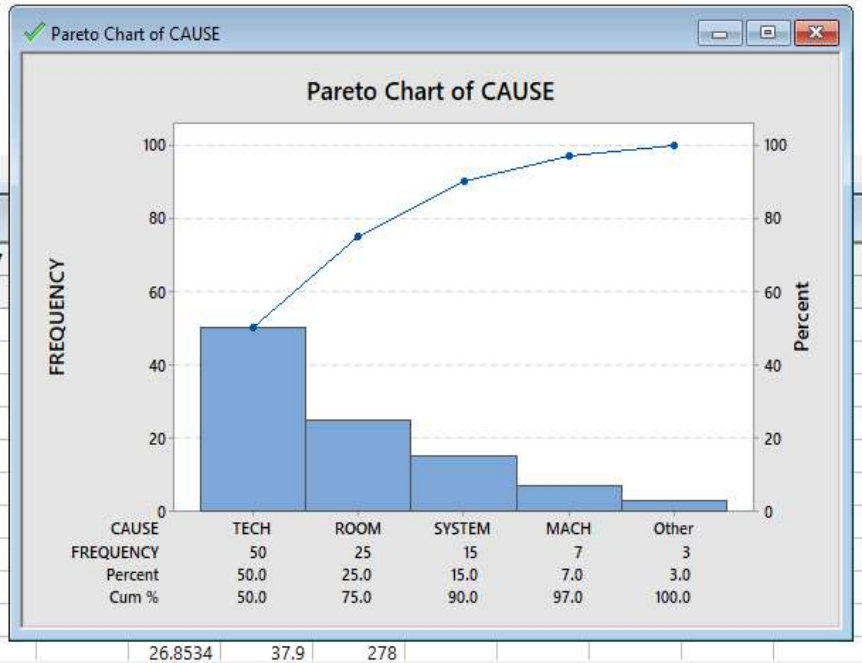
Pareto Chart of CAUSE

Worksheet 1 ***

	C1	C2	C3-T	C4	C5-T	C6	C7	C17	C18	C19	C2
	TAT	TAT 2	MACH	ANALYS	CAUSE	FREQUENCY					
1	30	35	A	20	TECH	50					
2	50	40	A	45	ROOM	25					
3	32	28	B	30	SYSTEM	15					
4	37	29	A	40	MACH	7					
5	40	36	B	50	ENG	3					
6	32	31	B	45							
7	33	27	A	44							
8	31	30	A	35							
9	20	32	B	30							
10	30	29	A	49							
11											

26.8534 37.9 278

Pareto Chart of CAUSE



Minitab - Untitled

File Edit Data Calc Stat Graph Editor Tools Window Help Assistant

Session

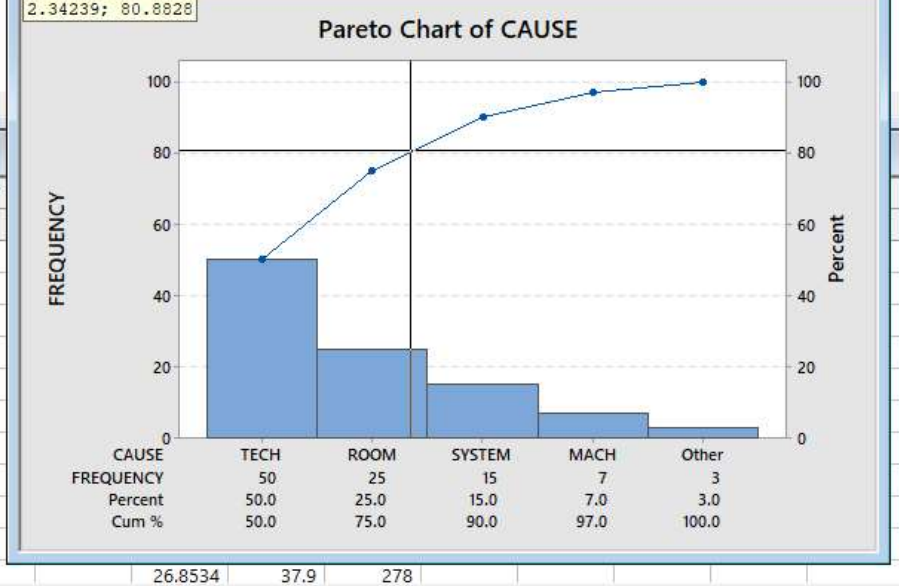
Pareto Chart of CAUSE

Pareto Chart of CAUSE

Pareto Chart of CAUSE

Pareto Chart of CAUSE

2.34239; 80.8828



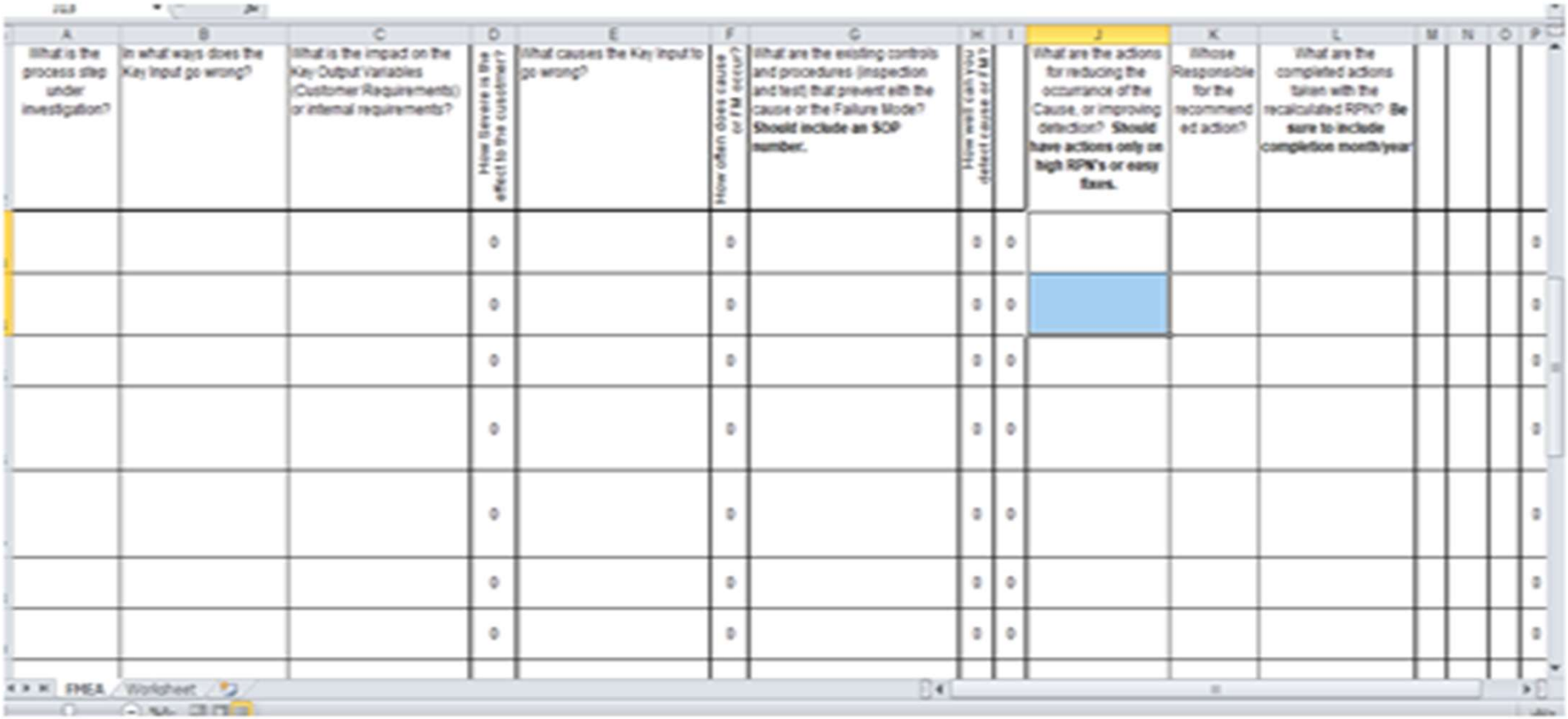
Worksheet 1 ***

	C1	C2	C3-T	C4	C5-T	C6	C7	C17	C18	C19	C2
	TAT	TAT 2	MACH	ANALYS	CAUSE	FREQUENCY					
1	30	35	A	20	TECH	50					
2	50	40	A	45	ROOM	25					
3	32	28	B	30	SYSTEM	15					
4	37	29	A	40	MACH	7					
5	40	36	B	50	ENG	3					
6	32	31	B	45							
7	33	27	A	44							
8	31	30	A	35							
9	20	32	B	30							
10	30	29	A	49							
11											

26.8534 37.9 278

Current Worksheet: Worksheet 1

FMEA



A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
What is the process step under investigation?	In what ways does the Key Input go wrong?	What is the impact on the Key Output Variables (Customer Requirements) or internal requirements?	How Severe is the effect to the customer?	What causes the Key Input to go wrong?	How often does cause or FM occur?	What are the existing controls and procedures (inspection and test) that prevent eith the cause or the Failure Mode? **Should include an SOP number.**	How well can you detect cause or FM?		What are the actions for reducing the occurrance of the Cause, or improving detection? **Should have actions only on high RPN's or easy fixes.**	Whose Responsible for the recommend ed action?	What are the completed actions taken with the recalculated RPN? **Be sure to include completion month/year**				
			0		0		0	0							0
			0		0		0	0							0
			0		0		0	0							0
			0		0		0	0							0
			0		0		0	0							0
			0		0		0	0							0
			0		0		0	0							0

FMEA | Worksheet

FMEA

Cause	Severity	Occurrence	Detection	RPN
A	9	3	4	63
B	8	6	5	★ 240
C	6	9	7	★ 378
D	10	1	5	50

RPN = Sev x Occ x Det

The 6 M of Cause and Effect Diagrams include all of the following except ?	Methods	Machinery	Money	Measurements

What is the relationship of Brainstorming to Cause and Effect Diagrams ?	Both the tools are used only in Control phase	They are completely different tools used in ISO 9000	Cause and Effect can be performed using brainstorming	They are different words for thee concept

The number one rule of brainstorming that is most frequently violated is ?	wrong technique used	discussion or evaluation of ideas	no participation	scribe writes too slowly

The method that attempts to reduce the overall risk on a system is called ?	PDCA	FMEA	Cause-and-effect diagrams	Pareto analysis

In a Pareto Chart, the cumulative frequency percentage line is ?	ascending	descending	vertical	horizontal

