EPITA Information Management Master

Introduction to Six Sigma 6σ

Module 2

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Source : Photo Afidium

Course Schedule

- **3 Theoretical sessions : Jan 11, Jan 25**
- **1 Practical session with a game : Jan 12**

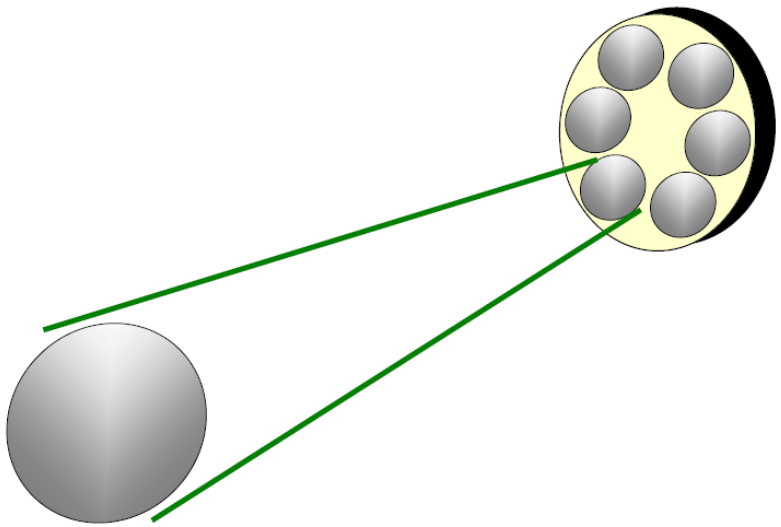
Exam

- **Participation to the 4 modules/sessions (40% of your score)**
- **Practical session (game play) 40%**
- **Quiz (20 questions) with no document 20%**

DMAIC

- **DEFINE – Clarify opportunities/issues, set goals, make sure we're working on the right things. Understand and balance stakeholder needs.**
- **MEASURE – Target the right facts and data to build understanding, improve decisions, evaluate results**
- **ANALYZE – Assess relationships between actions and results, reasons for problems, potential impact of new solutions or innovations**
- **IMPROVE – Develop effective new ways to get things done that gets results**
- **CONTROL – Ensure solutions and innovations last, and can be leveraged to maximize benefit**

Game : Your mission



Each ball must weight 10g at +/- 5g

Game

- 4 teams of 7-8 players
- 6 Operators O1-O6 per team
- The game has 3 rounds
- Each team must produce 30 balls
- Each operator must produce 5 balls
- Each team sorts the production on a sheet of paper
- 2 persons for the measure and data collection

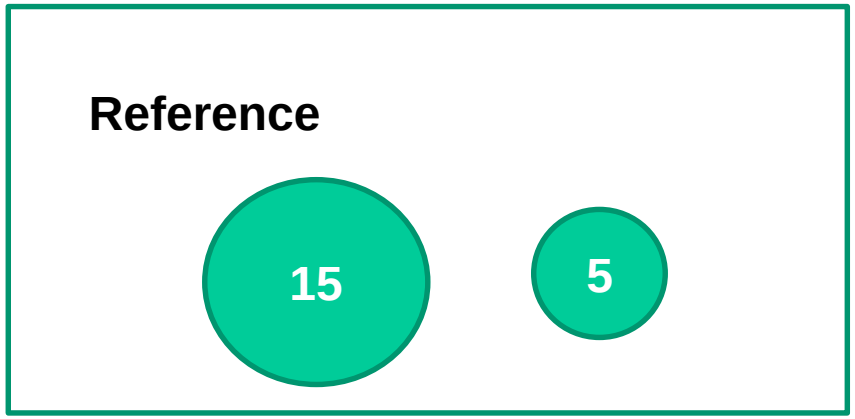
Each ball must weight 10g at +/- 5g

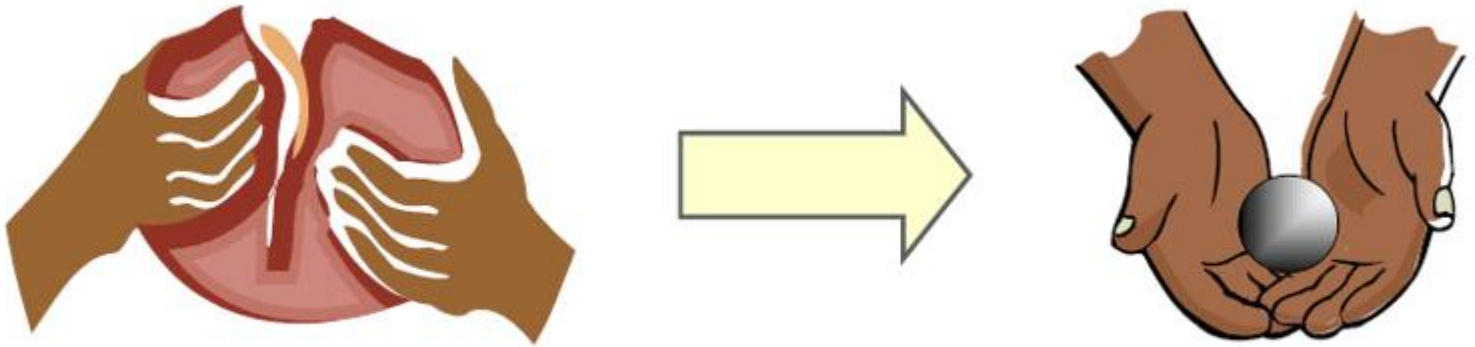
Evaluation

- **Deliverable per team : ONE SPREADSHEET with the 3 series**
- **Statistical values**
- **Graphs**
- **Additional information you may think of**

