

# Defining and Measuring Goals and Business Objectives:

## What You Measure Matters

# Measure, Measure, Measure



## Everyone has a measurement program

- Goal Question Metric
- SMART: Specific, Measureable, Attainable, Relevant, Time Bound
- We want 100% Customer Satisfaction!!!!

# Context of Data:



- There is a current term “Big Data”
  - “We are generating 2.5 quintillion bytes of data each day, more than 90 percent of it in the past two years.”
- How do we use data in our businesses?
  - Humans assign values to the data, since the data cannot speak for themselves.
- Data is analyzed and interpreted but
  - “Whenever there is human judgment there is the potential for bias.”

# Contents

- We will address the following:
  - What is useful data?
  - How do we know what to measure?
  - What is a Business Objective?
  - Integrating the Concepts – Why Should We Be Interested in High Maturity/Six Sigma?
  - Summary

“In God we trust, all others bring data”

We have lots of Data so what could go wrong?  
Ever heard of Chaos Theory?

“the flap of a butterfly’s wings in Brazil can set off a  
Tornado in Texas”

A small change in initial conditions can produce a large  
and unexpected divergence in outcomes.

Can Big Data help us in our accuracies of predictions?

# Context of Data



- Therefore,
  - One must decide, what can one predict, and what can one not predict
- Inaccuracies in our data often come from our assumptions.
- We must determine what are **controllable** and **uncontrollable factors** in our data.

# Uncontrollable Factors



- Sometimes we attribute what happens to us to uncontrollable factors. These factors, such as innate ability (talents we are born with), luck, or other people (like our teachers), are not factors we can control. Attributing what happens to you to these factors can make you feel frustrated and out of control. Believing that the outcomes in your life depend on the actions or contributions of some outside force or person can have extremely negative consequences on your motivation

# Controllable Factors



- Sometimes we attribute what happens to us to controllable factors. These factors, such as acquired ability (abilities we develop, like good reading skills) or effort (the amount and type of effort we put into our studies), are factors that we can generally control. Attributing what happens to us to these factors helps us to feel in control.

## The Same Principles Exist in Your Business

The important point is that YOU ARE IN CONTROL. You can improve performance in much of your life by the simple choice of attributing results to controllable factors.

# What Is Useful Measurement All About?



- Statistics usually **sample** and not measure an entire population, since it is nearly impossible unless your population is small.
  - But sampling can lead to a forecast that resists considering out-of-sample problems. Evidence may not support what we ‘believe’ to be ‘true’ We are forced to acknowledge less than we thought we did or are willing to admit.
  - Personal and professional bias gets in the way and we confuse “out of sample” problems with “in sample”

# What Is Useful Measurement All About?



- Statistical and other quantitative methods are used, at the organizational and project levels, to **understand past and predict future** quality and process performance. **Are you predicting or forecasting?**
  - **Prediction: a definitive and specific statement about when and where (say an earthquake will happen) Such as “a major earthquake will hit Kyoto, Japan on June 28.”**
  - **Forecast: a probabilistic statement, usually over a longer time scale: there is a 60% chance of an earthquake in Southern California over the next 30 years.**
- “Probability can be seen as a waypoint between ignorance and knowledge” -Laplace
- Most of our business models rely on probabilistic inferences in lieu of exacting measurements.

# Prediction Is Not Management by Rear-View Mirror

- Many measurements are purely retrospective:
  - Do you know where you are (actual vs. plan)?
  - Do you know what corrective action to take?
- It is difficult to use these types of measurement results to answer the following questions:
  - Will you be successful?
  - What if you were to do something different?
    - How can I go from Forecasting to Predicting?



# Prediction

- Prediction involves the following qualities:
  - Variables; those **controllable factors**, which we have identified, tracked and analyzed as useful in predicting
  - Having these **known variables** and using them to hypothesize about the unknown variables (Bayes's Theorem)
  - Besides **controllable** and **uncontrollable** factors we need to understand independent and dependent variables.

# Prediction

- Prediction involves the following qualities:
  - Projects and individuals use statistical and quantitative methods in their **activities** to plan, monitor, and control progress against their objectives.
  - Organizations **use the resulting information** to understand process performance, understand variation, target areas for continuing improvement, and evaluate the impact of proposed improvements.
    - Sometimes managers see what they want to see and what is not really there.