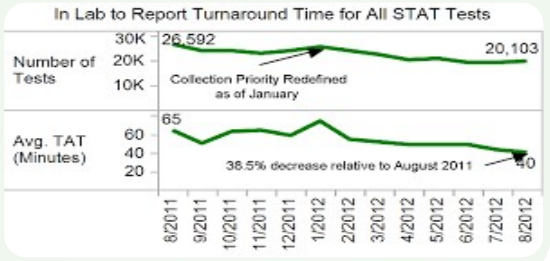
The first step to construct a Cause and Effect Diagram is?	identify a problem to be solved	establish category causes	perform brainstorming	determine how many bones; the diagram will have

If severity =5, Occurrence = 4, Detectability = 2, what is RPN	20	8	10	40

Process Improvement Project

Project Name:

Reduction in Lab Turn Around Time



Project Charter

D M A I C

Problem Statement
In KFSH, pathology department, as per data collected, the lab test on average take around 111 min (1 hour 50 min) vs. the expectation of 1 hour, this leads to delay in completing results, effect patient care and delay in decision making

Project Scope	Goal Statement
Stat Chemistry specimen	To reduce the average turn around time of lab test from 1 hour 50 min to less than 1 hour

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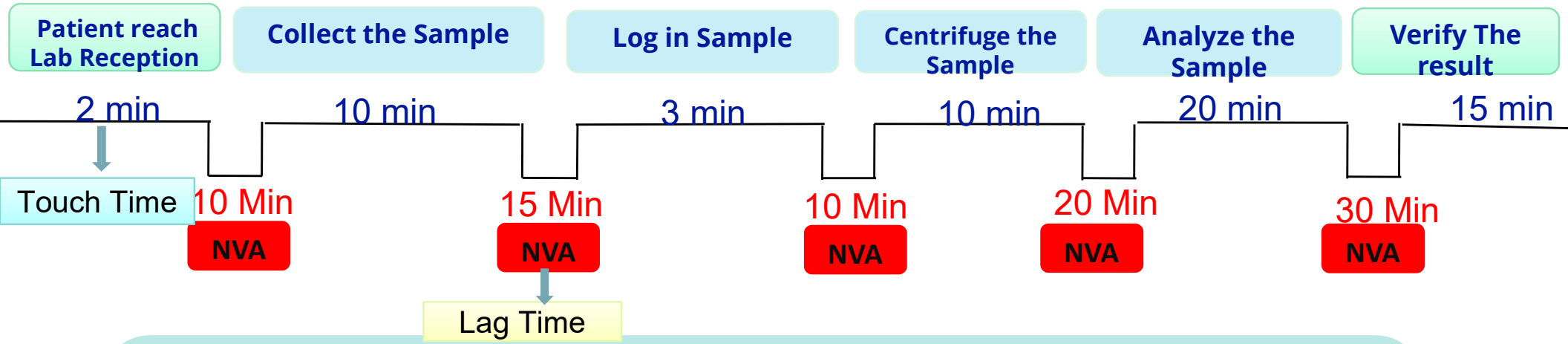
Data Collection for Potential Causes

Patient N	Dat	TAT	Time to send blo	Time to Log in Syste	Time to Start sp	Spining Tir	Waiting time between spin & Analys	Analysis Tir	RepReporting tir	Technici	Machi	Test ty	Special	Wa	Shift
2	13-May	138	15	56	14	10	10	30	3	K	1	R,H,B	General	A	Before 10
3	13-May	62	5	6	9	10	10	20	2	K	1	R,H,B	General	CLINIC	After 10
4	13-May	80	2	3	5	10	10	45	5	K	1	R,H	General	CLINIC	After 10
5	13-May	61	1	4	8	10	7	30	1	K	1	R,H	General	CLINIC	After 10
6	13-May	240	125	11	4	10	25	63	2	K	1	R,H,B	General	B	Before 10
7	13-May	49	1	1	3	10	5	25	4	J	1	R,H,B	General	CLINIC	After 10
8	13-May	160	1	1	8	10	10	70	60	J	1	R,H	General	CLINIC	Before 10
9	13-May	155	18	2	35	10	10	75	5	J	1	R,H	General	B	Before 10
10	13-May	262	85	40	45	5	30	55	2	K	1	R,H	General	B	Before 10
11	13-May	97	1	4	10	10	5	65	2	K	1	R,H,B	General	CLINIC	Before 10
12	13-May	66	10	18	2	10	5	20	1	J	1	R,H,B	General	CLINIC	Before 10
13	13-May	172	70	20	30	10	5	36	1	J	1	R,H,B	General	A	Before 10
14	13-May	185	70	21	14	10	10	58	2	J	1	R,H,B	General	A	Before 10
15	13-May	162	69	22	14	10	10	36	1	K	1	R,H,B	General	A	Before 10
16	13-May	72	5	4	6	10	5	40	2	K	1	R,H	General	CLINIC	Before 10
17	13-May	198	68	27	26	9	5	62	1	K	1	R,H	General	D	Before 10
18	13-May	96	20	36	14	10	2	13	1	K	1	R,H	General	CLINIC	After 10
20	13-May	176	65	30	12	10	8	48	3	J	1	R,H	General	A	Before 10
21	13-May	54	5	3	7	10	5	22	2	J	1	R,H,B	General	B	Before 10
22	13-May	110	0	6	4	10	15	45	30	J	2	R,H	General	CLINIC	After 10
23	13-May	44	2	10		10	7	22	3	J	2	R,H	General	CLINIC	After 10
24	13-May	70	5	7		15	5	40	5	J	2	R,H,B	General	CLINIC	After 10
25	13-May	161	20	30	10	10	10	78	3	K	2	R,H,B	General	B	Before 10
26	13-May	112	20	20	20	10	11	29	2	K	2	R,H	General	A	Before 10
27	13-May	82	2	3	10	10	3	52	2	J	2	R,H	General	A	Before 10
28	13-May	66	2	5	3	13	7	35	1	K	2	R,H	General	CLINIC	Before 10

Current Process – Value Stream Mapping



Total Touch time (Actual time to do all activities) = 60 Min
Lag Time (waiting time between activities)= 90 Min

Total cycle time = 150 Min (almost 2 hour and half)

The process which can be done in 60 min takes 150 min

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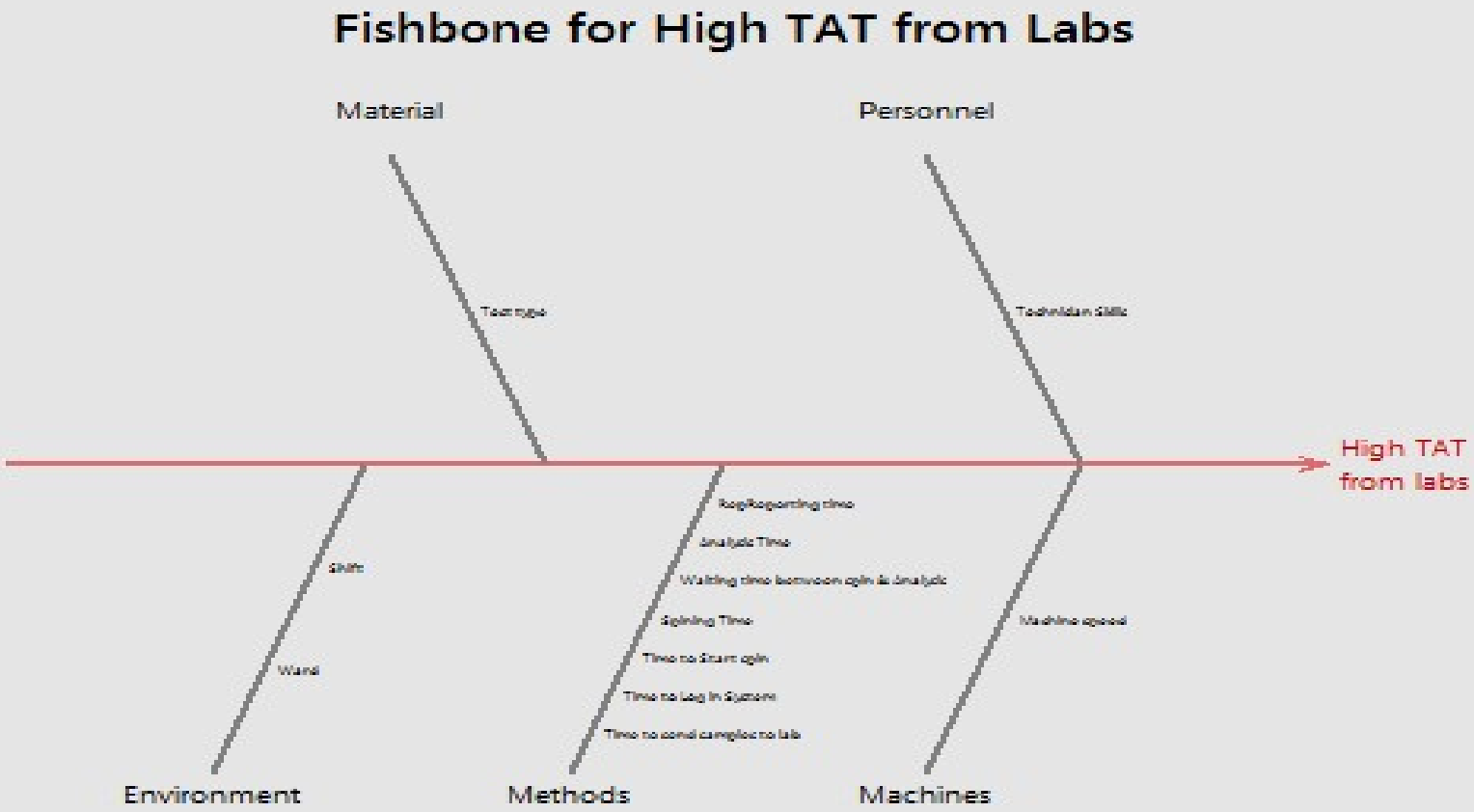
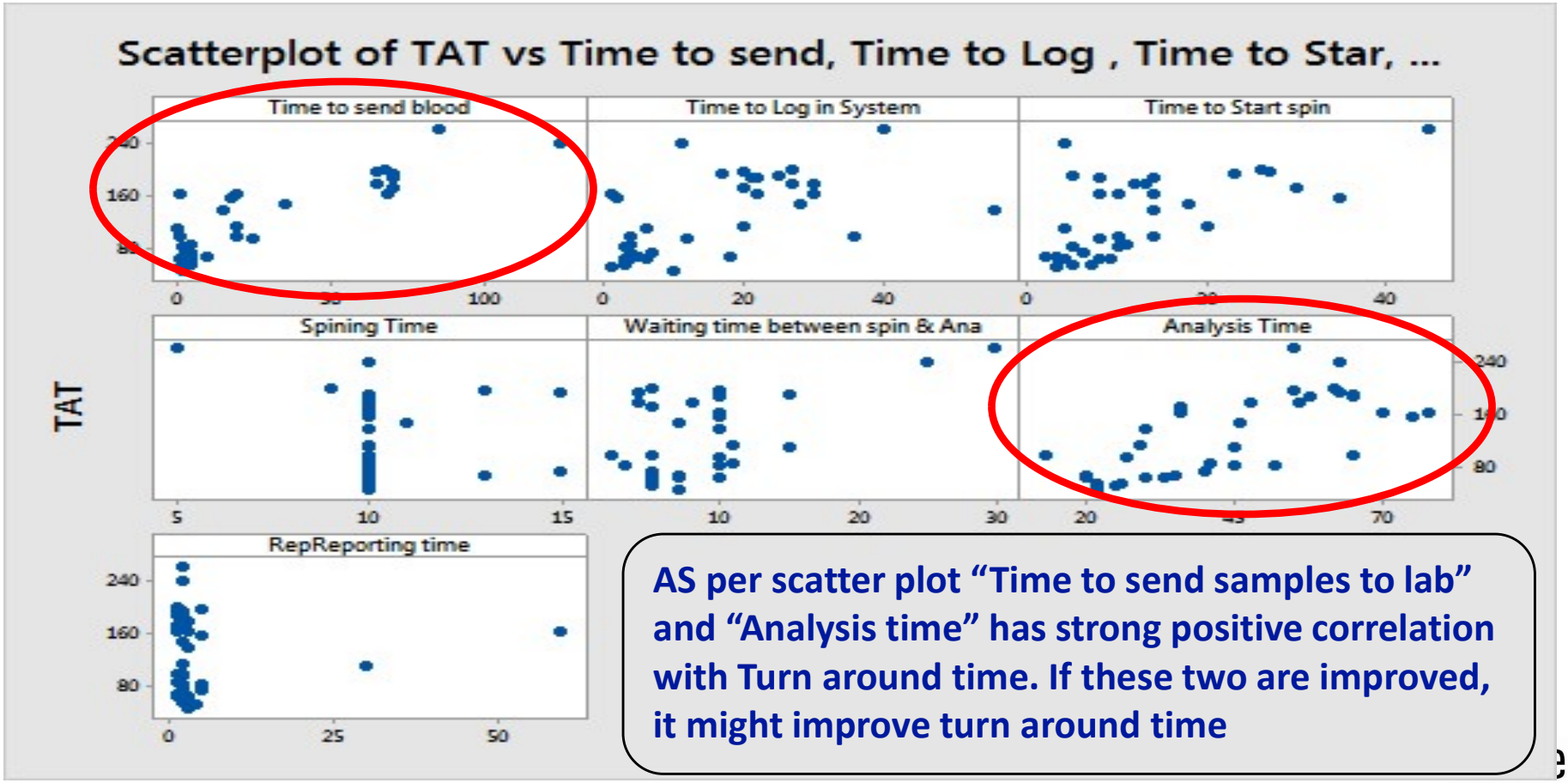
Potential Causes of Delay