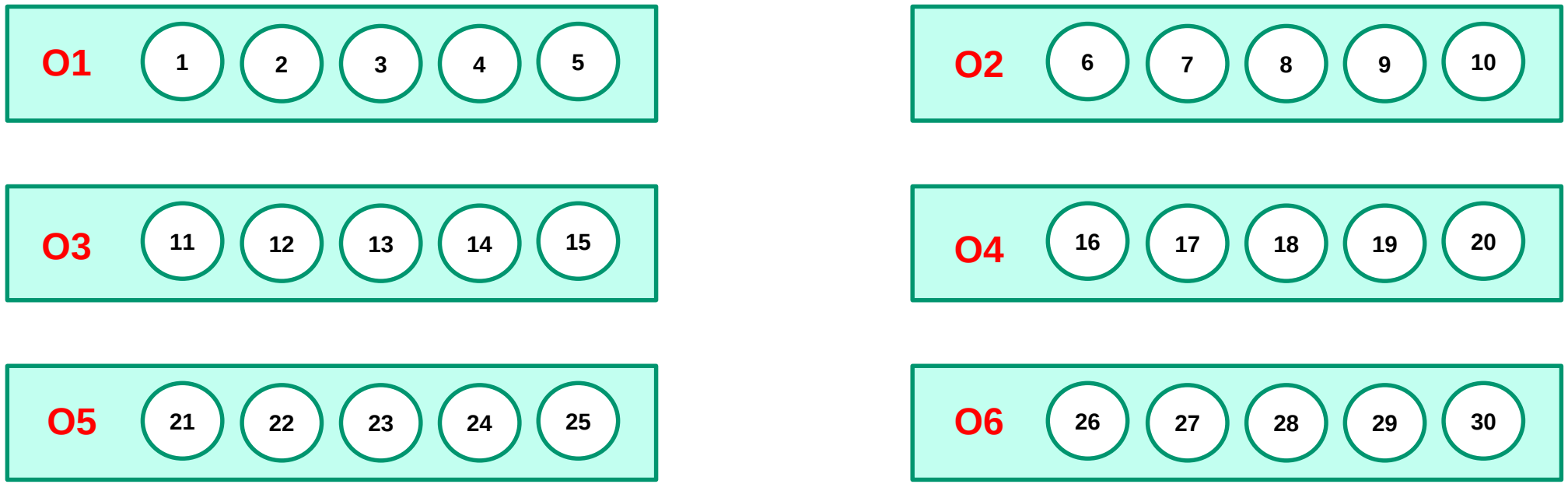
Each ball must weight 10g at +/- 5g

Round 1 30 minutes





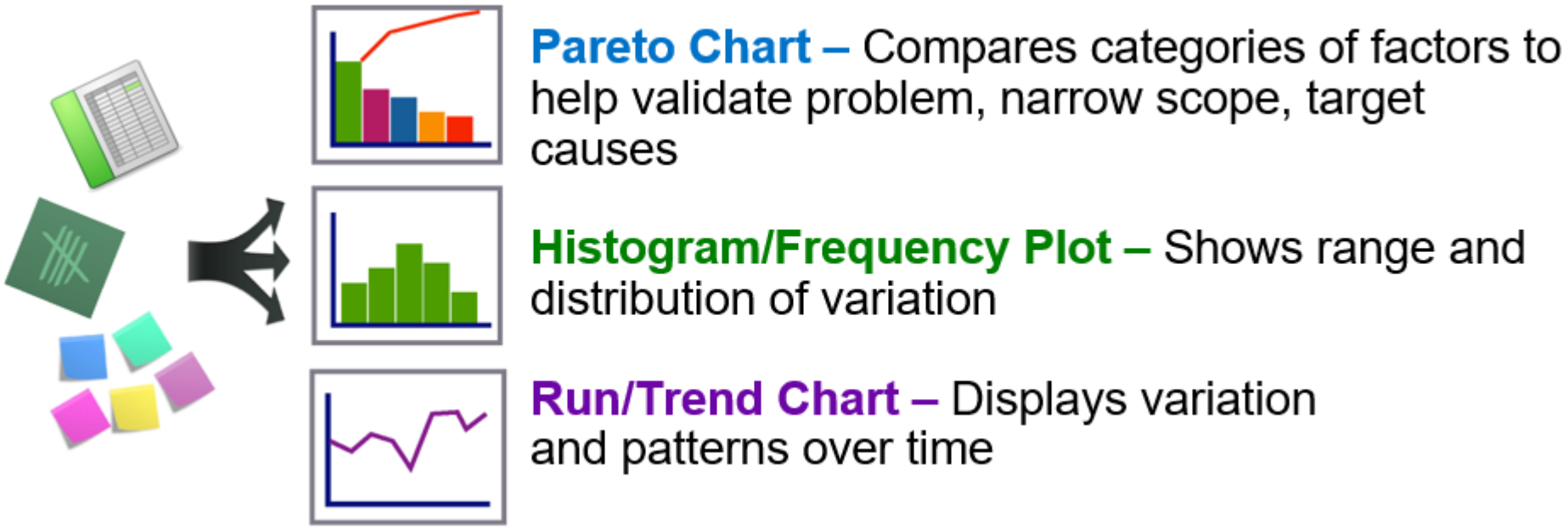
Round 1 : Sorting production



Round 1 measurement

- **Measurement**
  - **Measure weight of each ball and report the measure into a spreadsheet**
- **Visual**
  - **Represent the Histogram of values as well as the Run chart**

How will the data be displayed?



Pareto Chart – Compares categories of factors to help validate problem, narrow scope, target causes

Histogram/Frequency Plot – Shows range and distribution of variation

Run/Trend Chart – Displays variation and patterns over time

Main problem of round 1

- **Problem**
  - **Estimate weight between 2 visual references**
- **Solution**
  - **Define only one visual reference**

