Measuring and Using Data for Improvement

Presented by: Brandon Bennett

Agenda

- Three Faces of Performance Measurement
- Selecting Measures
- Defining Measures
- Family of Measures
- Interpreting Data, Creating Information

Aspect	Improvement	Accountability	Research
Aim	Improvement of care	Comparison, choice, reassurance, spur for change	New knowledge
Methods: • Test Observability	Test observable	No test, evaluate current performance	Test blinded or controlled
• Bias	Accept consistent bias	Measure and adjust to reduce bias	Design to eliminate bias
• Sample Size	"Just enough" data, small sequential samples	Obtain 100% of available, relevant data	"Just in case" data
• Flexibility of Hypothesis	Hypothesis flexible, changes as learning takes place	No hypothesis	Fixed hypothesis
• Testing Strategy	Sequential tests	No tests	One large test
• Determining if a change is an improvement	Run charts or Shewhart control charts	No change focus	Hypothesis, statistical tests (t-test, F-test, chi square), p-values
• Confidentiality of the data	Data used only by those involved with improvement	Data available for public consumption and review	Research subjects' identities protected

Lief Solberg, Gordon Mosser and Sharon McDonald *Journal on Quality Improvement* vol. 23, no. 3, (March 1997), 135-147.

Brainstorming Activity

- What aspects of a wedding venue would be important to you if you were getting married?
- List those key things you would consider in deciding between multiple venues
- Share your list with those near you

Potential Attributes of Interest

- Size
- Location
- Reputation
- Indoor/Outdoor
- Security
- Catering
- Proximity
- Air Conditioning
- Many others…

Cross over activity

- With those next to you share personal experiences with the healthcare system either as patients and family members or as care providers
- Using real life examples –
  - What were the things that made the care experience enjoyable?
  - What were the things you strongly disliked about the care you, your family member or a patient received?

Defining Quality

- Quality is not one thing

- Walter Shewhart defined quality broadly as the ‘goodness’ of something

Defining Quality

The Institute of Medicine defines quality using these 6 terms:

1. Equitable
2. Safe
3. Timely
4. Affordable
5. Efficient
6. Patient Centered

7. Accessible

But what do these really mean?

What is an Operational Definition?

Walter Shewhart wrote: “Being free from grease is not rigorously definite; to some people it means clean enough to eat on; to the experimental physicist it may in some instances mean baked out at a high temperature under vacuum.”

Provost and Murray

Operational Definition

- “If the data are collected differently by different people, or differently each time the data are collected, it makes it hard to know whether changes in the data are due to the changes tested or from inconsistencies in data collection. To learn from data, you need an agreement as to how the data will be collected in order to maintain data collection consistency. An **operational definition** is the term used for such an agreement. An operational definition is one that gives communicable meaning to a concept (such as error, waiting time, and appropriate care) by specifying how the concept is applied within a particular set of circumstances. An important component of an operational definition is the statement of the measurement process used.”

Provost and Murray

Operational Definition

1. A method of measurement or test
   - Is there a clear process, what equipment, how frequently, to what discretion (whole number, decimal places), etc.
2. A set of criteria for judgment
   - What constitutes an error, a fall, a delay, etc.

Aspirin at Arrival Example

- Definition includes headers:
  - Description
  - Rationale
  - Type of Measure
  - Improvement noted as
  - Numerator Statement
    - Included Populations
    - Excluded Populations
    - Data Elements
  - Denominator Statement
    - Included Populations
    - Excluded Populations
    - Data Elements
  - Risk Adjustment
  - Data Collection Approach
  - Data Accuracy
  - Measure Analysis Suggestion
  - Sampling
  - Data Reported As

Notice the level of detail for a single measure!