Root Cause Analysis



AS per scatter plot "Time to send samples to lab" and "Analysis time" has strong positive correlation with Turn around time. If these two are improved, it might improve turn around time

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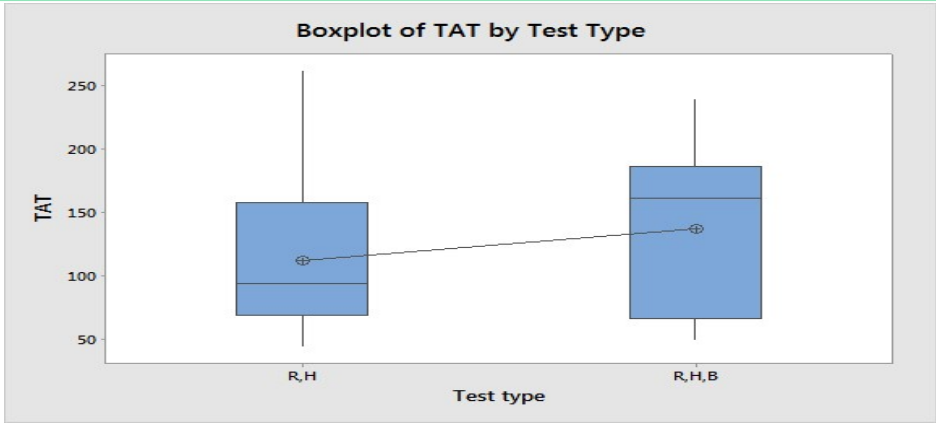
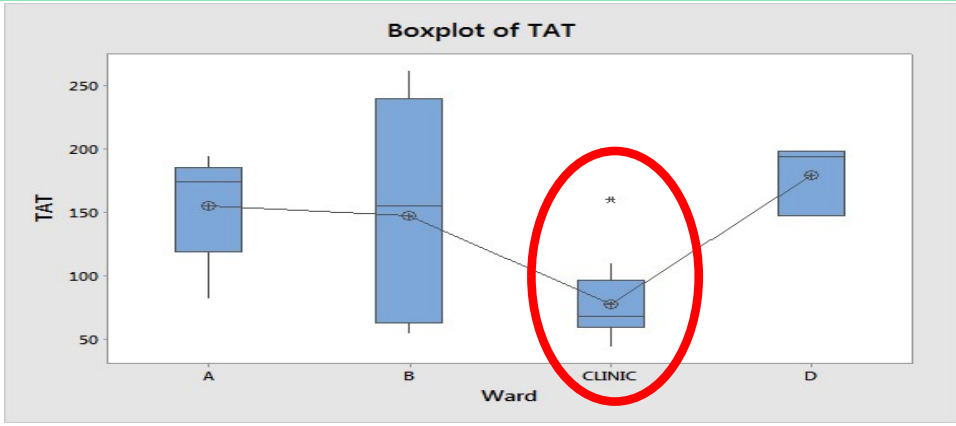
Root Cause Analysis

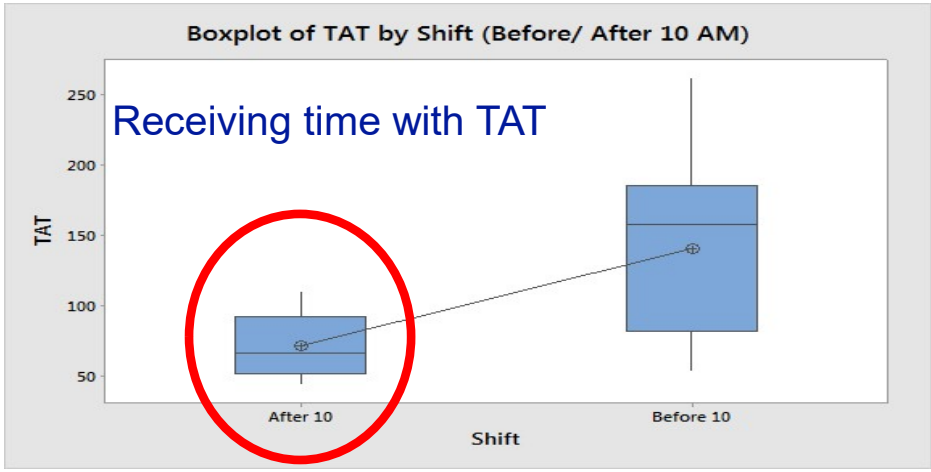
Test Type with TAT



Wards with TAT



Receiving time with TAT



- Test type has no impact on Turn around time
- Samples received from clinics have less TAT (77 Min) as compared to other wards
- Samples received before 10 AM have significantly high time (166 min) as compare to sample received after 10 Am (56 Min)

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Analysis Summary

Y	Root cause	Classification	Control
High TAT from lab	Delay in receiving samples from lab	Waiting waste	In control
	High Analysis Time	Value Added	Out of control
	Samples received before 10 AM have high TAT	Wait	In control
	Samples received from clinics and samples collected on the Laboratory have less TAT		Out of control
	15 min lag time after receiving the samples and logging into system	Waiting waste	In control
	10 Mins of lag time after logging into system and spinning the sample	Waiting waste	In control

Solution (Improvement)

Y	Root cause	Control	Solution Proposed
High TAT from lab	Delay in receiving samples from lab	In control	Nurses to send the samples immediately after extracting the blood through tubes
	High Analysis Time	Out of control	-
	Samples received before 10 AM have high TAT	In control	Change the shift timing for some staff to 5 AM or do Night shift
	Samples received from clinics and samples collected on the Lab have less TAT	Out of control	-
	15 min lag time after receiving the samples and logging into system	In control	Login to system immediately after receiving the samples by the same person who received the samples

DMAIC

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Improve

Summary

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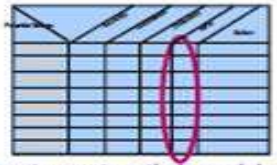
IMPROVE

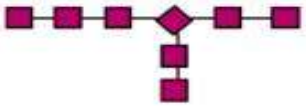
Purpose : **To determine new improved process design** through idea generation, selection, process design, solution testing , and improvements implementation.

Solutions Refinement



Evaluate potential problems in new process design and improve robustness of this design

New Process



Develop a "should be" process map showing the impact of the solution

Pilot

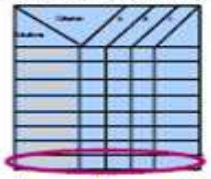
Pilot the solution on a small scale to increase buy-in and improve overall implementation

Finalised Cost / Benefit

Perform cost / benefit analysis of proposed solution

Solution generation and selection

-Brainstorming, anti solution, brainwriting, ...



Generate solutions to address the root causes and develop criteria to screen and select solutions (including cost / benefit)

DMAIC METHOD OF LEAN SIX SIGMA

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Overview

Objectives:

Determine new improved process design.

