

# 5 M&Ms of Measurement

*Franklin Training Systems*

**Learning is the key to success**



# **PRESNTER**

*Chet Franklin*

**Owner:**

*FRANKLIN TRAINING SYSTEMS*

**Speaker**

**Trainer**

**Consultant**

# INTENDED TO ANSWER:

1. Do your measurements matter?
2. Is what you want measurable?
3. Are your measurements monitored and tracked?
4. Are your measurements used to make decisions?
5. How many times should you measure it?

# **A BIT OF MEASUREMENT HISTORY**

**First recorded system of  
weights and measures?**

**Around the 3rd or 4th millennium BC**

# A BIT OF MEASUREMENT HISTORY

**Do you recognize this?**

## ➤ **The Egyptian Cubit**

✓ **From about the 3rd Millennium BC**

▪ **I bought mine a little later**

**Around Mid-1990s**

# MORE MEASUREMENT HISTORY

## Cubit Length?

Pharaoh Menes forearm

✓ Around  $17 \frac{1}{2}$  inches

# **MORE MEASUREMENT HISTORY**

## **How many Cubits?**

**Egyptian**

**Hebrew**

**Babylonian**

**Egyptian Long**

**Hebrew Long**

# **METRE CONVENTION TREATY**

**Signed by 17 nations**

- **May 20, 1875**

✓ **Including the US!**

**Established**

**International System of Units - SI**



# **METRE CONVENTION TREATY**

**SI: French, “Système International”**

**Most used in the scientific world**

**Preferred by NIST for many uses**

# 5 M&Ms OF MEASUREMENT

## AN OVERVIEW

**M&M #1: Measure what Matters**

**M&M #2: Measure what's Measurable**

**M&M #3: Monitor what's Measured**

**M&M #4: Manage with what's Monitored**

**M&M #5: Measure it some More**

# **M&M #1: OVERVIEW**

## **MEAASURE WHAT MATTERS**

**To get information:**

- **Decisions**
- **Actions**
- **Analysis**

# M&M #2: OVERVIEW

## MEASURE WHAT'S MEASURABLE

### Not just BECAUSE:

- ✓ **It's Measurable**
- ✓ **It's easy**
- ✓ **We know how**

“Not everything that counts can be counted;  
Not everything that can be counted counts.”

*Albert Einstein*

# **M&M #3: OVERVIEW**

## **MONITOR WHAT'S MEASURED**

**Monitor = Surveillance**

**Recorded:**

- **Logs**
- **Graphs**
- **Charts**

# **M&M #4: OVERVIEW**

## **MANAGE WITH WHAT'S MONITORED**

❖ **Can you use it?**

○ **Make decisions?**

○ **Take action?**

# **M&M #5: OVERVIEW**

## **MEASURE SOME MORE**

### **➤ Assure Reliability:**

- **Accuracy**

- **Repeatability**

- **Offset possible side effects**

# M&M #1: DETAILS

## MEASURE WHAT MATTERS

### Why measure it?

➤ To get information:

✓ **Information that matters**

✓ **Information you can use**

❖ **Take Action**

❖ **Make Decisions**



# **M&M #2: DETAILS**

## **MEAASURE WHAT'S MEAASURABLE**

- **Can I measure what I need?**
  - ✓ **Do I have the equipment?**
  - ✓ **Do I have a process?**
  - ✓ **What if I can't measure it?**
  - ✓ **Is there a substitute?**

# M&M #2: DETAILS

## MEASURE WHAT'S MEASURABLE

### SURVEYS

- Measurement

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### TYPICAL FORMAT

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9	10

GUESS WORK

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### WORKABLE FORMAT

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5

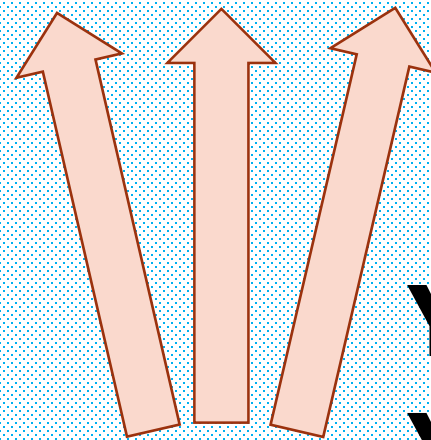
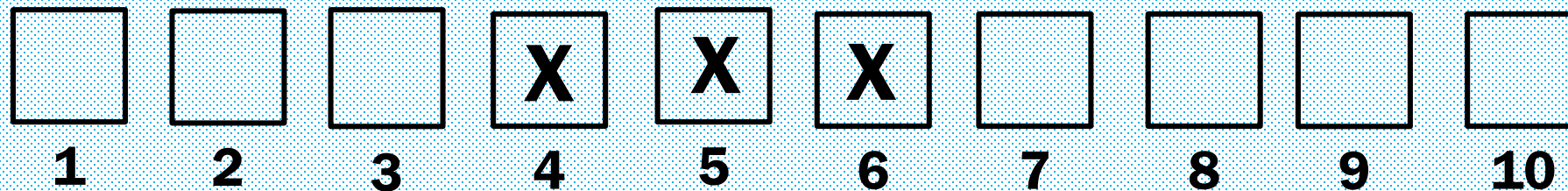
LESS GUESS WORK

# M&M #2: DETAILS

## MEASURE WHAT'S MEASURABLE

### □ SURVEYS (CONTD)

No mid-point!