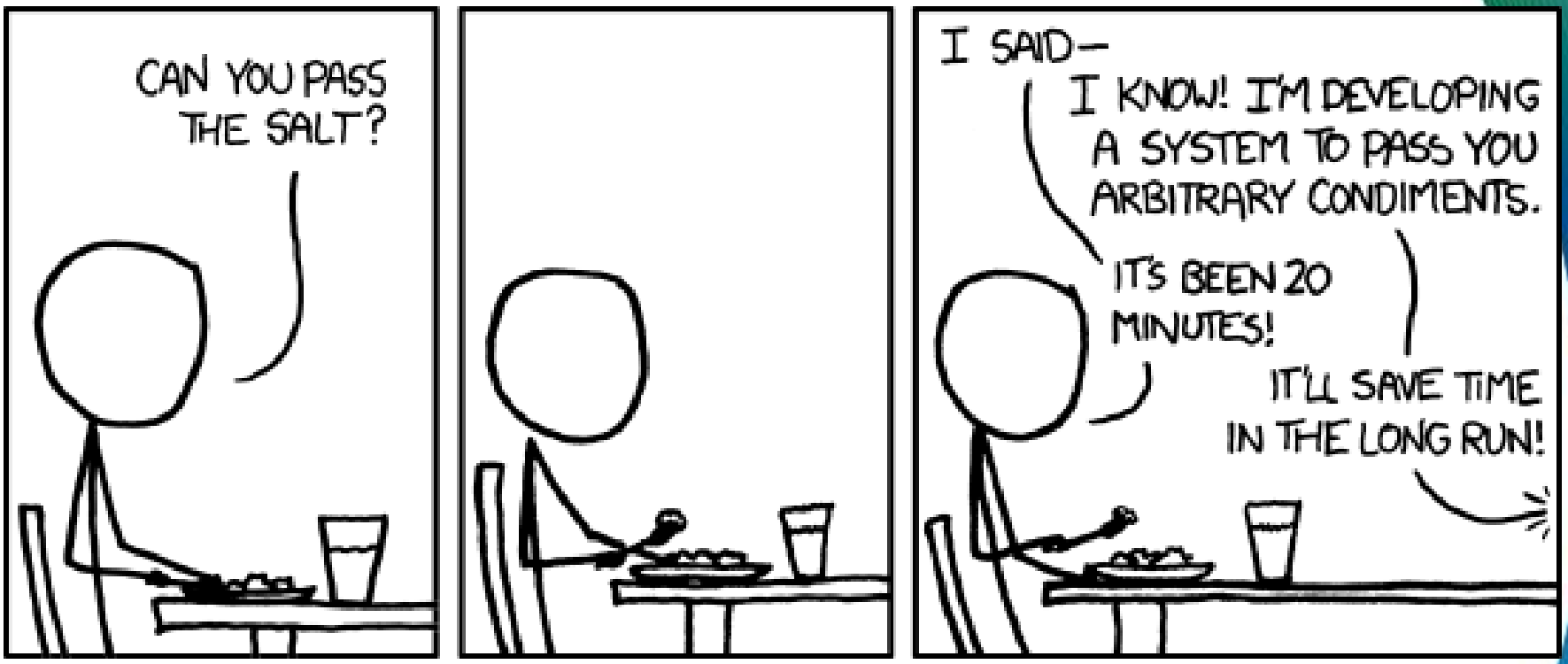
Provost and Murray

Defining Quality in our workplaces

- Choose 2 measures you work with regularly
- Spend 5 min
- How are the measures you use defined?
- Do they have this level of sophistication?
- Can you identify specific instances where generalities or vagueness have caused confusion/debate about measurement regarding your work?
- Has the team you work with considered more rigorous definitions?