Solution

- **Each team creates a reference of 10.0 g**

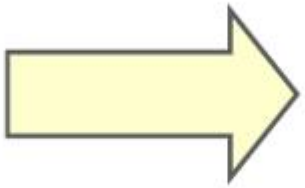
New customer requirement

Each ball must weight 10g at +/- 1g

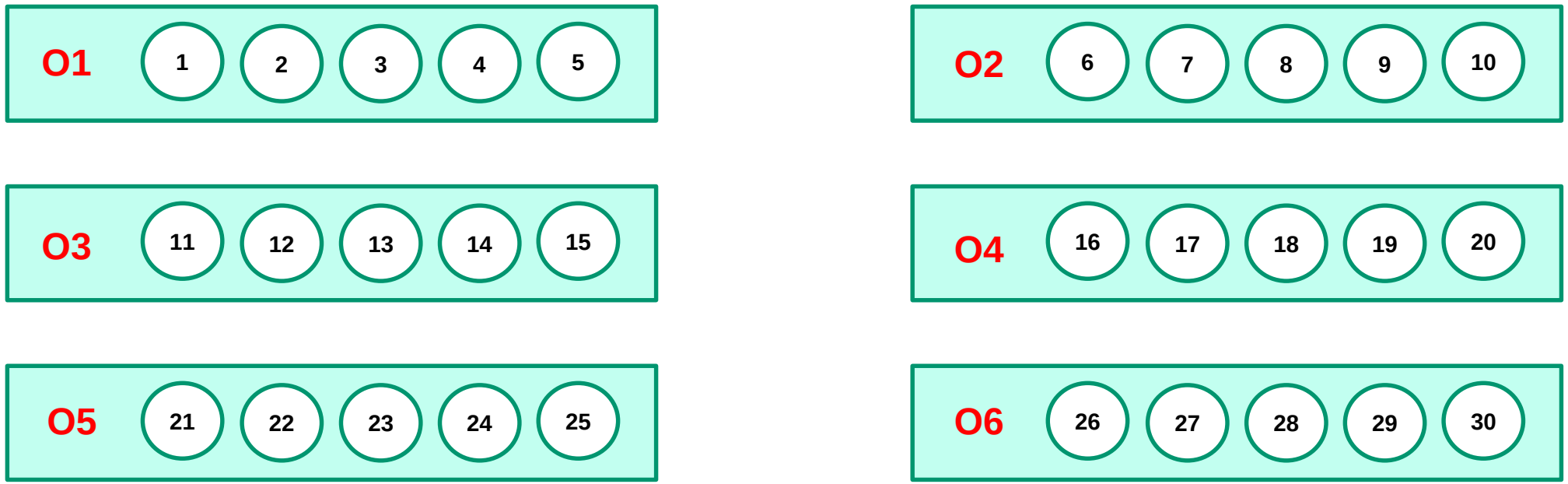
Round 2 20 minutes

Reference

10



Round 2 : Sorting production



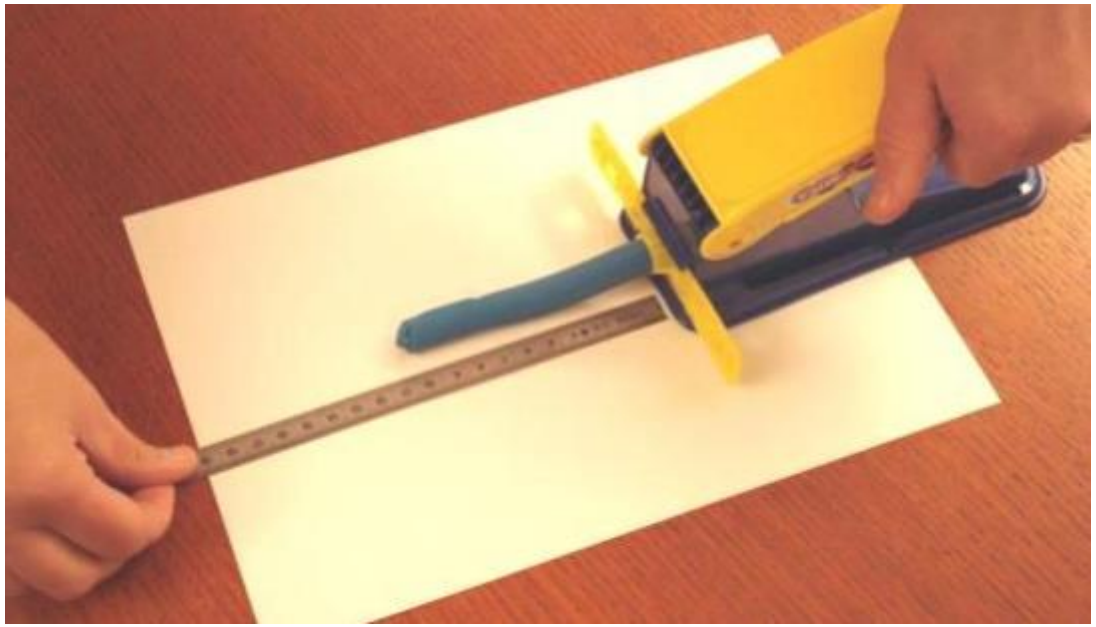
Main problem of round 2

- What can we do to reduce again the dispersion ?
- What is the main cause of the dispersion ?
  - Difficulty to extract the right quantity
- Which solutions can we use ?