**You hurry up!**  
**YOU GUESS!**  
**(Not a measurement)**

# M&M #2: DETAILS

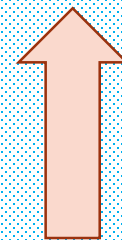
## MEASURE WHAT'S MEASURABLE

### □ SURVEYS (CONTD)

- Measurement

### WORKABLE FORMAT

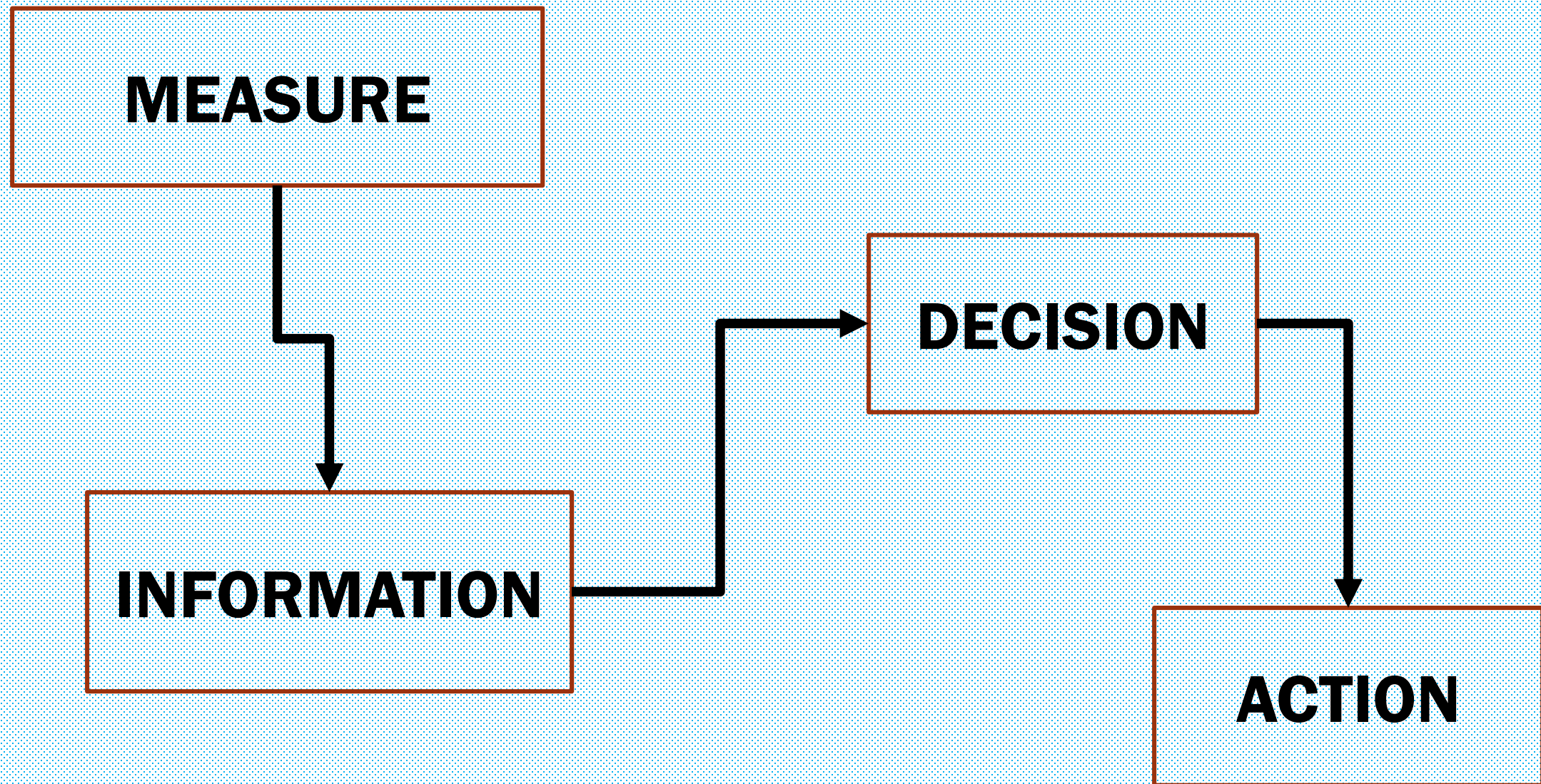
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5