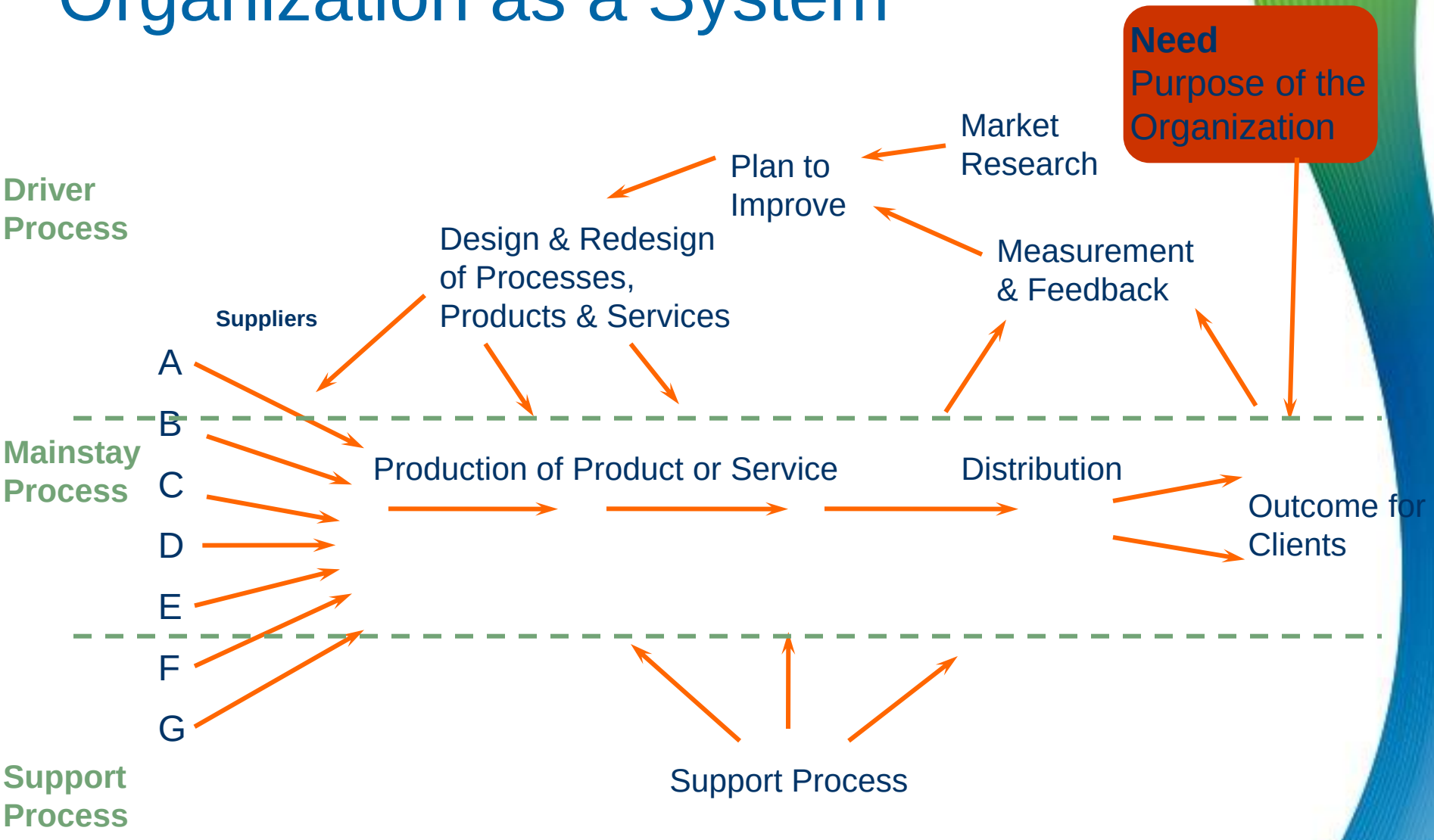
How can we develop a measurement system to help us understand when improvement is needed?

Adapted from API – QBS – 1999


CAN YOU PASS THE SALT?
I SAID—
I KNOW! I'M DEVELOPING A SYSTEM TO PASS YOU ARBITRARY CONDIMENTS.
IT'S BEEN 20 MINUTES!
IT'LL SAVE TIME IN THE LONG RUN!