Steps:

1. Ideas Generation.
2. Prioritize and Select solutions.
3. Test Solutions/Implementation.

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Idea Generation

Creativity approaches

- Process benchmarking
  - Compare the performance of an existing process against other companies' "best in class" practices (same market or not)
  - Determine how those companies are organized to deliver these performance levels

- Best practices
  - Use company data

- Brainstorming
  - Brainstorming with post it notes, channeled brainstorming, anti solution, …. etc

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Brainstorming

Pre-requisites of Brainstorming

- Purpose of Brainstorming
- Participants (From the process / not from the process)
- Facilitator
- Stationery
- Selection of tool of brainstorming
- Meeting room
- Facilities
- Communication to participants about time, venue, topic in advance

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Brainstorming

Rules of Brainstorming

- Equal opportunity to everyone to participate
- Capture all the ideas (Document)
- Leave your designation and ego along with your shoes outside meeting room
- Non threatening environment to be created
- Ensure that there are no disturbances
- Focus on the topic (Create parting lot)
- Fantasize freely (Do not put breaks on your thoughts)
- Watch your time!
- Defer evaluation (Do not discuss ideas)
- Generate Quantity, do not worry about Quality

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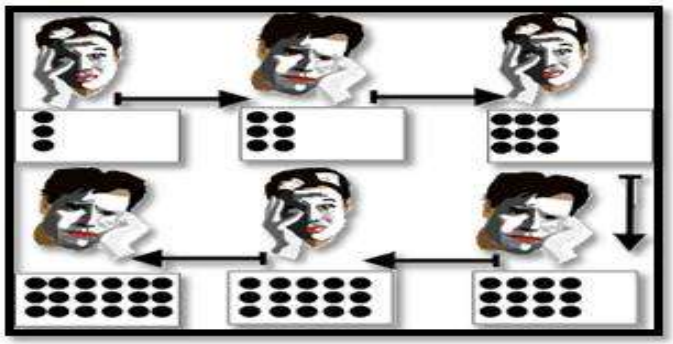
Brainstorming

Types of Brainstorming

Round Robin

6-3-5



Anti Solution

List of Anti-Solutions

- Put products on the wrong aisles
- Don't have employees to assist shoppers
- Don't train employees where products belong
- Move products on an hourly basis
- Train the employees to tell the shopper that "if they don't see it, we don't have it".
- Don't mark the aisles well

6 Hats

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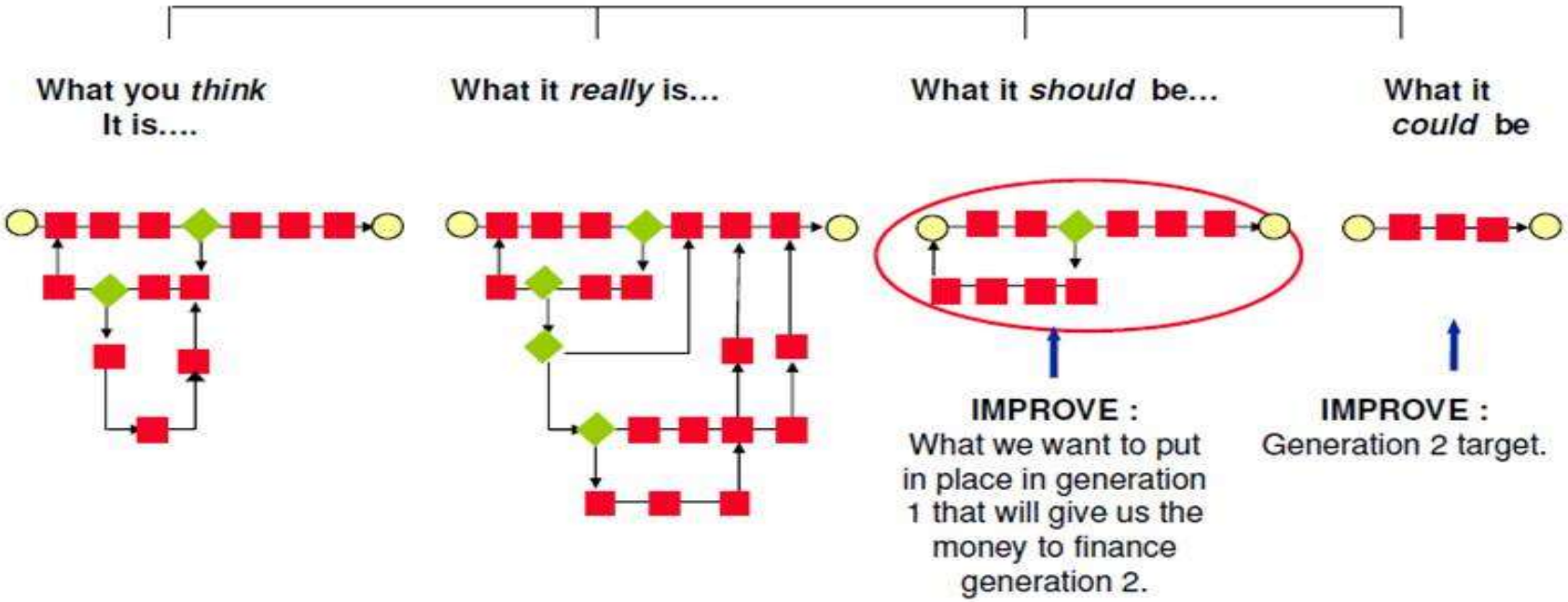
Continuous Improvement
(PDCA)



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Test Solutions/Implementation

Benefits of Doing a Pilot

1. Improve the solution that meets customer requirements.
2. Refine implementation plan.
3. Lower risk of failure by identifying and fixing possible problems ahead of time.
4. Confirming expected results and relations between predictive parameters and results (Xs on Y).
5. Increase opportunities to receive feedback and buy-in.
6. Implement the solution earlier and faster for a particular customer segment.

Select the Best Solutions

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M	L	K	J	I	H	G	F	E	D	C	B	A
#	solution		Team Members Voting (1 - 10)									Average
			1	2	3	4	5	6	7	8	9	
1		Impact										
		Effort										
2		Impact										
		Effort										
3		Impact										
		Effort										
4		Impact										
		Effort										
5		Impact										
		Effort										
6		Impact										
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7		Impact										
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8		Impact										
		Effort										

Select the Solution

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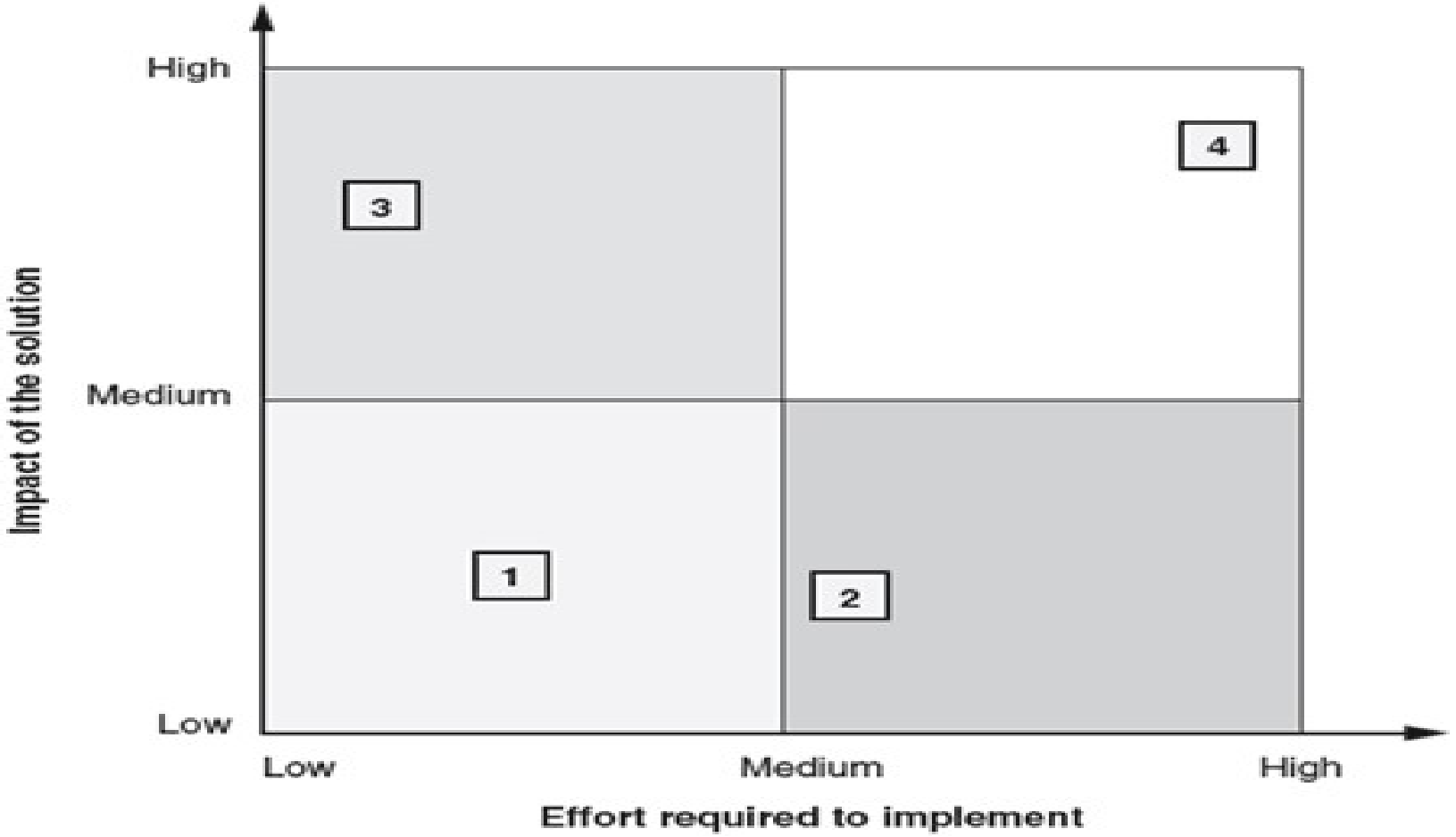

Improvement Methodology

5 S

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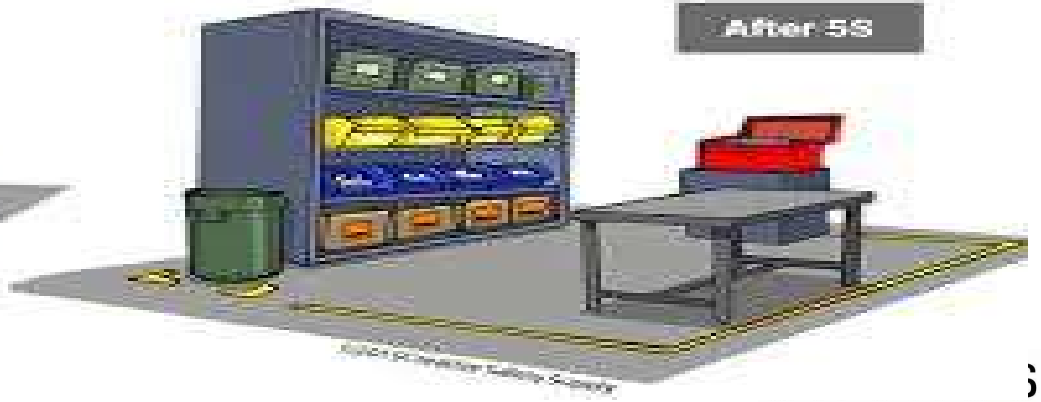