**LESS GUESS WORK**  
**(Less time consuming)**

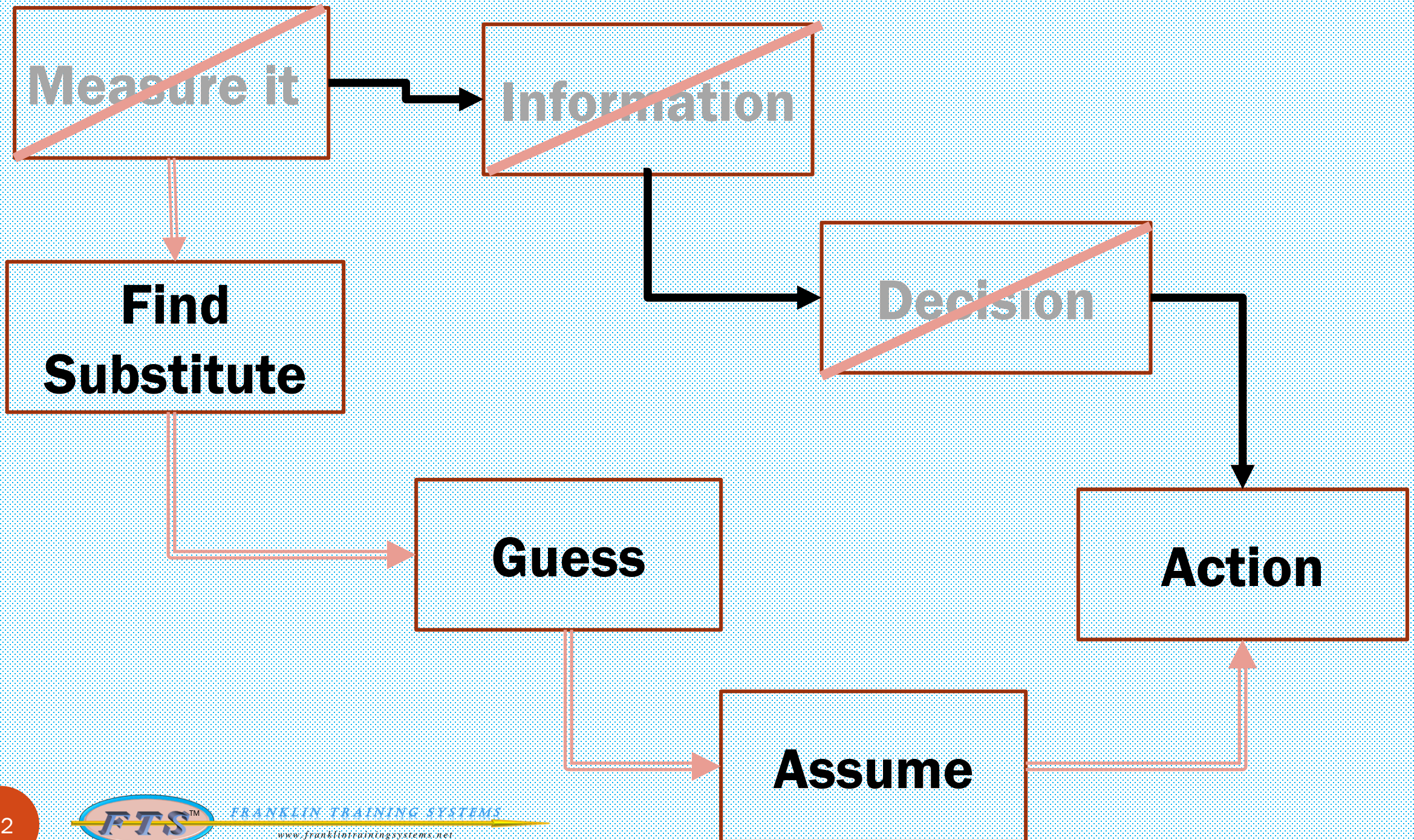
# M&M #2: DETAILS

## MEASURE WHAT'S MEASURABLE



# M&M #2: DETAILS

## CAN'T MEASURE IT? NOT MEASURABLE?



# **M&M #3: DETAILS**

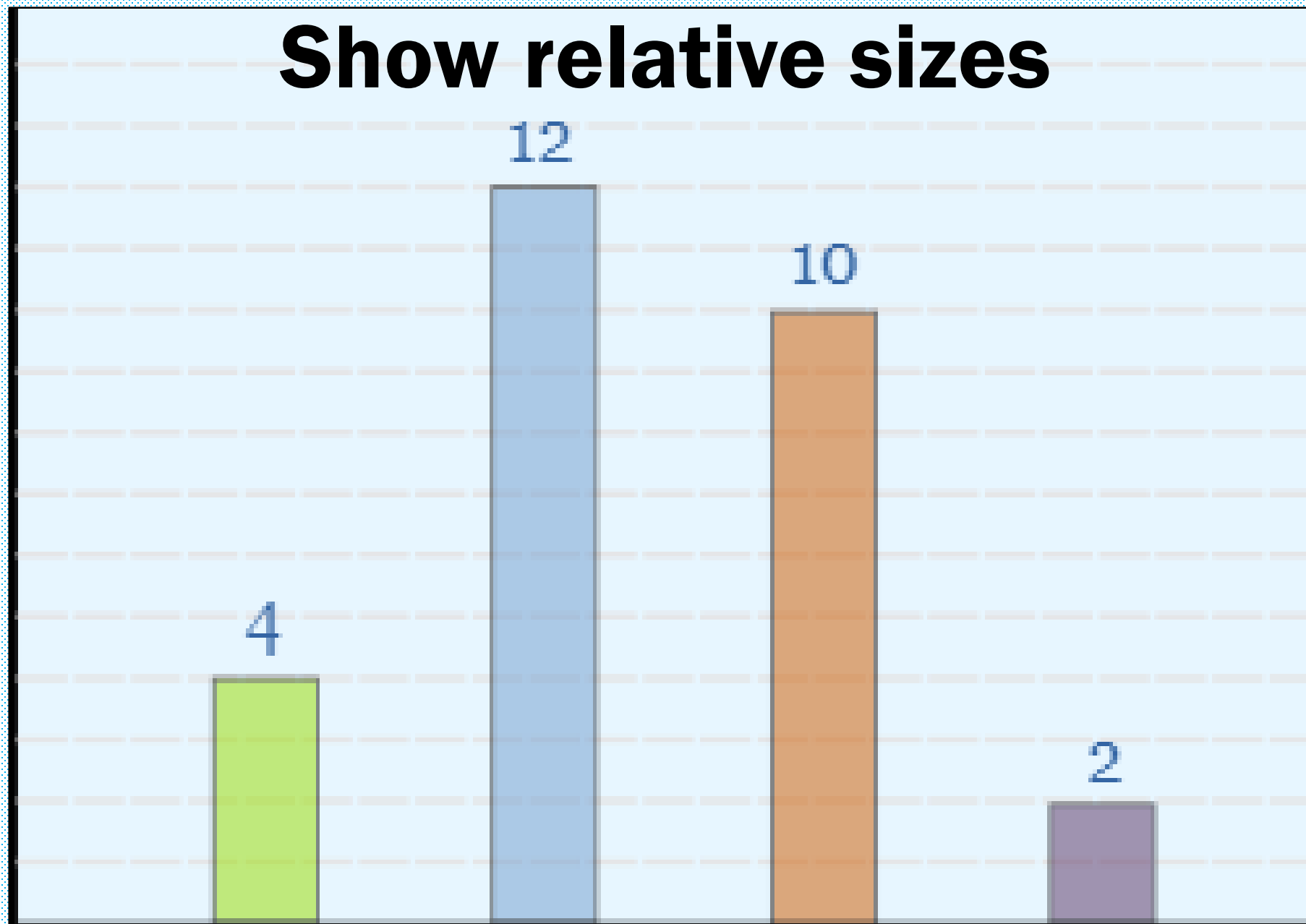