Solution

- **Measure precisely the quantity of matter**

Operational

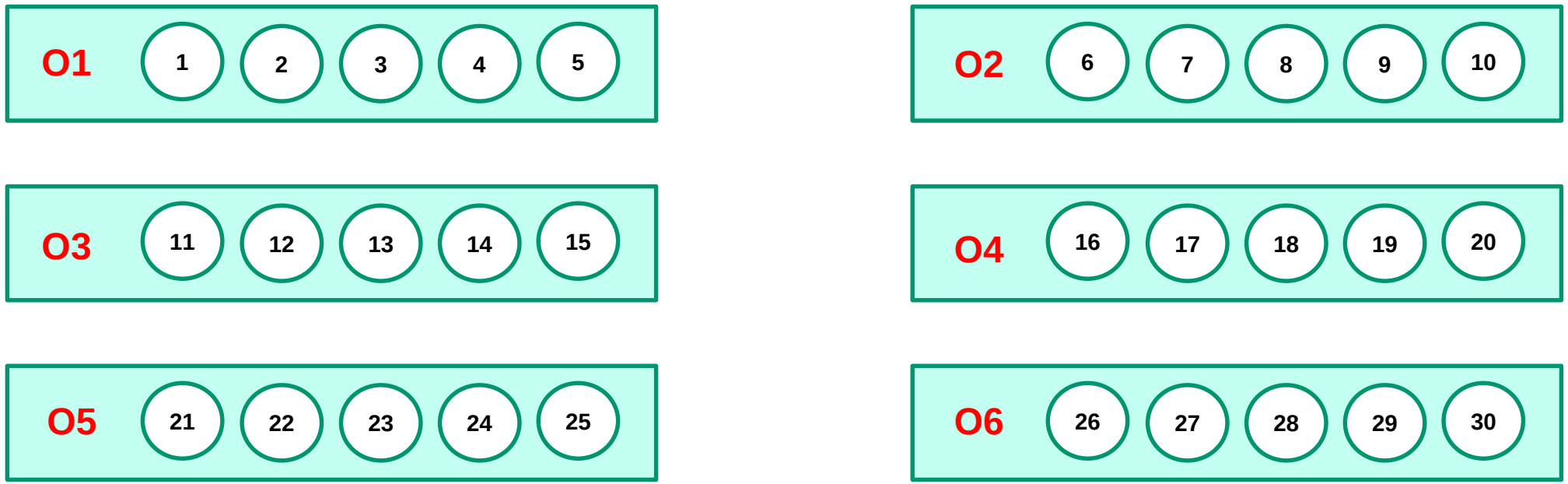


- **Measure precisely the quantity of matter**

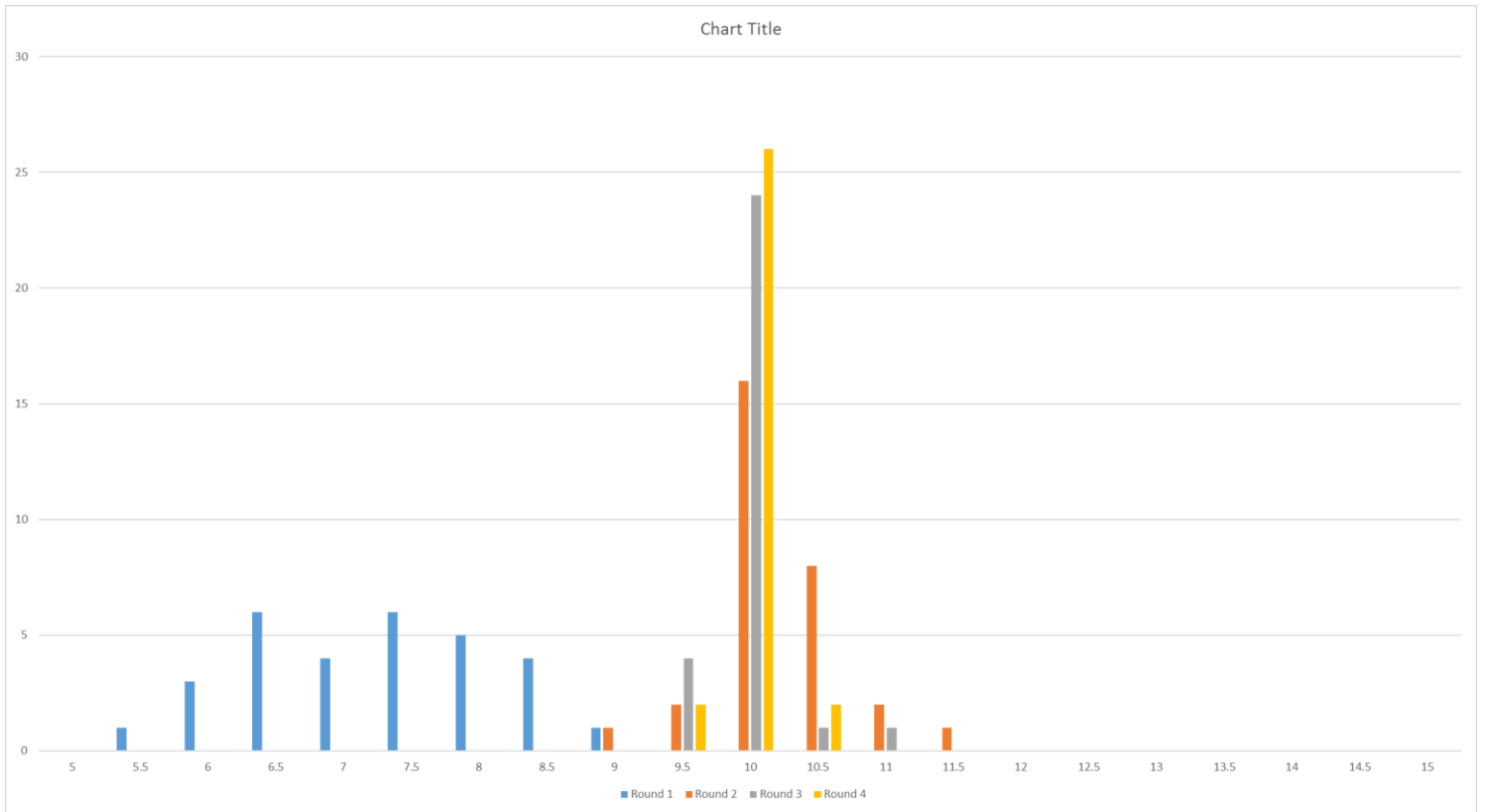
New customer requirement

Each ball must weight 10g at +/- 0.5g