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Visual Management

Poka Yoke

Improved quality and customer satisfaction

Prevent defect occurrence

Cost effective , Easy to implement

Standard Work

Create, Stabilize, Improve

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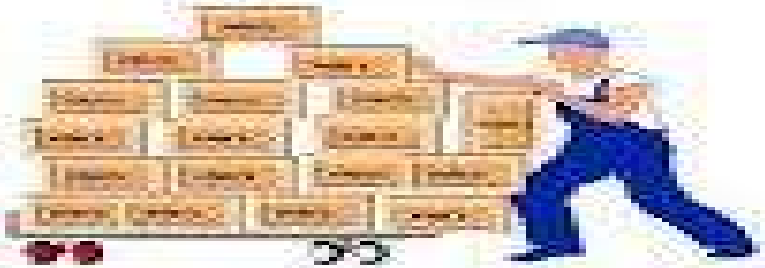
Pull VS Push

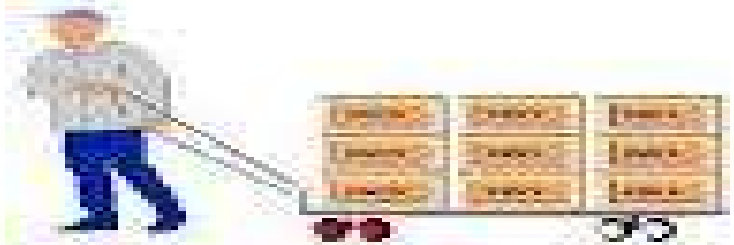
Push vs. Pull

Make all we can just in case..



- Production Approximation
- Anticipated Usage's
- Large Lots
- High Inventories
- Waste
- Management by Firefighting
- Poor Communication

Make what's needed when we need it



- Production Precision
- Actual Consumption
- Small Lots
- Low Inventories
- Waste Reduction
- Management by Sight
- Better Communication

Multi Task Employee

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The first step in getting started with process improvement is to?	put people in teams	use problem-solving techniques	empowerment	training

_____ is conducted based on the ground rules such as -no idea is a bad idea?	SIPOC	Brainstorming	Brain writing	Antisolution

The primary objective of a process is to achieve?	Efficiency	Low Cost	Customer Satisfaction	Throughput

Fool proofing (Japanese) ?	PILOTING	Brain storming	Poka Yoke	None of the above

The purpose of brainstorming is to?	improve processes	satisfy stakeholders	generate ideas	eliminate waste

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DMAIC

Control

Summary

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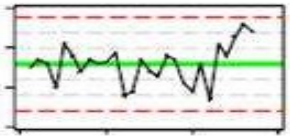
CONTROL

Purpose: **To ensure improvement effectiveness over time** by institutionalisation of the improvement and implementation of ongoing monitoring and reviews.

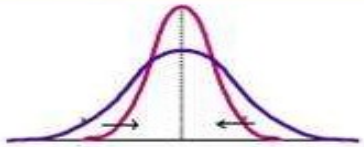
Monitoring Plan



Develop a monitoring plan to insures gains are held over the long term

Implementation Plan

Develop a full implementation plan including project and change management elements



Process Capability

Monitor the process according to plan. Chart data as evidence that process is in control and meeting customer specifications

Continuous Improvement

- Process ownership to Process Owner (Process Management chart to facilitate transfer)
- Process Owner to held regular process reviews based on dashboards.
- Process Owner to take action when process does not deliver what is expected
- Process has entered Process Management = Define, Measure , Operate.

Documentation / Standardization

Document the process with process maps & procedures to assure the solution becomes part of daily work

Address appropriate changes to broader systems and structures to institutionalise the improvement

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Overview

Objectives:

Ensure improvement over time.

Steps:

1. Documentation / Standardization / Implementation Plan
2. Control Plan

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Control Chart

Purpose

Predict expected product outcome

Advantages

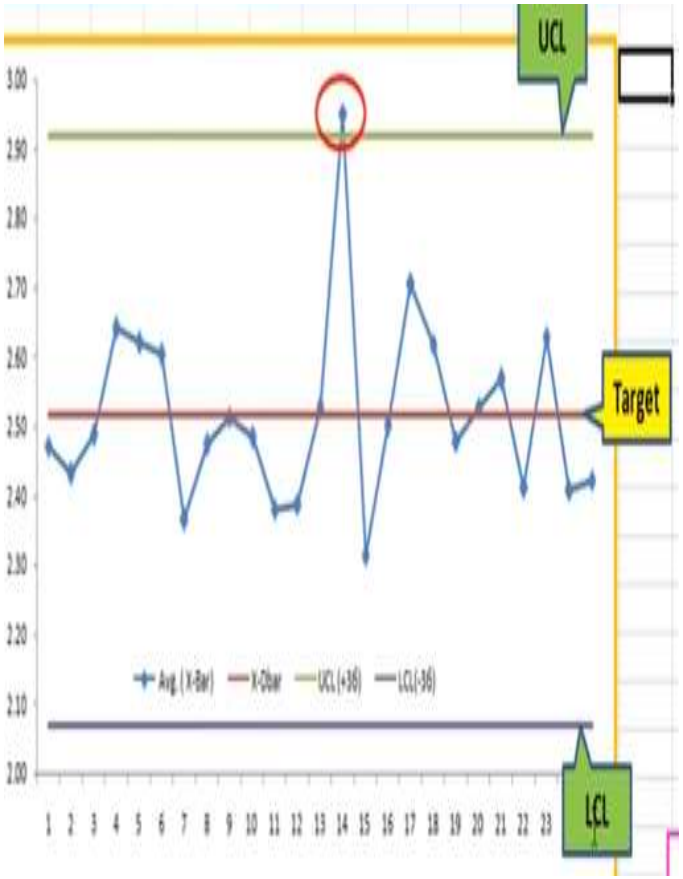
Predict process out of control and out of specification limits
Distinguish between causes of variation

How to eliminate Assignable cause variation

Get timely data
Search for the cause
Change tools to compensate for the special cause

How to eliminate Common Cause Variation

Don't attempt to explain the difference
Reducing Common cause variation usually requires making fundamental changes in your process



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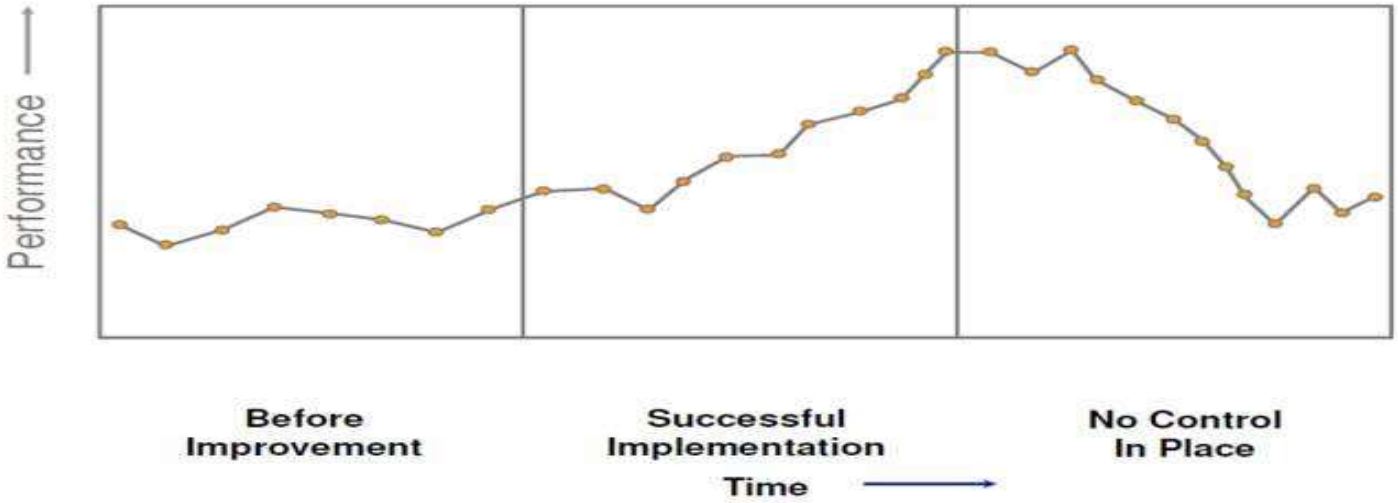
Ensure Gains Over Time

The *CONTROL* phase naturally leads to *Process Management* as the purpose of that phase is to deliver the tool set for ongoing management of the process performance by Process Owner.