## **MONITOR WHAT'S MEASURED**

**□ Recorded:**

**✓ Graphs / Charts:**

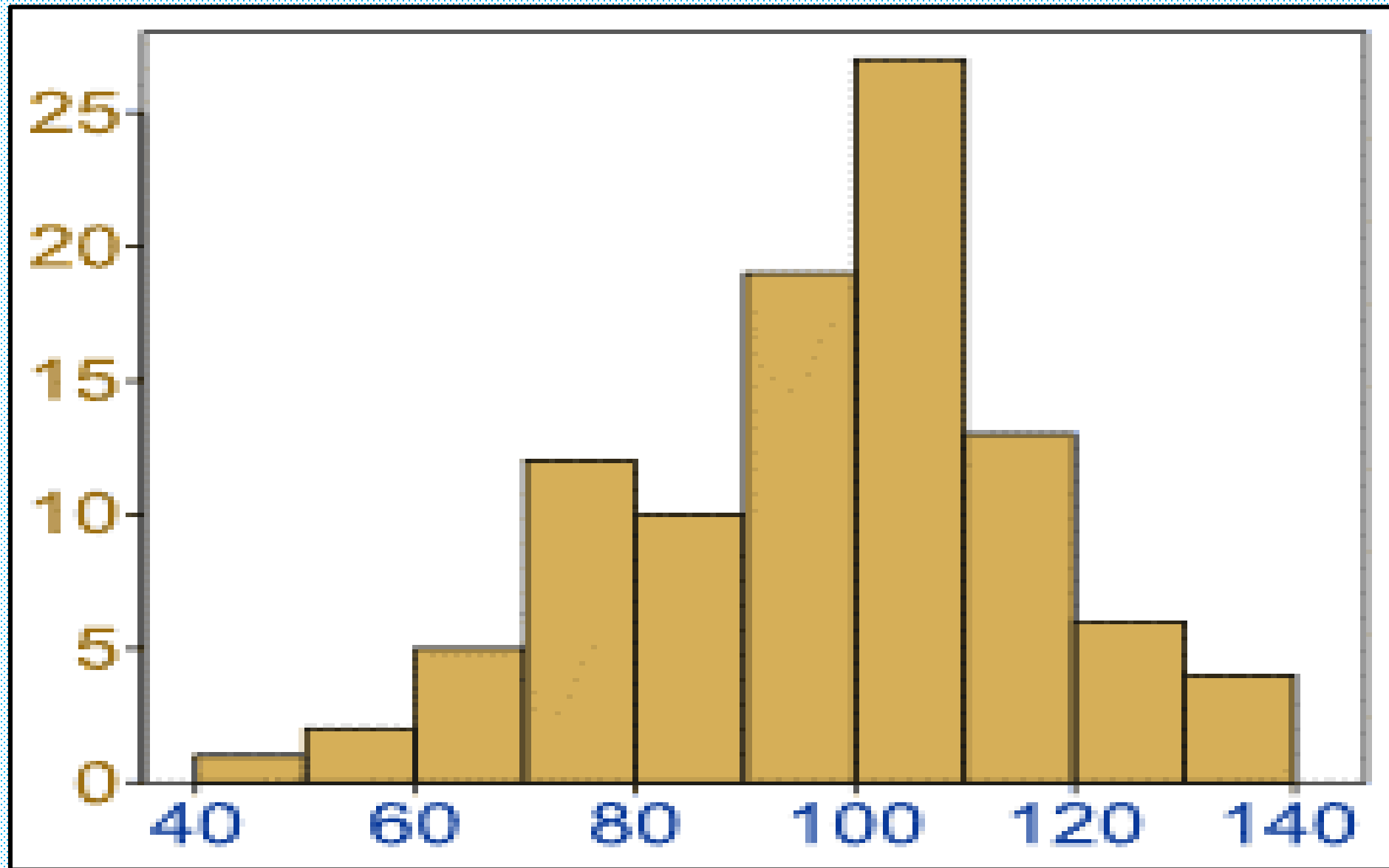
- Bar Graphs**
- Histograms**
- Run Charts**
- Pie Charts**
- X bar R Charts**
- Trend Charts**