# Prerequisites for Prediction



Before an organization can perform predictive activities, it has to have the following in place:

- the capability to gather and use data at all organizational levels, i.e., project members who
  - gather data on their own work
  - understand and use the data in planning and performing their work
    - Remember “If you do not know where you are, a map won’t help”
- project-defined processes that specify how and when data are gathered and ANALYZED (remember the A in MA)
- execution of the defined process consistently, where tailoring is handled in a controlled and disciplined fashion

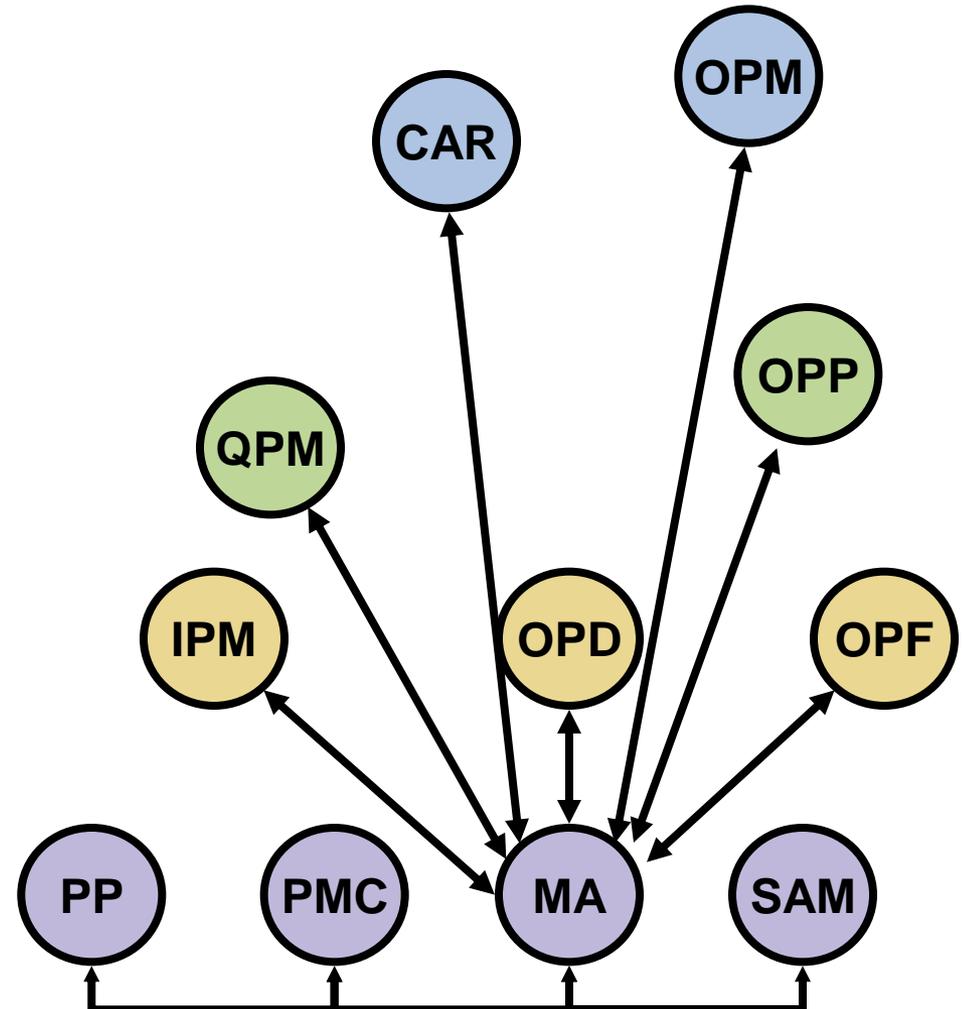
# What Is Useful Measurement All About?



- Organizations establish objectives for **quality and process performance** based on their Business Objectives (BO).
  - Hopefully it's not "Our organization's goal is for 90% customer satisfaction".
- These BO should be, no, *shall be* tied to Measurement Objectives.
  - How do we influence or *control* our Customer Satisfaction?
- Projects establish their objectives based on those of the organization and the **needs of customers** and end users.
  - Not just that someone thinks something should be counted somehow just to fulfill the requirements of ISO, CMMI or implement Six Sigma.