Round 3 : Sorting production 15 minutes

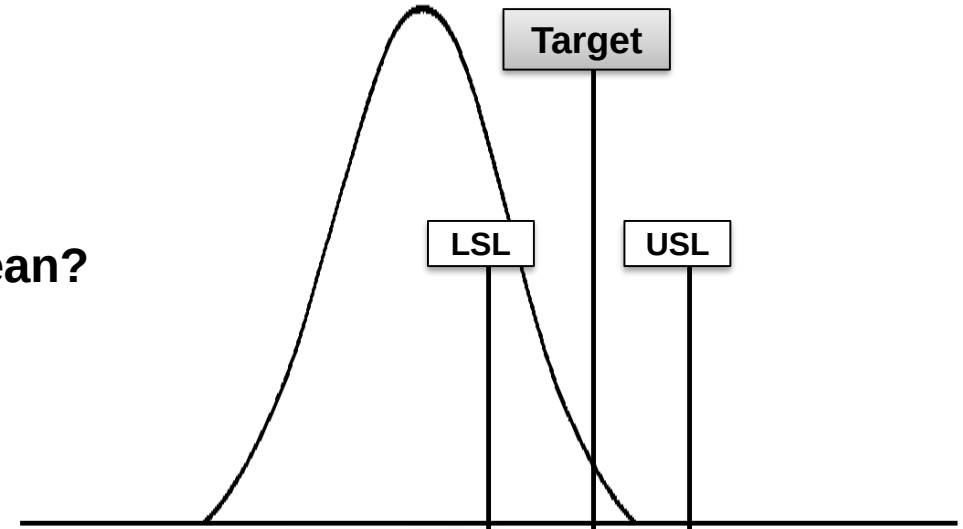


Visual charts



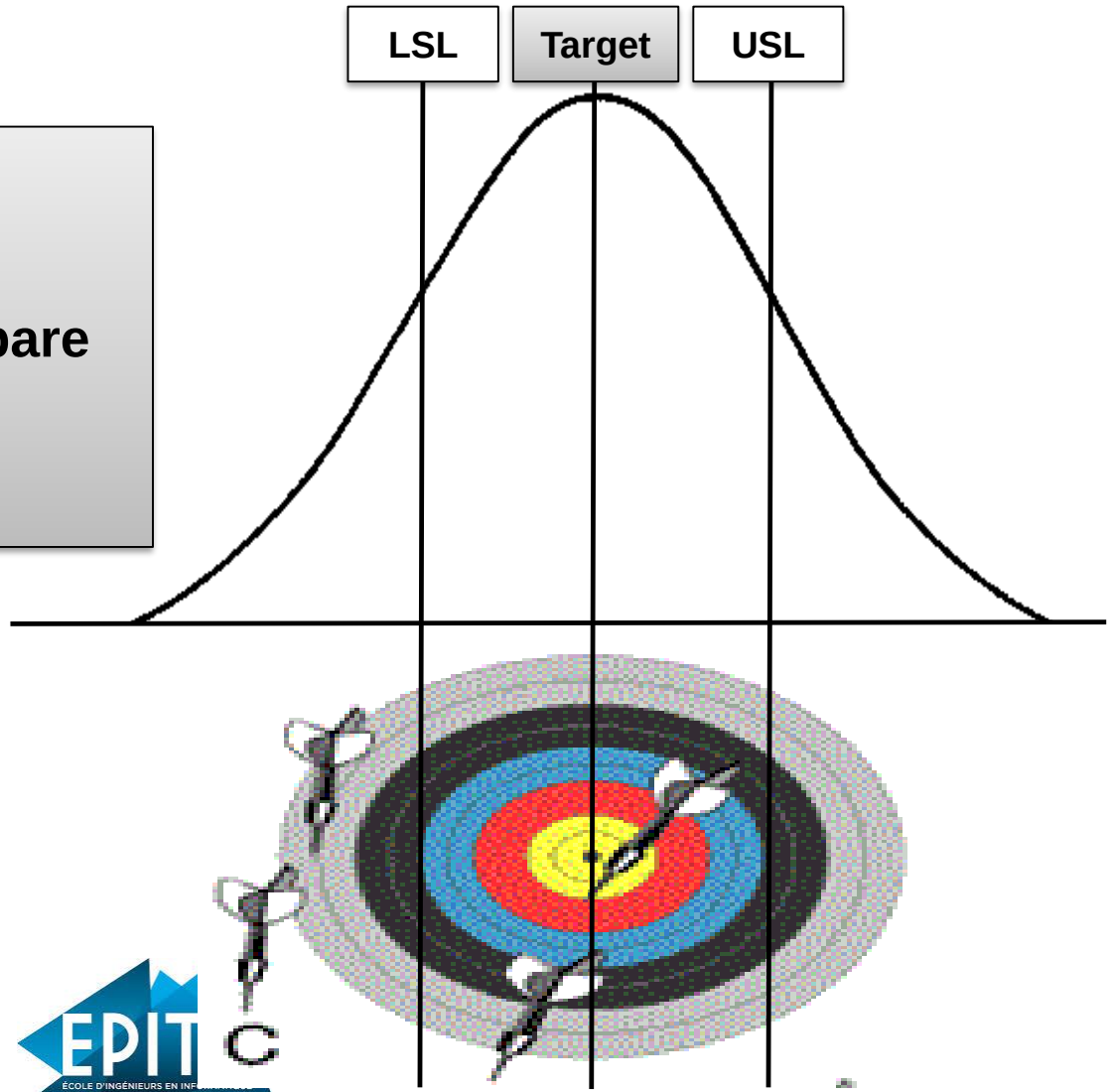
Process Accuracy And Precision

- **Accuracy describes centering**
- **Is my process mean at my target mean?**