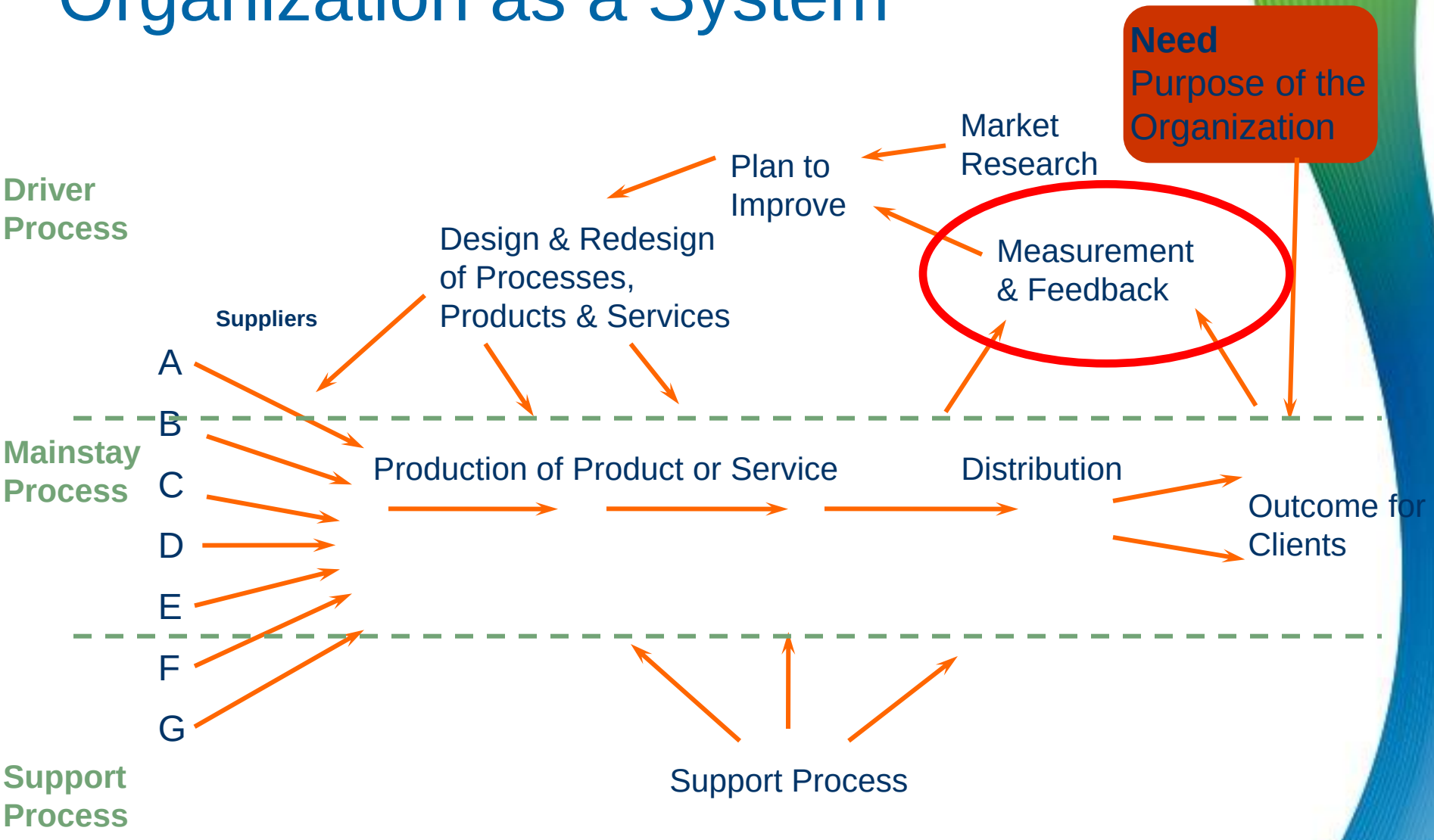
XKCD

Organization as a System



Deming, Out of the Crisis, pg. 4

Organization as a System



Deming, Out of the Crisis, pg. 4

What are Whole System Measures?

- Think of them as vital signs for the system of interest

- Take into account the concerns of multiple stakeholders in the system as well as the purpose of the system

- Who might be stakeholders in our systems?

General Categories

- Patients/Customers
- Employees
- Shareholders/Owners
- Operations
- Broader Environment (Community)

A family of whole system measures

Give us knowledge of:

- Past Performance
- Present Performance
- Future performance
- Indications that a problem is occurring and where

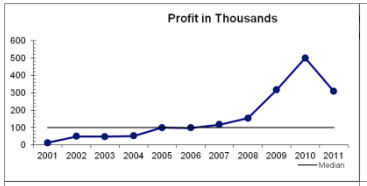
What information do they provide?