# ML 2 & 3 Provide an Important Foundation for High Maturity

- Maturity level 2 and 3 process areas do the following:
  - manage projects (e.g., estimating, planning, making commitments, monitoring, and controlling)
  - provide standard and defined processes
  - measure project or function progress (e.g., effort, cost, and schedule) and ways of normalizing such measures (e.g., through size and complexity measures) for use on other projects or functions
  - measure product quality, service quality, and process performance
  - ensure process compliance
  - establish organizational process assets that are aligned with organizational process needs and priorities



# Why Is Early Consideration of Quantitative Management Important?



- Measurements needed for performing quantitative management may (or may not) be different from the measurements needed for understanding your processes at lower levels of process maturity.
- To perform quantitative management, analysis and history of measurement data is required.
- Understanding the measurement needs for quantitative management may impact the existing measurement program.
  - What are you trying to prove? What is your hypothesis? What is keeping management or your CEO up late at night?

# Why Is Early Consideration of Quantitative Management Important?



## Goal Question Metric: What is the problem?

- When does it occur?
- Where is it occurring?
- Why is this problem occurring?
- What do we need to measure it?
- What is the Goal?
  - (What does the Customer Want?=Voice of the Customer)

# Why Is Early Consideration of Quantitative Management Important?

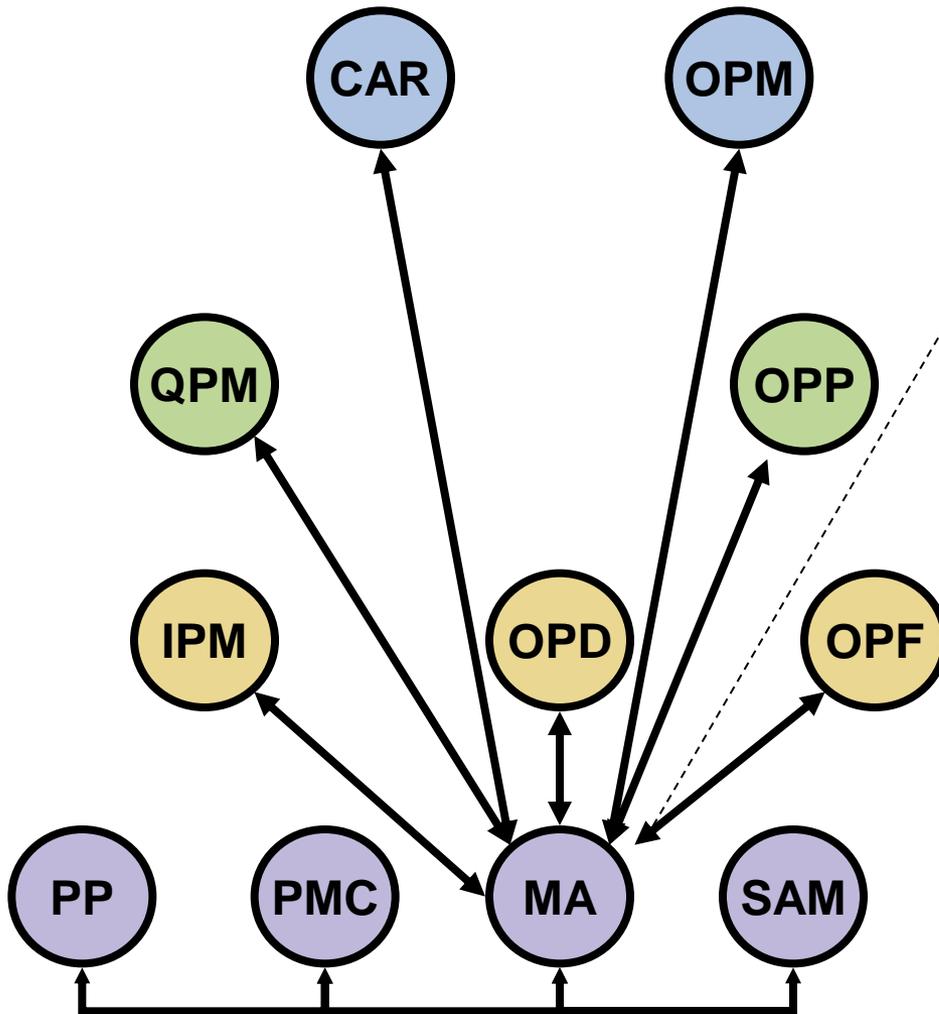


## Goal Question Metric

### When you figure out your Goal:

- What do we need to do?
- Who can do it?
- How can it be done?
- Can it be done?
  - (Process Capability= Voice of the Process)
- By when?
  