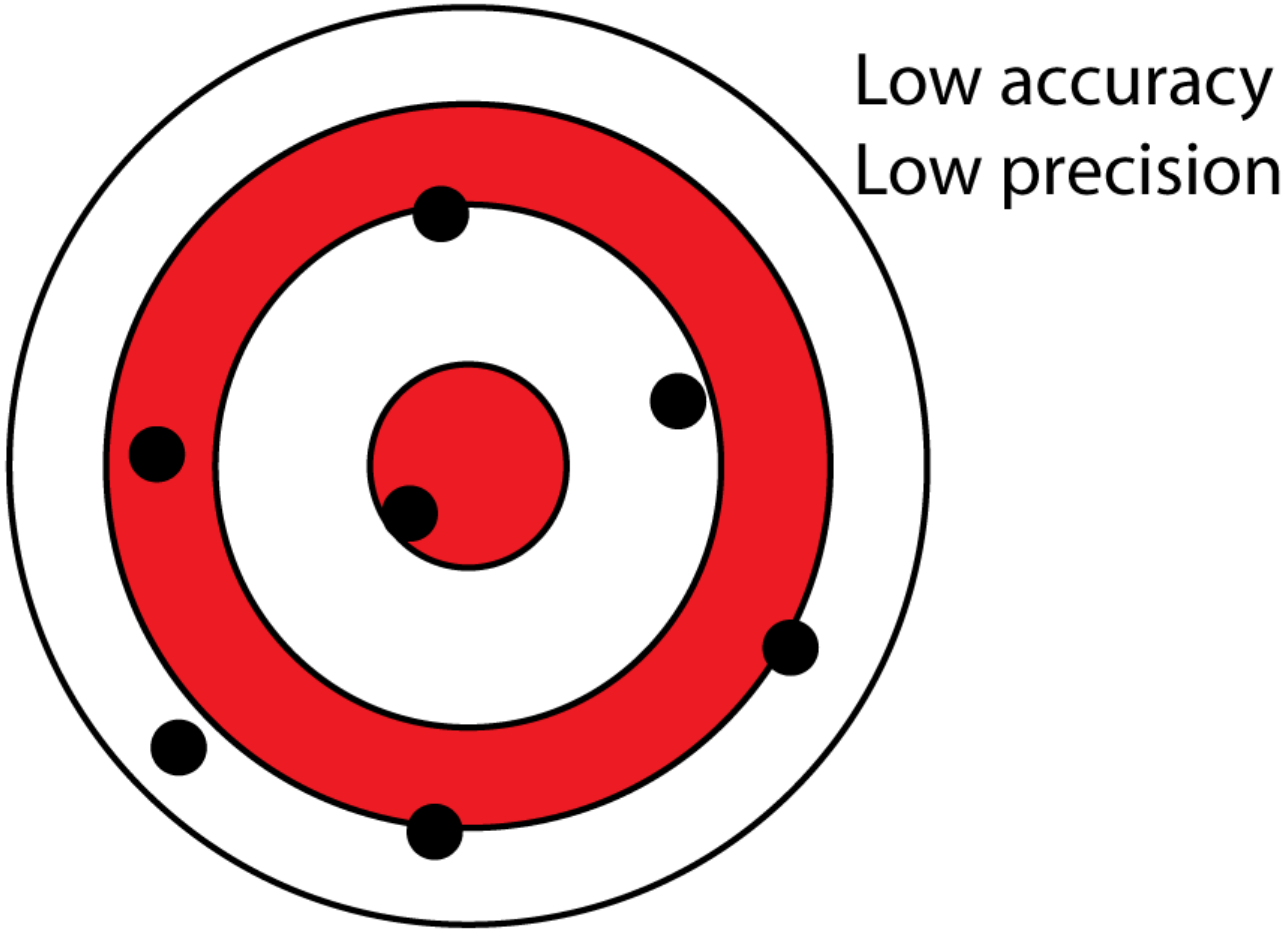


Process Accuracy And Precision

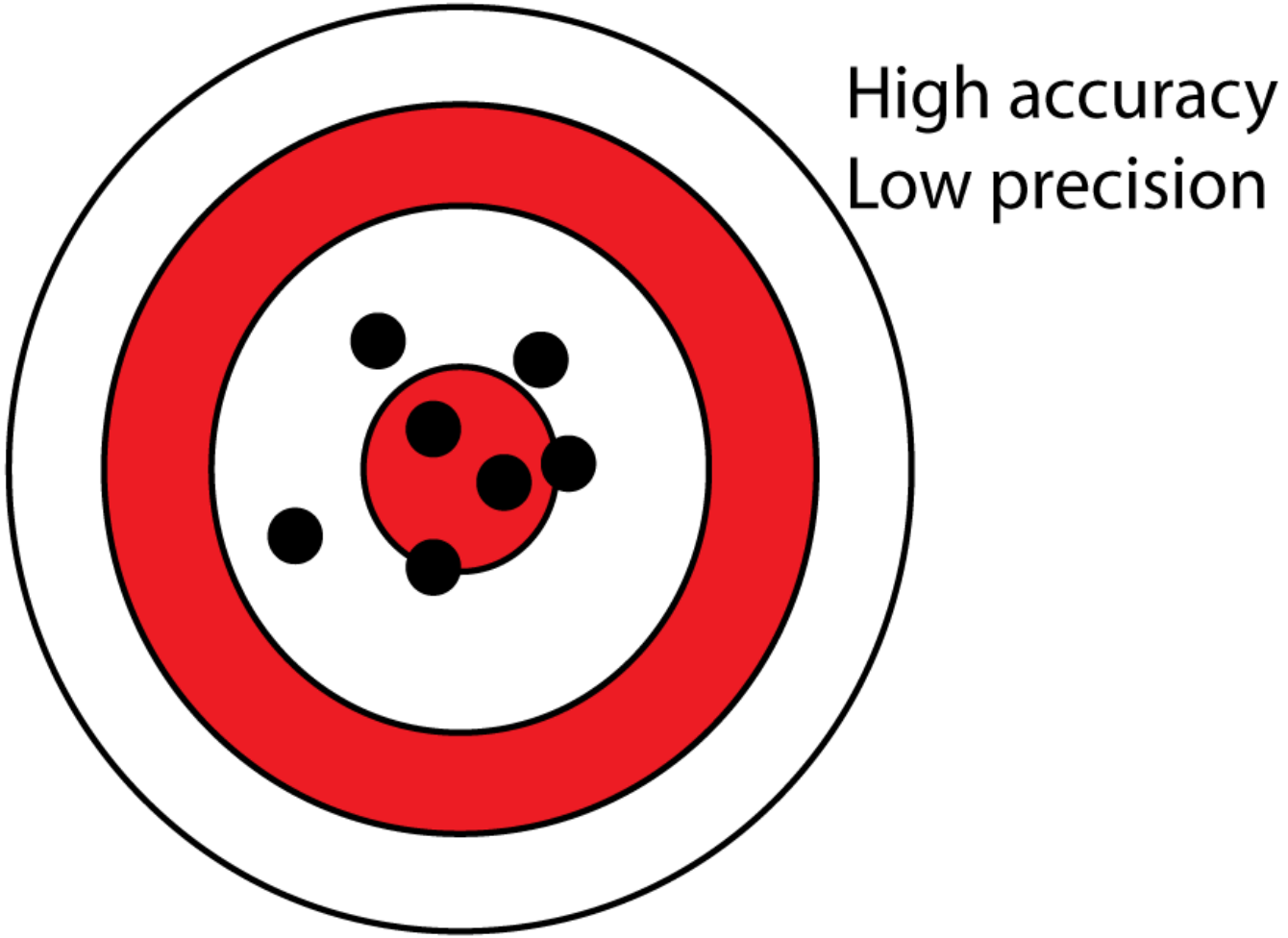
- Precision describes spread
- How does the spread of my process compare to the customer's specification limits?