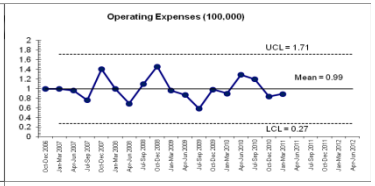
Three things:

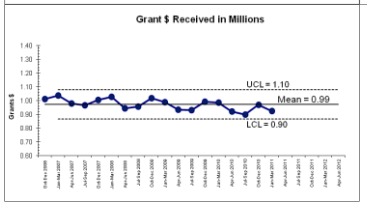
1. They display the present performance of the system to managers and administrators
2. They take advantage of data over time to provide predictions of the systems future performance in the near term
3. Provide insight into interaction effects and unintended consequences across the system when changes are made in one part of the system or when its environment begins to change

How are they used?

Business







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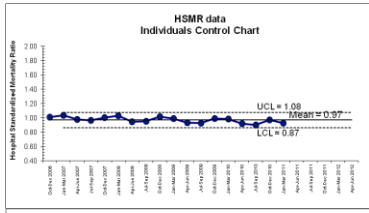
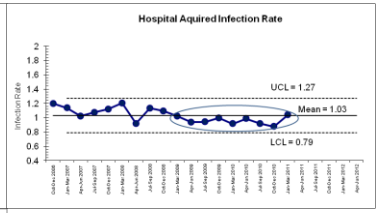
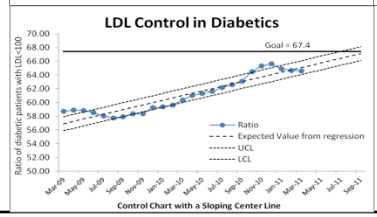
Patient/Customer







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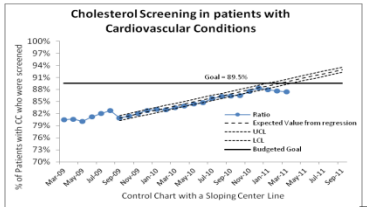
Operations Perspective



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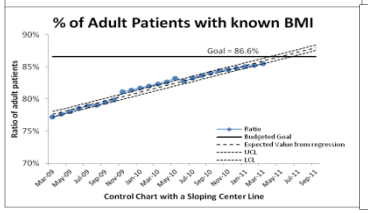
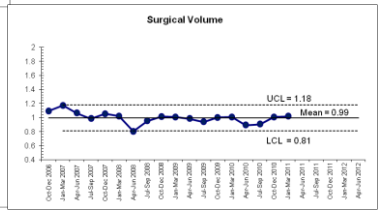
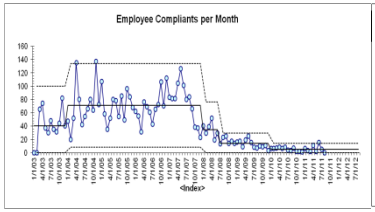
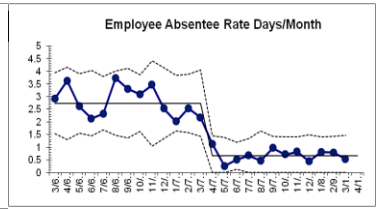




Employee





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In Collaboration with Ex Libris

Hamad Medical Corporation

Institute for Healthcare Improvement

How do we develop them?

- Start with the Purpose of the Organization – what measures flow directly from what the system is intended to accomplish?
- Consider the systems stakeholders – what measures would be meaningful to them in assessing their level of satisfaction with the system (Business, Operationally, Patient/Customer, Employee)

Key ideas to consider

- Any measure in isolation is not a good measure of the system and can easily be criticized
- A family of whole system measures will not be complete – it is intended to be useful but not comprehensive
- The group of measures selected should be examined collectively

Break Out

- Spend sometime thinking through what might be some important measures to include in a list of Whole System Measures for your system or microsystem

- Work with your neighbors, support each other and try to brainstorm measures that touch all stakeholders and the driver, mainstay and support sections of your system

Once we have a measurement system how do we convert data into useful information?