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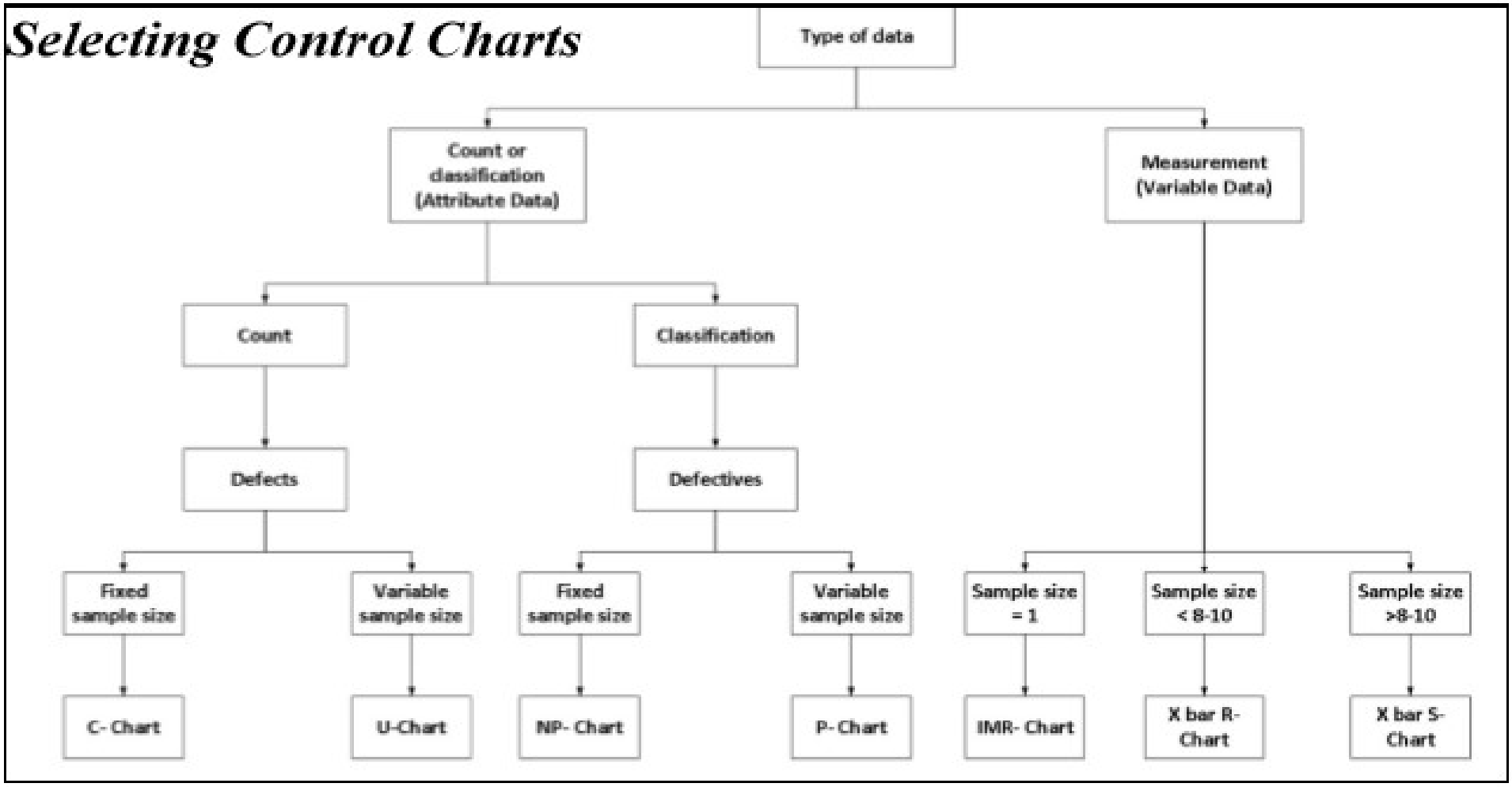
IMPLEMENTATION PLAN

Document the process with process maps & procedures to assure the solution becomes part of daily work.

WHO	WHAT	WHERE	WHEN

Selecting Control Charts



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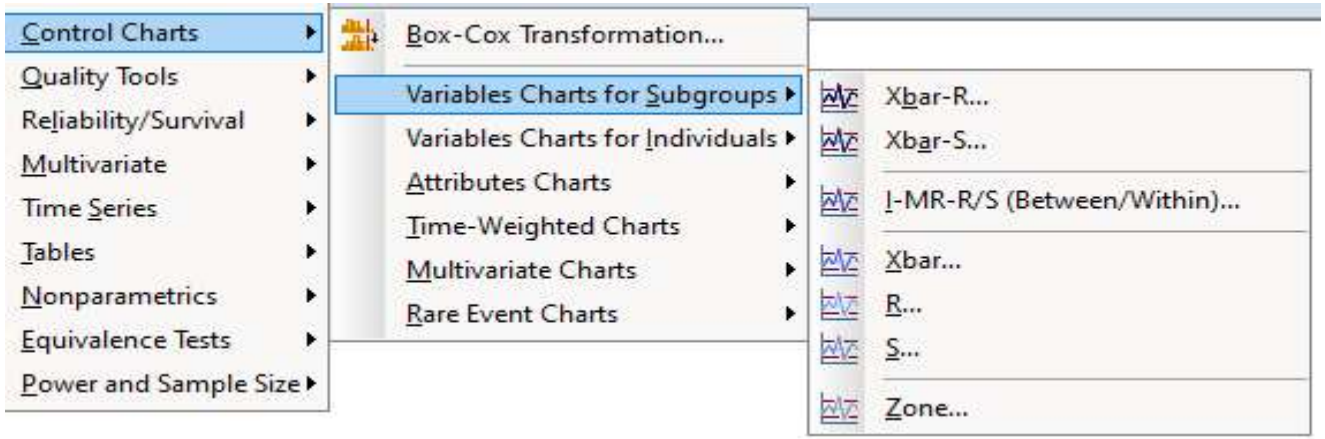

Xbar-R

Monitor the mean and the variation (range) of your process when you have continuous data in subgroups. Works best with subgroup sizes of 8 or less.

Xbar-S

Monitor the mean and the variation (standard deviation) of your process when you have continuous data in subgroups.

I-MR

Monitor the mean and the variation (moving range) of your process when you have continuous data that are individual observations not in subgroups.

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	X-Bar & R Chart in Excel Sheet				Dimension 2.5 ± 0.2
2	Date	Avg. (X-Bar)	X-Dbar	UCL (+3δ)	LCL(-3δ)
3	05.10.17	2.47	2.52	2.917	2.069
4	05.10.17	2.43	2.52	2.917	2.069
5	05.10.17	2.49	2.52	2.917	2.069
6	05.10.17	2.64	2.52	2.917	2.069
7	06.10.17	2.62	2.52	2.917	2.069
8	06.10.17	2.60	2.52	2.917	2.069
9	06.10.17	2.36	2.52	2.917	2.069
10	06.10.17	2.47	2.52	2.917	2.069
11	06.10.17	2.51	2.52	2.917	2.069
12	07.10.17	2.48	2.52	2.917	2.069
13	07.10.17	2.38	2.52	2.917	2.069
14	07.10.17	2.39	2.52	2.917	2.069
15	07.10.17	2.53	2.52	2.917	2.069
16	07.10.17	2.95	2.52	2.917	2.069
17	08.10.17	2.31	2.52	2.917	2.069
18	08.10.17	2.50	2.52	2.917	2.069
19	08.10.17	2.70	2.52	2.917	2.069
20	08.10.17	2.62	2.52	2.917	2.069
21	08.10.17	2.48	2.52	2.917	2.069
22	09.10.17	2.53	2.52	2.917	2.069
23	10.10.17	2.57	2.52	2.917	2.069

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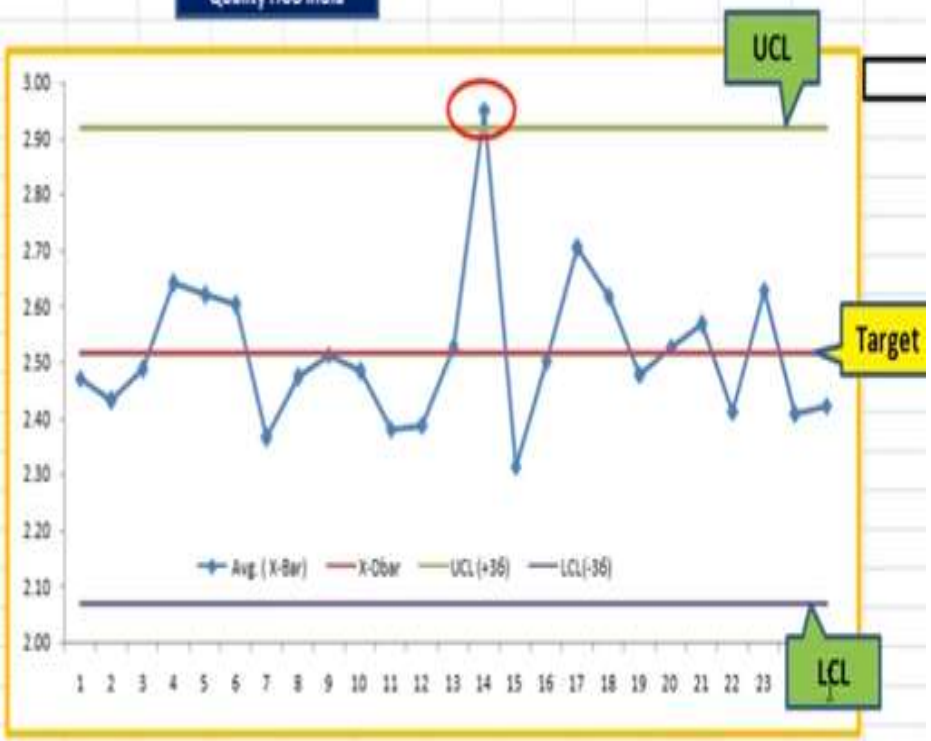
Quality HUB India