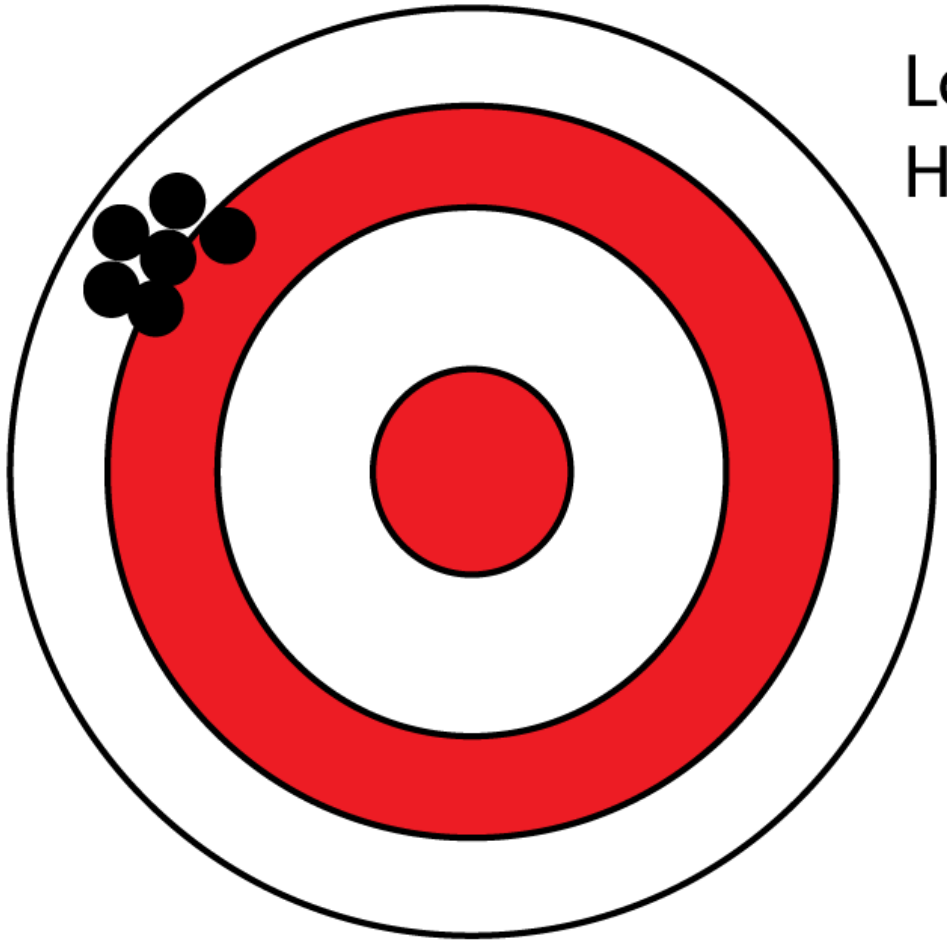
Inaccurate and Imprecise



Accurate and Imprecise

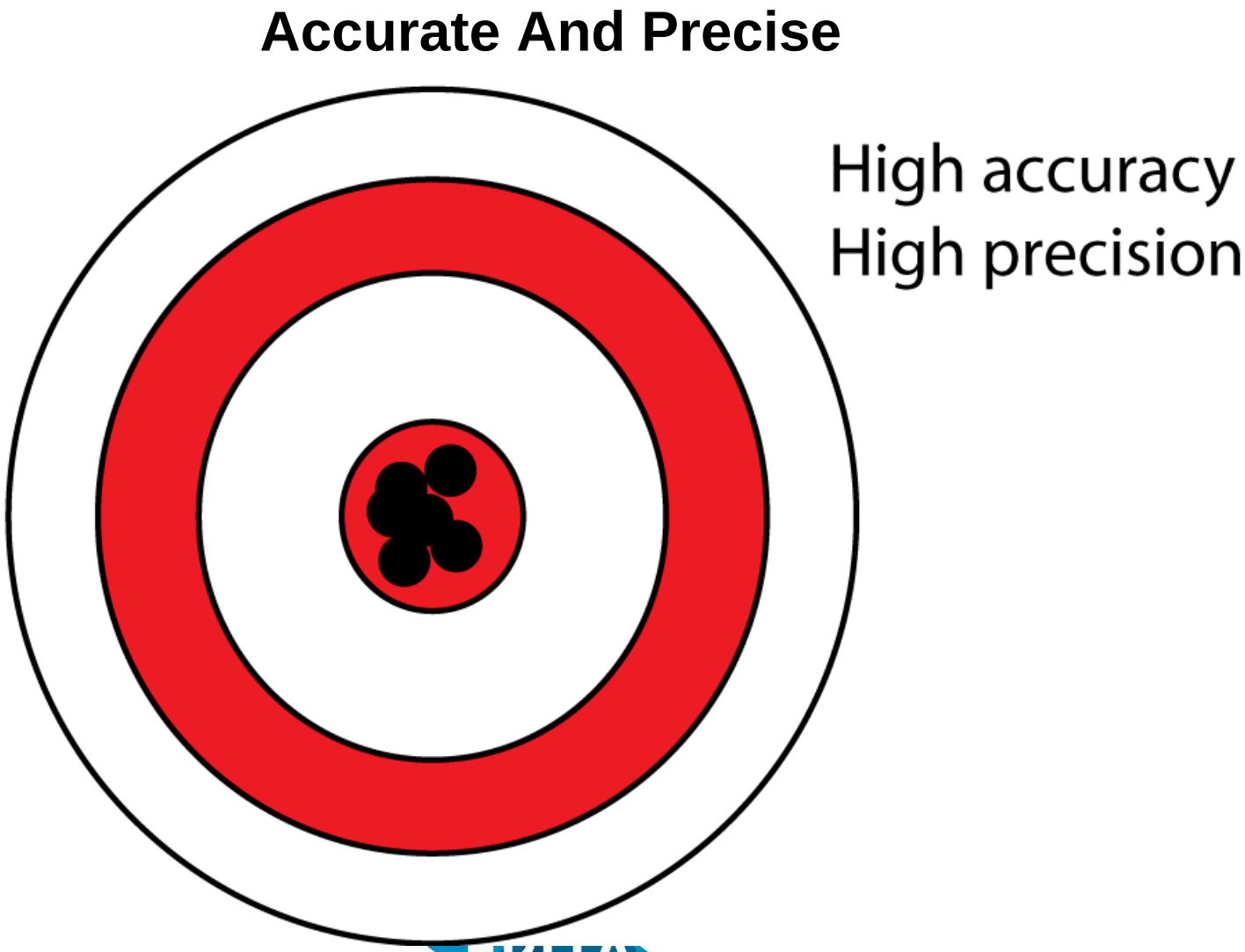


Precise But Inaccurate



Low accuracy
High precision

6σ



Software used for 6σ

- **There are generally four classes of software used to support the Six Sigma process improvement protocol:**
  - **Analysis tools, which are used to perform statistical or process analysis;**
  - **Program management tools, used to manage and track a corporation's entire Six Sigma program;**
  - **DMAIC and Lean online project collaboration tools for local and global teams;**
  - **Data Collection tools that feed information directly into the analysis tools and significantly reduce the time spent gathering data.**