- And the most important Question: How will we know?

# Evolving to Statistical Process Control (SPC)– Measurement and Analysis (MA)



**MA – Develops and sustains a measurement capability that is used to support management information needs:**

provides measurement and analysis support for PP, PMC, and SAM

establishes organizational measures, measurement standards, and repositories

supports the establishment of organizational objectives, PPMs, PPBs, etc.

provides measures to be used to support root cause analysis and incremental and innovative process improvement

# Establishing a Foundation for Managing Quantitatively



- The organization is going from **qualitative** to **quantitative** information
- Defined processes build a foundation necessary for quantitative management, which does the following:
  - achieve consistency across the organization
  - provide a qualitative understanding of subprocesses and their relationships
  - provide a quantitative understanding that lacks insight into variation
  - explicitly defined measures, which enable the organization to accumulate **meaningful** data across specific contexts

# Stability and Capability



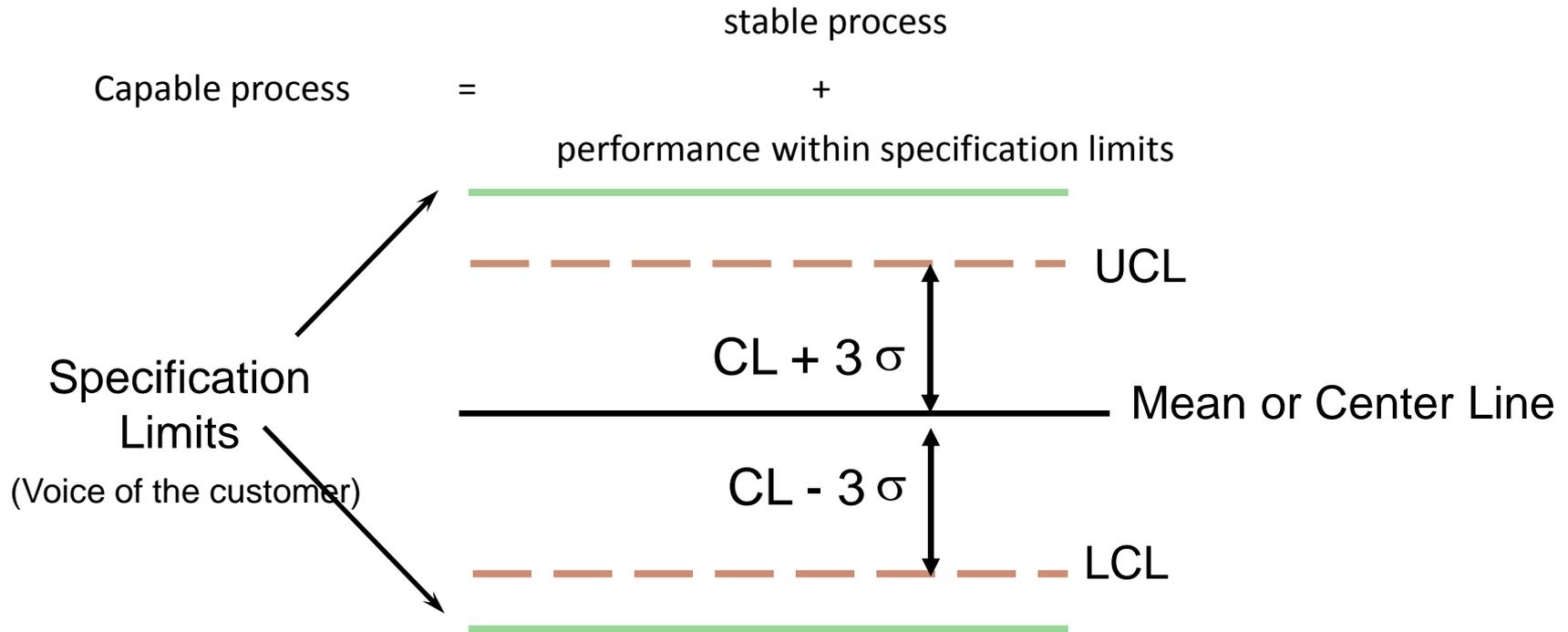
- Stability
  - Is the process being managed / behaving predictably?
  - Business value: foundation for estimating (predicting) and making commitments
- Capability
  - Is the process capable of delivering products that meet requirements?
  - Does the performance of the process meet the business needs of the organization?
  - Business value: foundation for making commitments

# Stable Process

- A process that is in control
- The state in which all special causes of process variation have been removed and prevented from recurring so that only the common causes of process variation remain
- Stability of a process depends on the following:
  - sufficient support (e.g., process description, measures, tools, and training) for the process
  - faithful execution of the process
  - a good fit of the process into its operating context

# Capable Process

- A process that can satisfy its specified product quality, service quality, and process-performance objectives



You cannot get Porsche performance from a Volkswagen.