# BAR GRAPHS





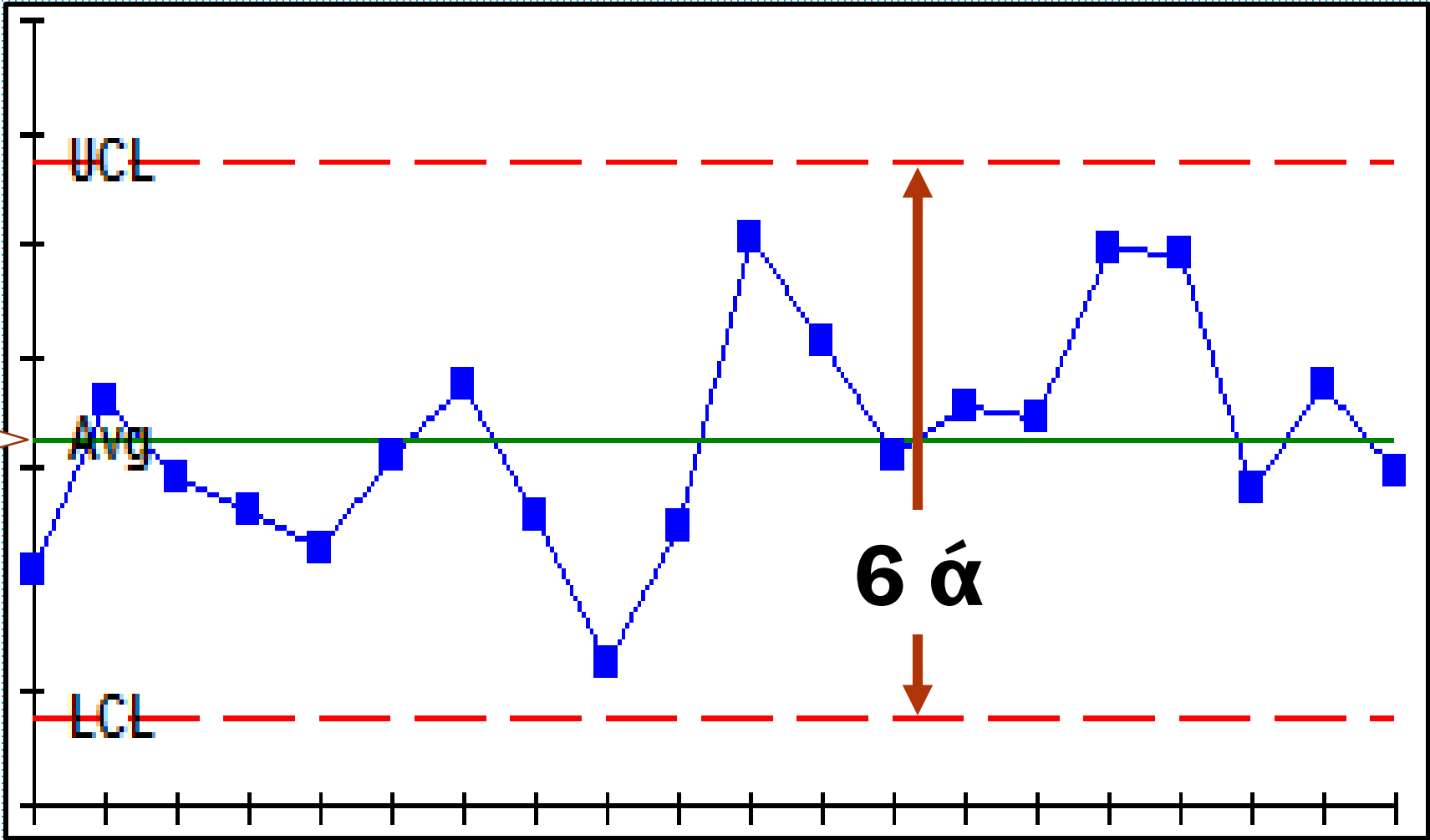
# HISTOGRAMS



**Groups Metrics into ranges**