Software used for 6σ

- **Minitab 18**
- **Process Model 5**
- **Microsoft Office/Visio**
- **Arena**
- **ARIS Six Sigma**
- **Bonita Open Solution BPMN2 standard**
- **KPIs for statistic monitoring**
- **JMP**
- **Mathematical**
- **MATLAB or GNU Octave**
- **STATA**
- **STATISTICA**

DMAIC

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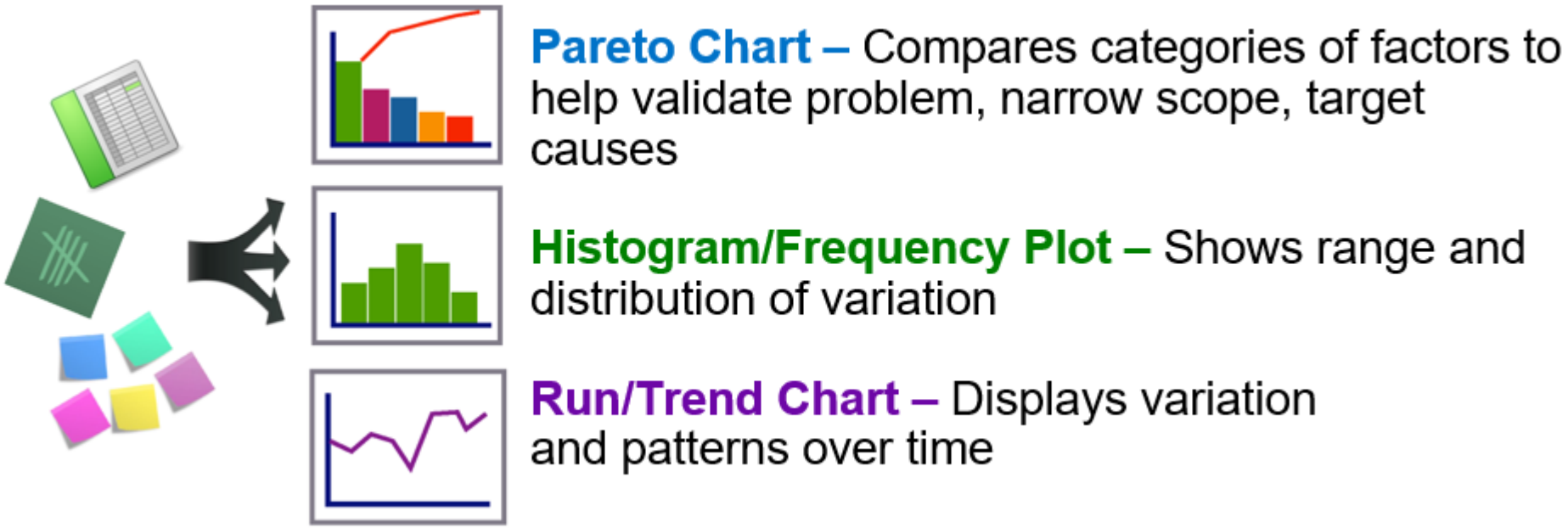
MEASURE

- **In the Measure phase, the team focuses on data collection, which takes time and effort**
  - **Select Measures**
  - **Data Collection Planning**
  - **Operational Definitions**
  - **Baseline Data**

What is the best measure of the problem?

- What is the metric?
- What is measured? Count? Proportion? Distribution?
- What is the time period?
- How would this be collected?
- Examples
  - incomplete requests received per week
  - # Late Print Labels per day
  - # Defects by type per release

How will the data be displayed?



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Why Measure ?

- **Validate: Gather data confirming existence of the problem and impact**
- **Baseline: Quantify current performance level of the process or area of improvement**
- **Stratify & Scope: Find "sweet spots" to narrow the focus and still achieve meaningful results**
- **Look for Causes: Measure/data to find clues, identify & verify**
- **Confirm Results: Post-solution assessment of change in the output measure versus target**

Measure to gain knowledge about the problem, process, customer or organization

Measurement Objective

The Measure phase aims to set a baseline in terms of process performance through the development of

clear and meaningful measurement systems

6σ

SIGMA	Defect per Million Opportunities (DPMO)
1	**690,000**
2	**308,537**
3	**66,807**
4	**6,210**
5	**233**
6	**3.4**

Discrete data

- **Discrete data is that which cannot be further broken down, and has a finite number of measurements that are based on counts. This type of data can be divided into three basic types**
  - **Ordinal data – This is the data that can be put in an order, like 1st, 2nd, 3rd, etc.**
  - **Nominal data – This is the descriptive type of data that is not numeric, like names, colours, phone numbers, etc.**
  - **Binary data – This is the qualitative or categorical data that is made up of two classifications, like yes-no, on-off, good-bad, pass-fail, etc.**

Continuous data

- **Continuous data is that which can be broken down further. This includes time, temperature, weight, height, money…**
  - **Time can be broken into hours, minutes, and seconds**
  - **Temperature can be broken into Degrees, Celsius, and Fahrenheit**
  - **Weight can be broken into kilograms, grams, etc.**
  - **Height can be broken into feet, inches, and fractions**
  - **Money can be broken into Rupees, Dollars, Yens, Euros, etc.**

- **Discrete data is less precise, less informative, less time-consuming, and cannot remove estimations.**
- **Continuous data, on the other hand, is more precise, more informative, more time-consuming, and can remove estimations and rounding of measurements.**

How is data collected?

- **A data collection plan (DCP) is implemented to capture in a single place different data points required for the project. In this way, all the members involved in the project are brought together on the same page. A DCP involves the following :**
  - **The measurements that need to be recorded**
  - **The process through which the measurement is calculated**
  - **The kind of measurement metric that needs to be used in the process**
  - **The mention of whether the data is discrete or continuous**
  - **The mention of the type of sampling methodology used to collect data**
  - **The frequency at which the data needs to be collected**
  - **The person/machinery responsible to collect the data**