# SPC is Management with a Navigation System

- Measurement is used routinely by those who are proactive:
  - Are you confident you know where you are, where you are going, and your performance outcomes (quantitative understanding)?
  - Do you understand variation?
- Use measurement results to answer the following questions:
  - Will you be successful?
  - Are your customer's expectations and what you are capable of doing aligned?
  - What if you were to do something different?



# Statistical and Quantitative Management



- **Statistical management**
  - Management involving **statistical thinking** and the correct use of a variety of statistical techniques, such as run charts, control charts, and confidence intervals.
- **Quantitative management**
  - The process of using data **from statistical and other techniques** to manage the project, enabling you to do the following:
    - predict whether the project will be able to achieve its quality and process-performance objectives **(not just forecasts)**.
    - identify what corrective action (if any) **SHOULD** be taken or even what **CAN** be taken. (Insert Accenture Story Here).

# Variation

- All processes have variation in their results.
- Understanding variation is the basis for management by fact and systematic improvement:
  - understand the past quantitatively
    - Do not throw out your data. Ignoring data is often a tip-off that the forecaster is overconfident, or is overfitting their model.
  - control the present quantitatively
  - predict the future quantitatively
    - Short term vs. long term variance

# Improvement Requires Process Understanding



- Real process behavior must be understood before making conclusions about the performance of products or services.
- Ask these questions to find out about real process behavior:
  - What is the normal or inherent process variation?
  - What differentiates inherent from anomalous variation?
  - What is causing the anomalous variation?
- **Statistical Process Control** provides the methods and tools needed to measure and analyze process behavior, draw conclusions, and drive improvement.

# Improvement Requires Process Understanding



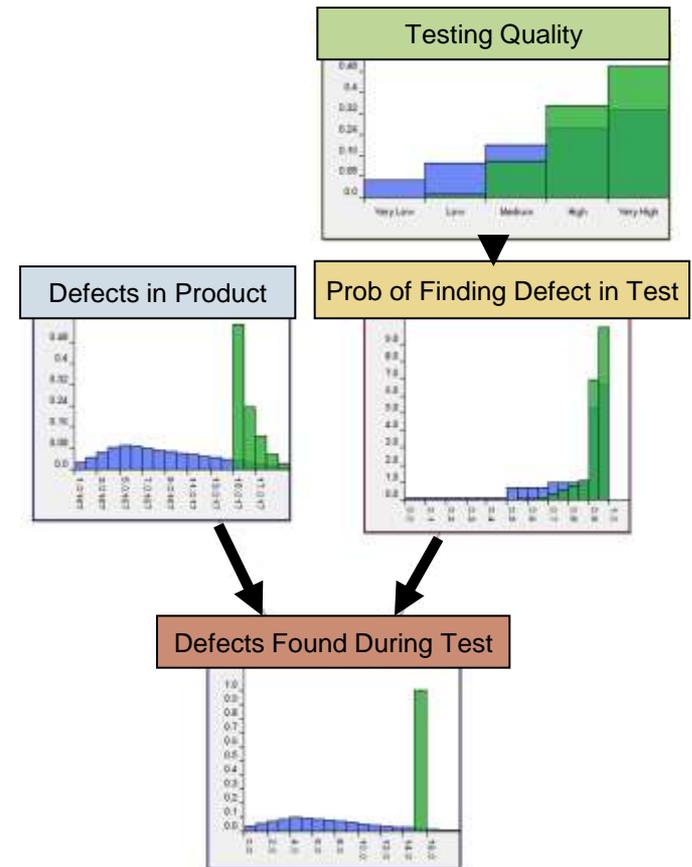
- The goal in formulating a prediction is to work out the root cause: **Why, why, why?**
- Figuring out what is truly causal and what is correlation is difficult to do. **“Correlation does not imply causation”**
  - For instance, ice cream sales and forest fires are correlated because both occur more often in the summer heat. But there is no causation: you do not light a patch of the Montana brush on fire when you buy a pint of Haagen-Dazs.
- We have to determine that there are independent variables and dependent variables, inputs and outputs to the process.