# X-BAR-R CHARTS

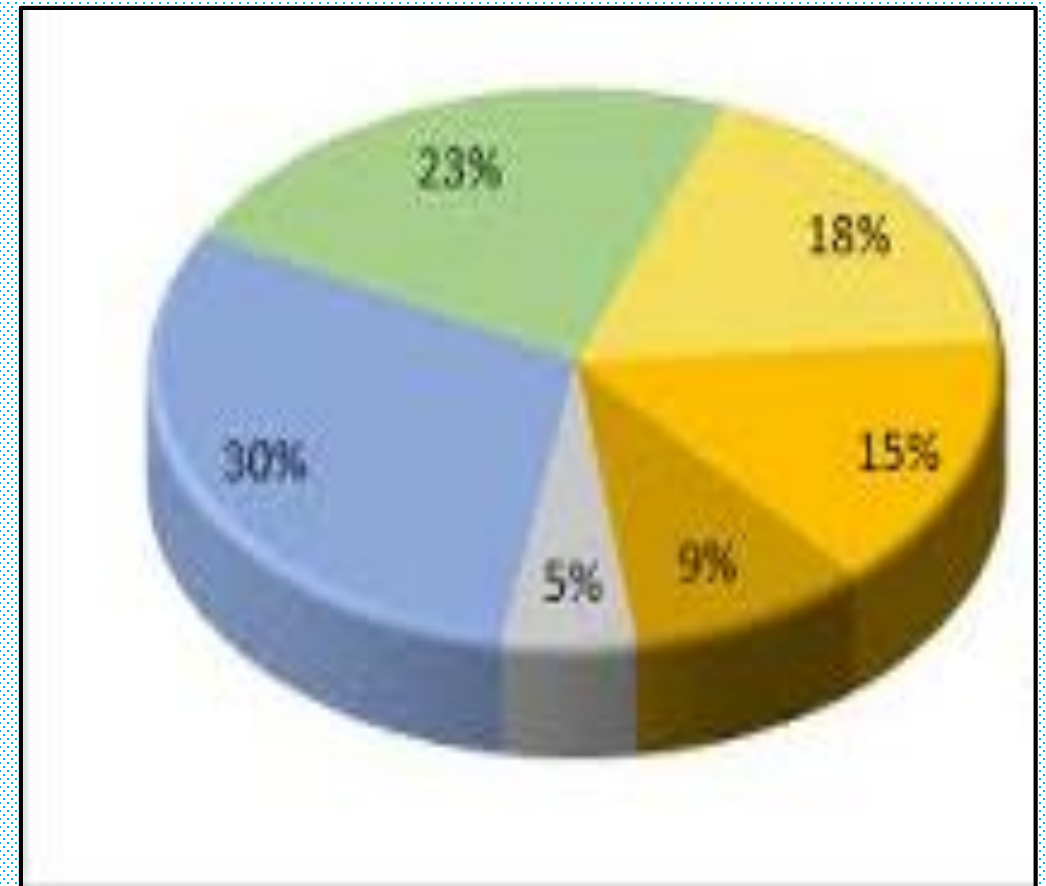
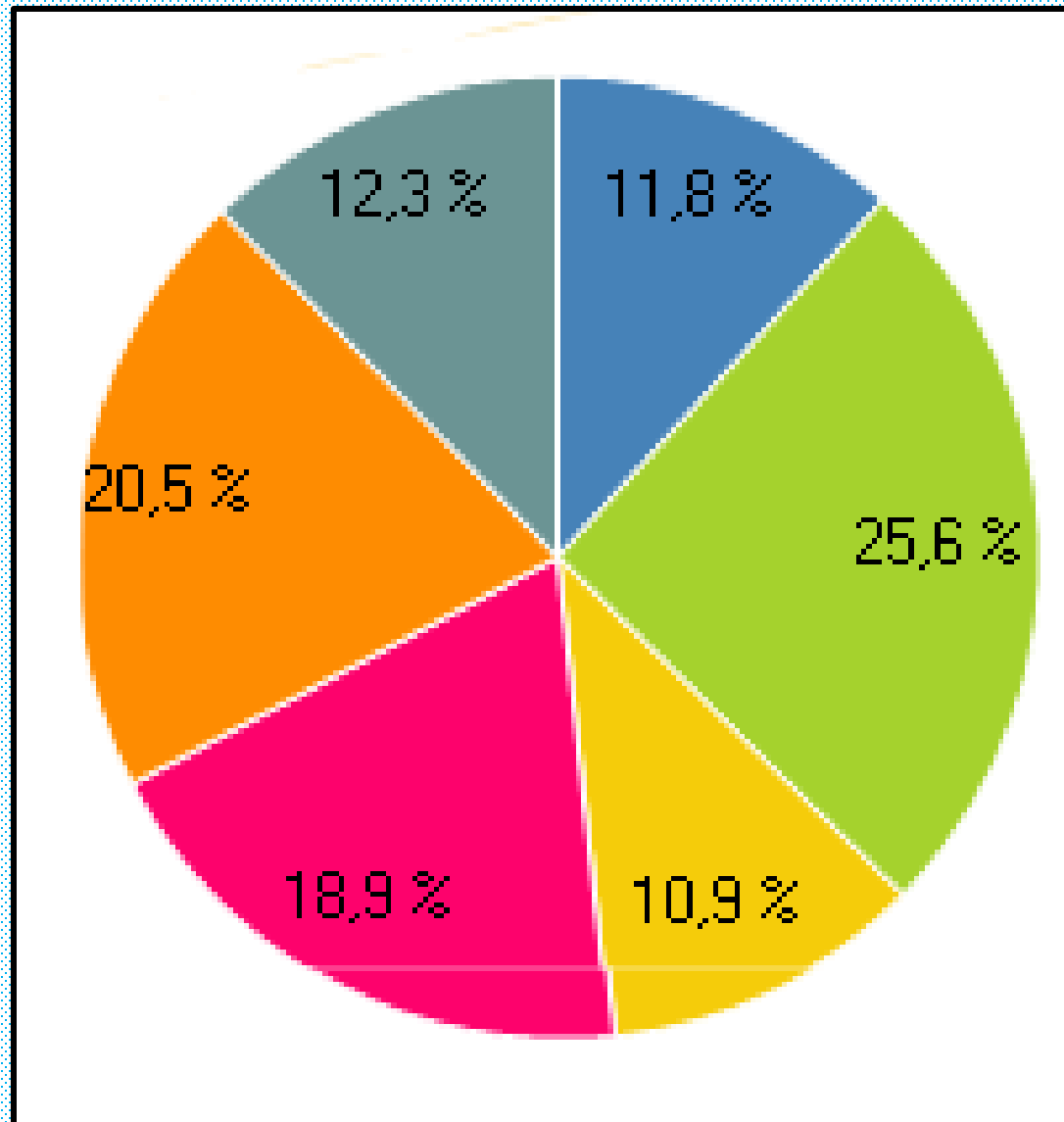
Average