Basic | X-Bar | R-Bar | Formula | Constants

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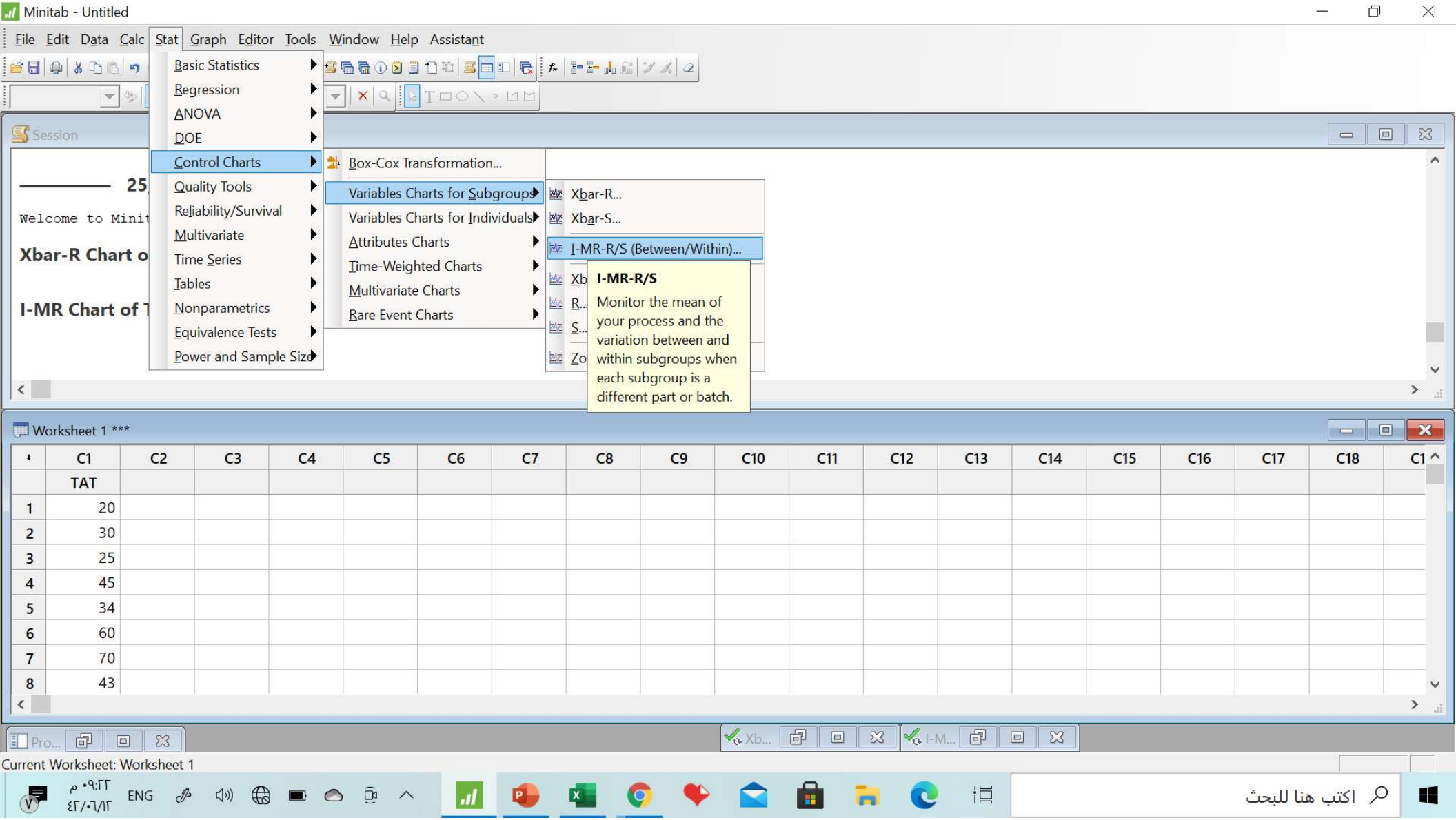
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Basic Statistics
Regression
ANOVA
DOE
Control Charts
Quality Tools
Reliability/Survival
Multivariate
Time Series
Tables
Nonparametrics
Equivalence Tests
Power and Sample Size
Box-Cox Transformation...
Variables Charts for Subgroups
Variables Charts for Individuals
Attributes Charts
Time-Weighted Charts
Multivariate Charts
Rare Event Charts
Xbar-R...
Xbar-S...
I-MR-R/S (Between/Within)...
I-MR-R/S
Monitor the mean of your process and the variation between and within subgroups when each subgroup is a different part or batch.
Session
Welcome to Minit
Xbar-R Chart o
I-MR Chart of T
Worksheet 1 ***
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18
TAT
1 20
2 30
3 25
4 45
5 34
6 60
7 70
8 43
Current Worksheet: Worksheet 1
ENG
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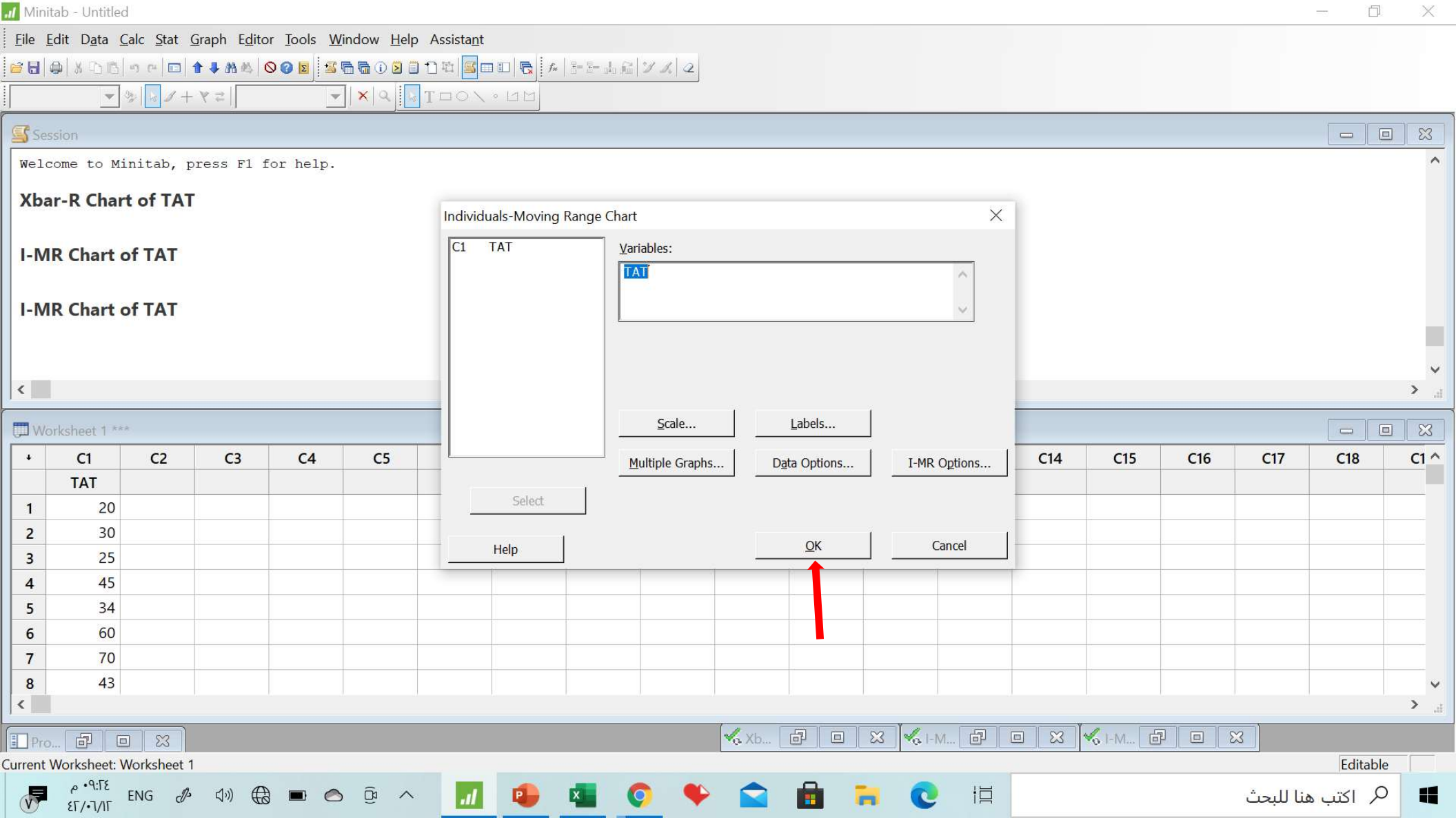
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Session
Welcome to Minitab, press F1 for help.
Xbar-R Chart of TAT
I-MR Chart of TAT
I-MR Chart of TAT
Individuals-Moving Range Chart
C1 TAT
Variables:
TAT
Scale...
Labels...
Multiple Graphs...
Data Options...
I-MR Options...
Select
Help
OK
Cancel
Worksheet 1 ***
C1 C2 C3 C4 C5 C14 C15 C16 C17 C18
TAT
1 20
2 30
3 25
4 45
5 34
6 60
7 70
8 43
Current Worksheet: Worksheet 1
Editable
ENG
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Minitab - Untitled

File Edit Data Calc Stat Graph Editor Tools Window Help Assistant

Session

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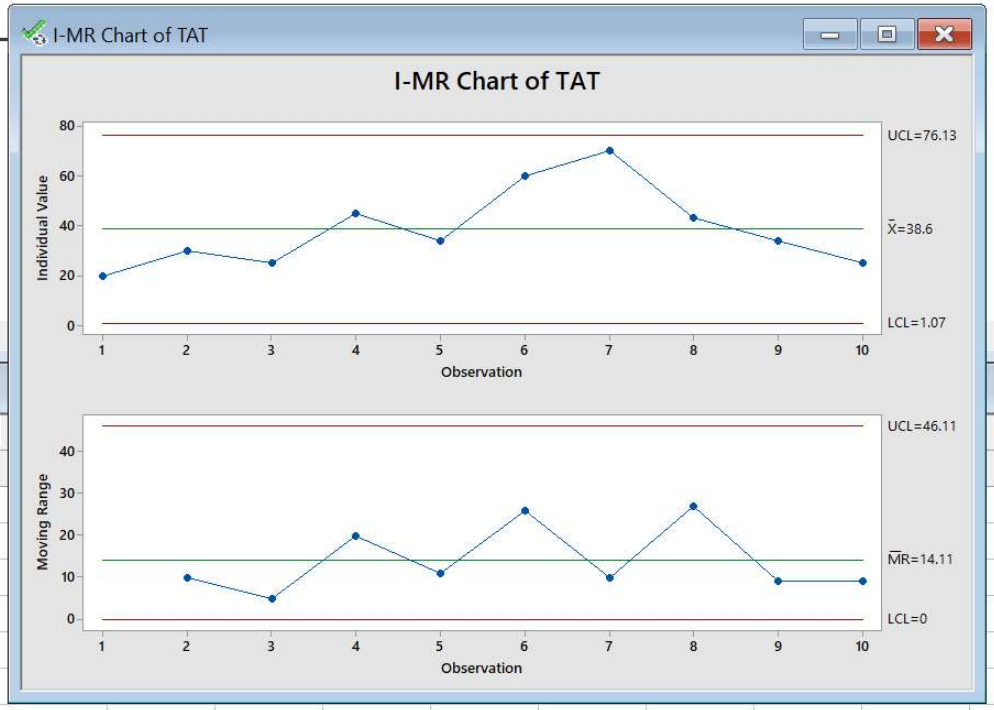
Welcome to Minitab, press F1 for help.

Xbar-R Chart of TAT

I-MR Chart of TAT



Worksheet 1 ***

	C1	C2	C3	C4	C5	C6	C16	C17	C18	C1
	TAT									
1	20									
2	30									
3	25									
4	45									
5	34									
6	60									
7	70									
8	43									

Pro... Xb...

Current Worksheet: Worksheet 1

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٤٢/٠٦/١٢
ENG

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A very useful attribute control chart for plotting the actual number of defects found during an inspection is known as the ?	X-bar and R chart	np chart	p chart	c chart
The prime use of a control chart is to ?	Detect assignable causes of variation in the process	Detect nonconforming product	The Measure the performance of all quality characteristics of a process	Detect the presence of random variation in the process

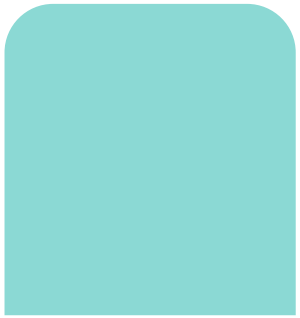
A green belt is going to monitor the number of defects on different sized samples. Which of the following control charts would be most appropriate ?	u	np	c	p

Your Control Chart shows seven consecutive points on one side of the mean. What does this indicates	The process is in -control(within the UCL and LCL)	The process appears to be too stable and should be questioned	The process needs to be checked for special cause	The wrong control chart has been selected

An attribute chart can be represtated by all of the following EXCEPT	P Chart	R Chart	NP Chart	C Chart

Thanks!