# Prerequisites for SPC

- The following prerequisites exist for SPC:
  - stable processes
  - capable processes
  - quantitatively managed processes
- This foundation allows the organization to be able to react in a disciplined manner to change (e.g., customer, technology, environment, and legal).

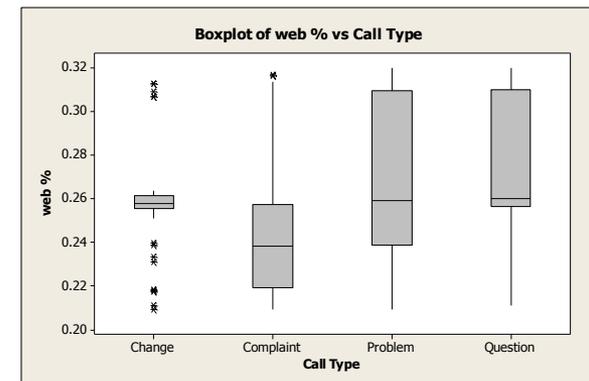
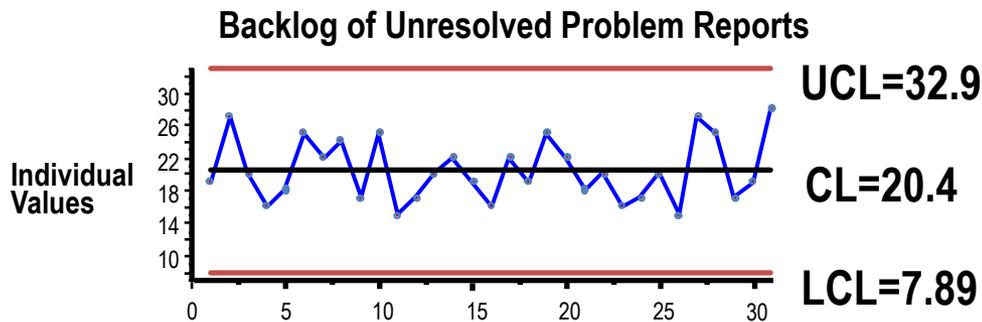
# Optimizing Organizations

- All levels of the organization are involved in improvement activities.
- Organizations at level 5 understand the balance between stability and change. They have the capability to do the following:
  - predict impacts of changes to the process and the return on investment (ROI)
  - measure and determine effects of the change



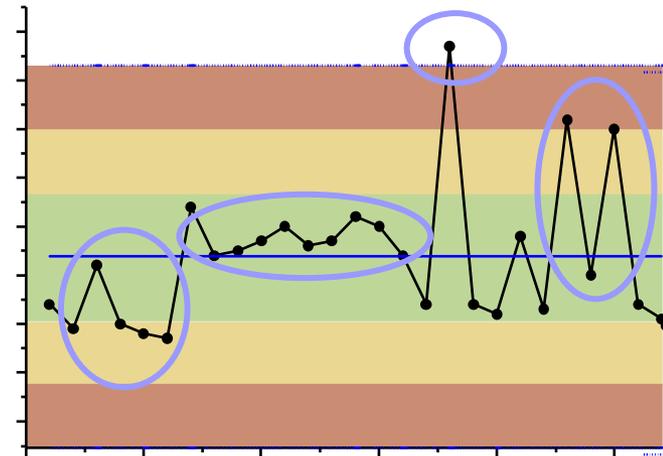
# Common Causes of Variation

- Common causes are the sources of variation of a process that exist because of **normal and expected interactions** among the components of a process (i.e., people, machines, material, environment, and methods).
- Common causes represent the **noise of the process**.
- Level 5 addresses common causes of process variation.



# Anomalous Variation: Special Causes of Process Variation

- **Special causes of process variation (aka assignable cause)**
  - A source of variation that is specific to some circumstance and not an inherent part of a process.
    - Is the variation in process performance due to events that are **not part of the normal process**?
    - Does it represent **sudden or persistent abnormal changes** in one or more of the process components?
    - Are there **signals** that the process may not have behaved as it should have? If so, it is time to understand why not and take corrective action if necessary.