3 σ

3 σ

# PIE CHARTS



# **M&M #4: DETAILS**

## **MANAGE WITH WHAT'S MONITORED**

- **Plan**
- **Decide**
- **Act**
- **Report**

**Rule # 1: If you can't use it,  
you didn't Measure what Matters!**

**Rule # 2: If you don't Measure you can't  
Manage!**

# **M&M #5: DETAILS**

## **MEAASURE SOME MORE**

➤ **Determine reliability**

✓ **Manage variation**

❖ **Entropy**

❖ **Drift**

# **MEASURE IT SOME MORE TO ASSURE MEASUREMENT RELIABILITY**

- ✓ **Measurement accuracy**
- ✓ **Calibrate to assure accuracy**
- ❖ **Working Cubits checked against  
“Standard Cubit”**
  - **Reliability Rating?**

# **MEASURE IT SOME MORE TO ASSURE MEASUREMENT PROCEDURE RELIABILITY:**

- **Procedure yields the same results:**
  - ✓ **Repeatable**
  - ✓ **Reproducible**
- **Quality Function Deployment (QFD)**
  - ✓ **Can be used to set Procedure Reliability Targets**

# MEASURE IT SOME MORE TO OFFSET THE EFFECTS OF ENTROPY

- ❑ Entropy is a reality!
- ❑ From Thermodynamics:
  - “General, gradual decline to disorder”
    - Of systems
    - ANY SYSTEM