Anexas Europe
Contact us: enquiry@anexas.net



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Exam Questions

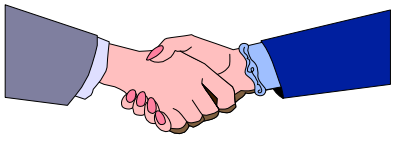
QuestionId	Questions	Option 1	Option 2	Option 3	Option 4
1	Which role is not traditionally performed by a green Belt?	Data Gathering	Analysis	Lead Small Projects	Coach and mentor other Six Sigma practitioners
2	The primary factor in the successful implementation of six sigma is to have ?	The necessary resources	The support/leadership of top management	Explicit customer requirements	Comprehensive training program
3	What is the relationship of Brainstorming to Cause and Effect Diagrams ?	Both the tools are used only in Control phase	They are completely different tools used in ISO 9000	Cause and Effect can be performed using brainstorming	They are different words for thee concept
4	In a control chart, control limits are ?	analogous to specifications	calculated using sigma value	set by customer or management	none of the above
5	The number one rule of brainstorming that is most frequently violated is ?	wrong technique used	discussion or evaluation of ideas	no participation	scribe writes too slowly
6	The method that attempts to reduce the overall risk on a system is called ?	PDCA	FMEA	Cause-and-effect diagrams	Pareto analysis
7	A very useful attribute control chart for plotting the actual number of defects found during an inspection is known as the ?	X-bar and R chart	np chart	p chart	c chart
8	The prime use of a control chart is to ?	Detect assignable causes of variation in the process	Detect nonconforming product	The Measure the performance of all quality characteristics of a process	Detect the presence of random variation in the process
9	Benchmarking is concerned with finding and comparing organization processes to ?	competitor processes	dissimilar organization processes	other organization processes (at another institution for example)	all of the above

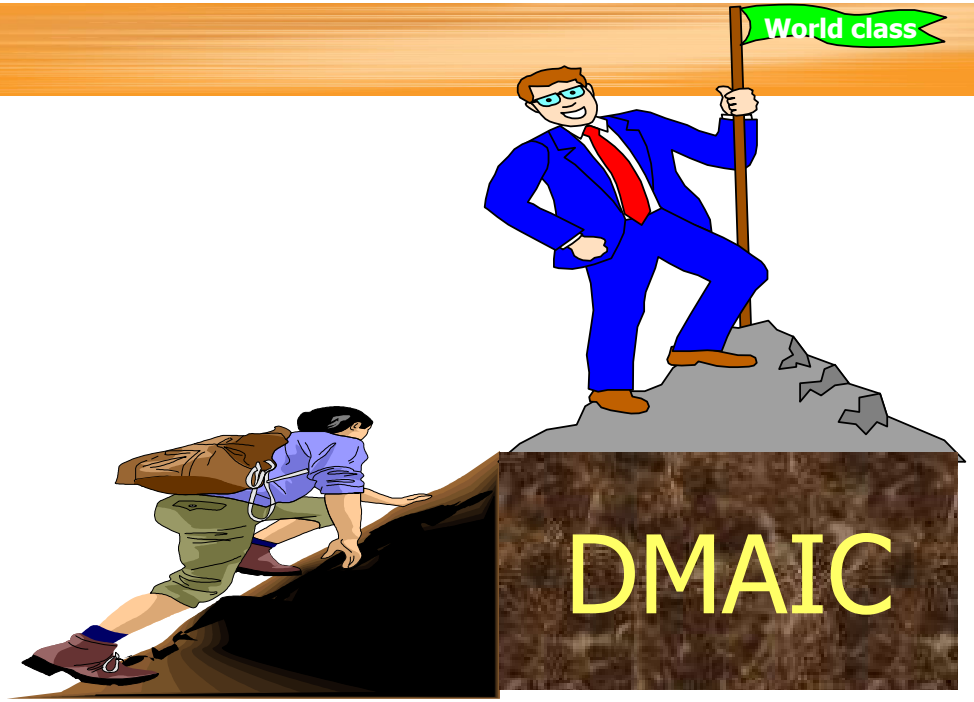
10	In a Pareto Chart, the cumulative frequency percentage line is ?	ascending	descending	vertical	horizontal
11	The median for the following numbers (6, 3, 2, 5, 1, 8,7) is ?	3	4	5	6
12	A green belt is going to monitor the number of defects on different sized samples. Which of the following control charts would be most appropriate ?	u	np	c	p
13	What does Six Sigma stand for ?	Six Standards of production from customer point of view	Customer Specifications away by Six Standard deviations from the mean	Only six errors in production	The frat house that housed its creator
14	Determine the Mode for the following data set: 2 3 2 1 0 0 4 6 2 1 3 4 4 4 ?	2	0	4	6
15	The central tendency of data set can be represented as ?	mean	mode	median	all of the above
16	RPN in FMEA stands for ?	Random Priority Number	Restricted Priority Number	Risk Priority Number	Relative Priority Number
17	SPC stands for ?	Standard process center	Statistical process control	Standard process control	Statistical process center
18	_____ refers to the category of variables that are least likely responsible for variation in a process, product, or service ?	Vital Causes	Vital Few	Common Causes	Trivial Many
19	The 6 M of Cause and Effect Diagrams include all of the following except ?	Methods	Machinery	Money	Measurements
20	The concept of discovering what is the best performance being achieved, whether in your company, by a competitor, or by an entirely different industry is called as ?	SWOT Analysis	Baseline Sigma	ANOVA	Benchmarking

21	The problems that can be solved easily and quickly are known in the six sigma hierarchy as	Lurking Variables	Defect	Process Improvement	Low hanging fruits
22	CTQ stands for ?	Criticize the quantity	Criticize the quality	Critical to Quantity	Critical to Quality
23	_____ Is recipient of a product or service ?	Supplier	Consultant	Employee	Customer
24	Fool proofing (Japanese) ?	PILOTING	Brain storming	Poka Yoke	None of the above
25	What does the acronym SIPOC stand for?	Solve Input Process Owner Customer	Solution Input People Output Caring	Supplier Input Process Output Customer	Supplier Internal Process Owner Customer
26	The purpose of brainstorming is to?	improve processes	satisfy stakeholders	generate ideas	eliminate waste
27	Cause and Effect Diagrams are also known as?	fishbone diagrams	PDCA	tree diagrams	storyboarding
28	When interested in seeing the pattern of data, _____ should be used?	FMEA	histogram	both of the above	none of the above
29	A benefit of C&E Diagrams is?	facilitates root cause analysis	sensitizing people to opportunities	provides a visual of the problem being studied	all of the above
30	A flowchart helps to?	understand the scope of a process	identify process steps	identify relationships	all of the above
31	Which of the following refer to a study of basic statistics?	measure of location	measure of dispersion / spread	both of the above	none of the above
32	The primary objective of a process is to achieve?	Efficiency	Low Cost	Customer Satisfaction	Throughput

33	Quality tools are used to?	broaden thinking	focus on the process and identify issues	both of the above	none of the above
34	The first step to construct a Cause and Effect Diagram is?	identify a problem to be solved	establish category causes	perform brainstorming	determine how many bones; the diagram will have
35	One characteristic of attributes data is that it is always?	Continuous	Discrete	Expensive to collect	Read from a scale of measurement
36	The Pareto Principle suggests that importance should be placed on?	the vital many	the trivial many	the trivial few	the vital few
37	A common measure of variation is?	mean	mode	median	none of the above
38	In Y=f(x), X represents the _____ of the process and Y the _____ of the process?	Output, Input	Input, Output	Mean, standard Deviation	None of the above
39	Using Six Sigma methodology, a company at 4 sigma would have a failure rate of?	308,000 ppm	233 ppm	6210 ppm	66,807 ppm
40	_____ is conducted based on the ground rules such as -no idea is a bad idea?	SIPOC	Brainstorming	Brain writing	Antisolution
41	People who are directly affected by the project?	Shareholders	Customers	Employees	all of the above
42	_____ is called the father of Six Sigma?	Mike Crichton	Mikel Harry	Michael Dell	Michael Jack
43	The ‘first’ benefit that flowcharts provide is ?	Identify wasteful steps	Increase understanding of what is taking place	Identify redundancies	assist with ISO compliance
44	MSA stands for ?	Measurement System Analysis	Manpower System Analysis	Management System Attribute	Measurement System Attribute

45	In order for a problem to be solved correctly,which of the following must occur first?	The problem must be defined	Relevant data must be gathered	The measurement system must be validated	The process must be mapped
46	The first step in getting started with process improvement is to?	put people in teams	use problem-solving techniques	empowerment	training
47	Which is not a Lean tool ?	Muda(Waste)	DOE	Mura(Variation)	Mure(Over Burdan)
48	_____ is Deliverable of Define Phase.	Identifying solution	Identifying root causes	Baseline Sigma Level	Project Charter
49	The person who celebrates accomplishments with the team, removes roadblocks, compensates the team efforts, and communicates with management is?	Coach	Champion	Time Keeper	Facilitator
50	_____ is the difference between the largest and the smallest observations .	Average	Standard Deviation	Range	Median
51	If severity =5, Occurrence = 4, Detectability = 2, what is RPN	20	8	10	40
52	MINITAB is a .	Statistical methodology	Quality initiative	Statistical data analysis software	None of the above
53	The expression “Y=f(x)” is best described by…	Inputs are a function of the process outputs.	Yield = First Pass X’s.	Y is a function of X.	First time Yield is derived from X.
55	Arrange the Six Sigma Process Improvement approach in the correct order: 1) Measure, 2) Define, 3) Control, 4) Improve, 5) Analyze	2,5,1,4,3	1,2,5,4,3	3,2,1,5,1	2,1,5,4,3
56	A process has a mean of 10 and a standard Deviation of 2. What is the tolerance of the process that exhibits the limit of normal variation?	5 to 15	4 to 16	2 to 8	6 to 14
57	A process is in-control and stable. Describe the type of variation that exists in the proccess	Special Cause variation	Natural Variation	Out-the-ordinary Variation	Non- random Variation
58	Indicate which are the examples of the variable data: 1) Length, 2) Weight, 3) Decision on the coin toss, 4) Dollors, 5) days	1,3,4,5	1,2,4	1,2,4,5	1,4,5





The 6 SIGMA journey Towards Excellence Continues… THANK YOU