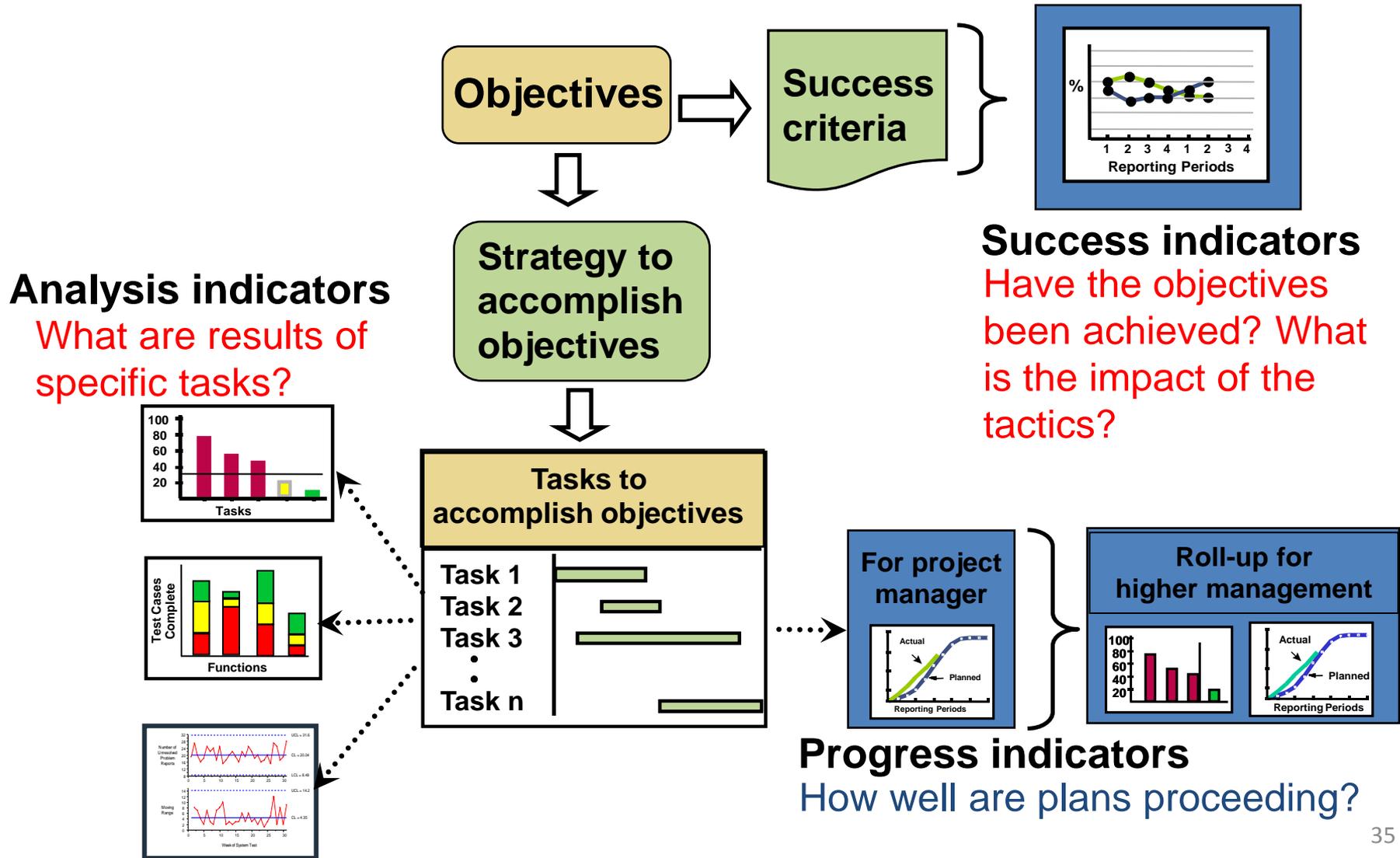
# Summary

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## Context of Measurement:

Integrating the Concepts – Why Should We Be Interested in SPC?

# Improvement Is Objective Directed



# Context for SPC

- Organizations can do the following:
  - gather and use **data** at all levels of the organization
  - provide **insight** into the operation of an organization and its processes based on data and statistical analyses
  - use statistical and other quantitative methods at the organizational, project, and subprocess levels, to do the following:
    - understand **past** quality and process performance
    - target areas for **improvement** and evaluate the impact of proposed improvements
    - predict **future** quality and process performance
  - focus on **innovation and learning** to be more competitive

**Overall, SPC Enables Better  
Achievement of Business Goals**