# **MEASURE IT SOME MORE TO OFFSET THE EFFECTS OF DRIFT**

## **❑ A tendency to change**

- Become out of tolerance or useable range**

## **❑ Change in a measurement that is:**

- Supposed or Expected to remain constant**

# **MEASURE IT SOME MORE TO DEAL WITH THE EFFECTS OF THE P-F CURVE.**

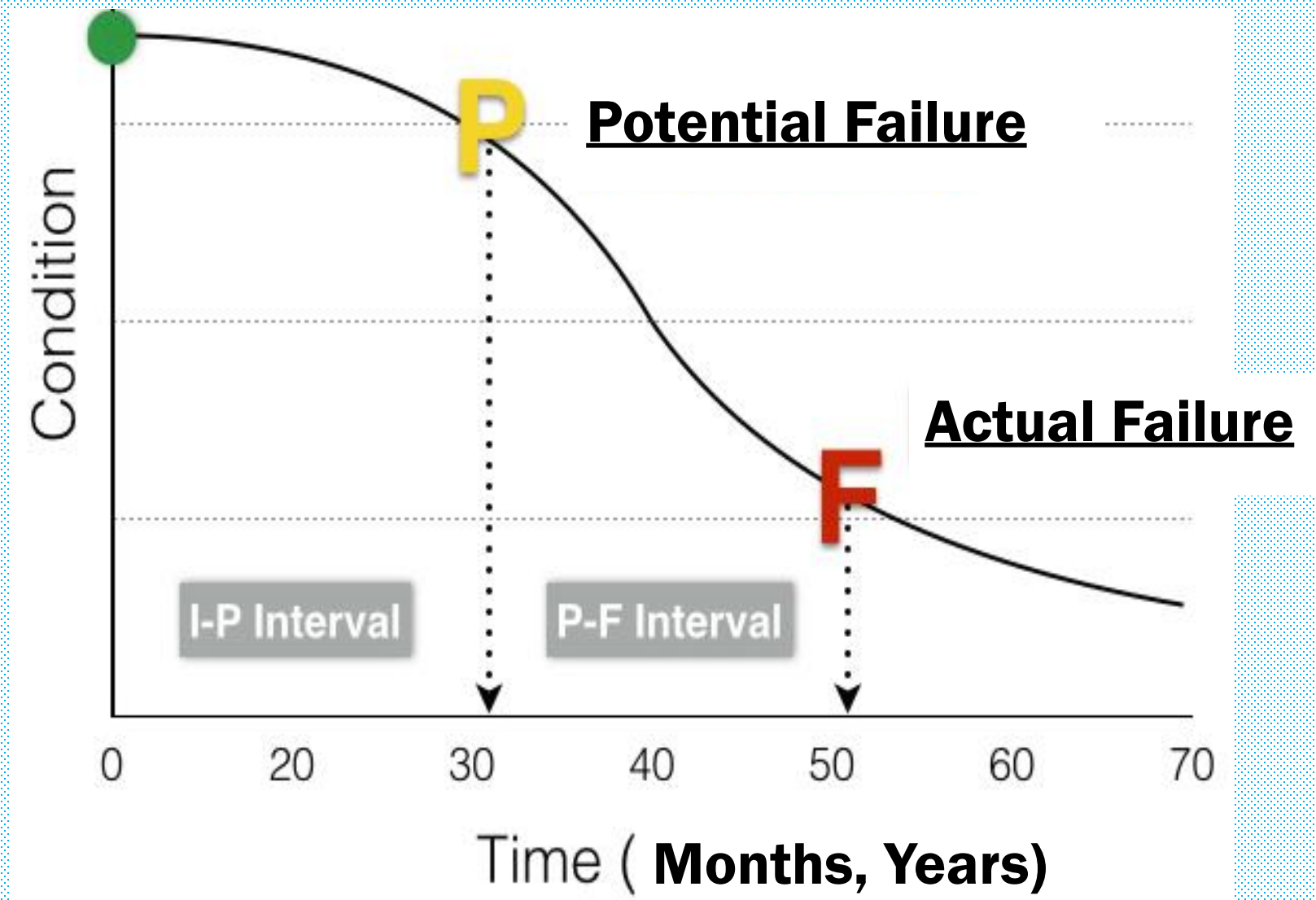
✓ **“P”**: Point of Potential Failure

✓ **“F”**: Point of Actual Failure

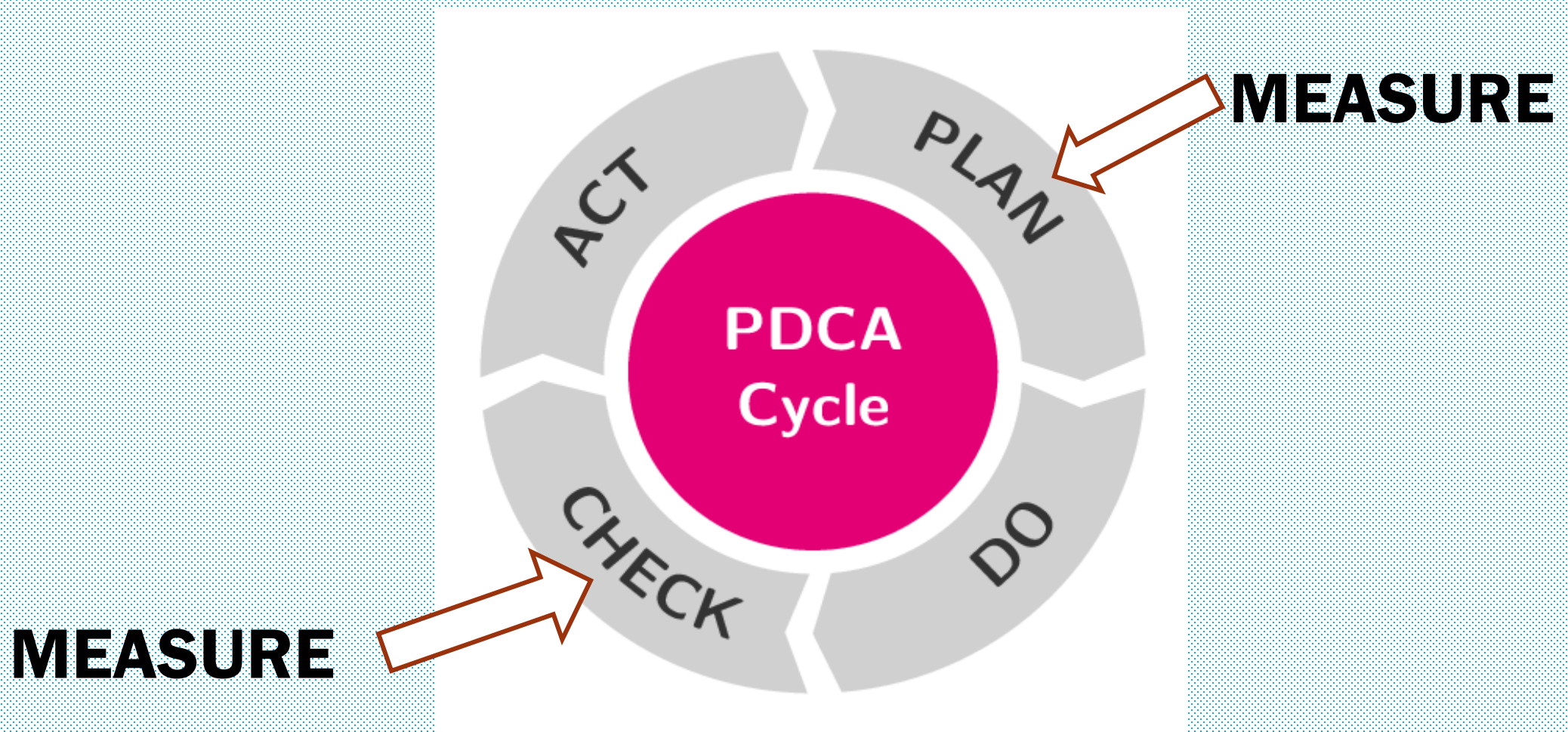
✓ **Real-time Monitoring and Measurement**

✓ **Continuous Process Measurement**

# MEASURE IT SOME MORE TO DEAL WITH THE EFFECTS OF THE P-F CURVE.



# MEASURE IT SOME MORE AS PART OF THE SHEWHART CYCLE; “PLAN-DO-CHECK-ACT” (PDCA)



# CONCLUSION

**Continuous Improvement Requires?**

**Change Management**

**Change Management requires?**

**Measuring What Matters**

**Lord Kelvin: If you can't measure it  
You can't improve it!**

# TYPICAL TERMS

- ✓ **Measurement of Quality**
- ✓ **Measurement Reliability**
- ✓ **Measurement Procedure Reliability**
- ✓ **Process Measurement for Improvement**
- ✓ **Quality Metrics**
- ✓ **Stakeholder Requirements (Measurements)**
- ✓ **Continuity Of Operations Plan (COOP)**
- ✓ **PERFORMANCE IMPROVEMENT**

# WRAP-UP

❖ **Questions?**

❖ **Comments?**

❖ **Evaluation**

**Measure it, Monitor it, Use it, Measure it again**