Adapted from API – QBS – 1999

Shewhart's Theory of Variation

- **Common Causes**—those causes inherent in the system over time, affect everyone working in the system, and affect all outcomes of the system
  - Common cause of variation
  - Chance cause
  - Stable process
  - Process in statistical control

- **Special (Assignable) Causes**—those causes ***not*** part of the system all the time or do not affect everyone, but arise because of specific circumstances
  - Special cause of variation
  - Assignable cause
  - Unstable process
  - Process not in statistical control

Balancing the Mistakes Made in Attempts to Improve

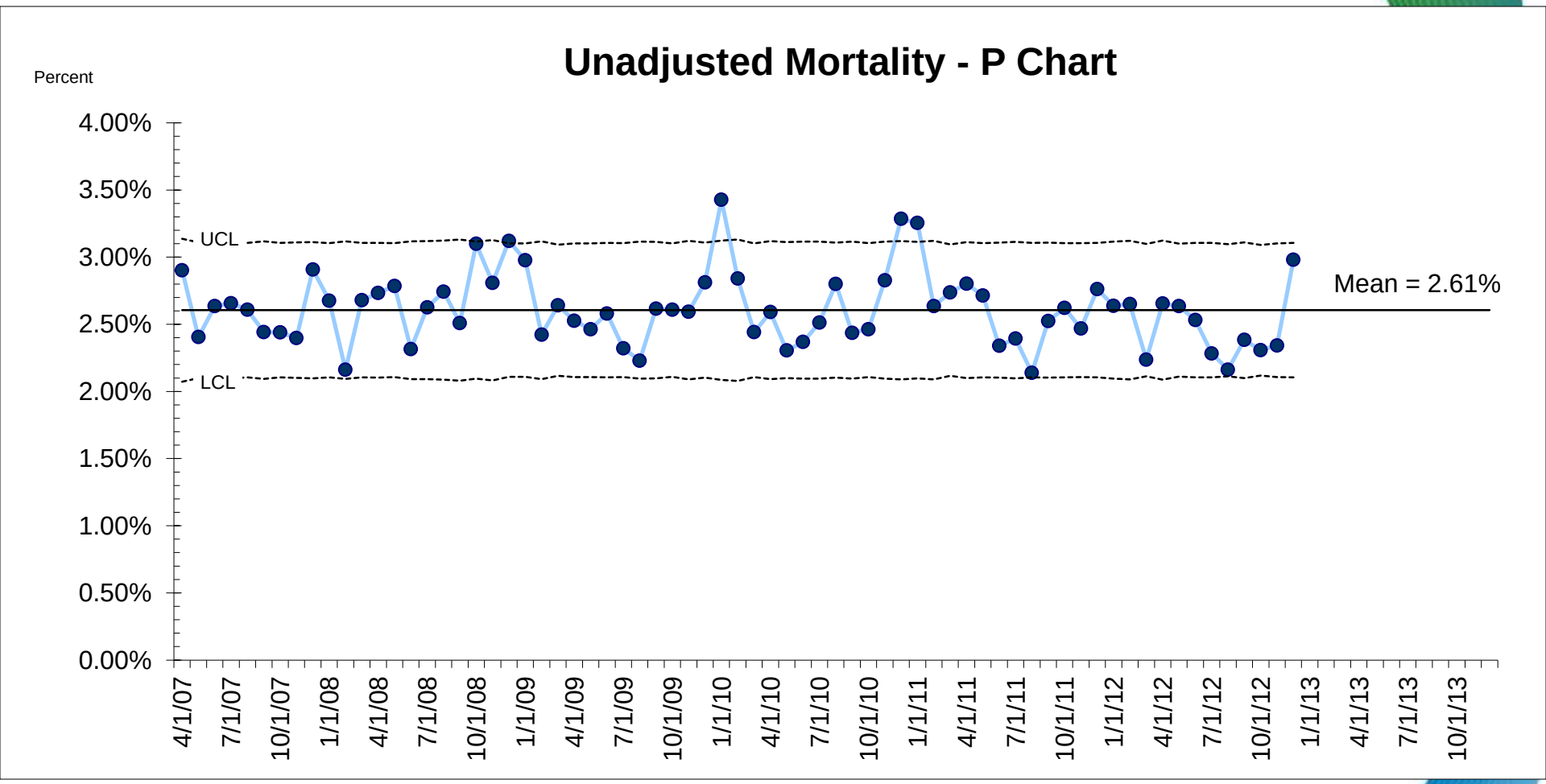
ACTION	ACTUAL SITUATION: When NO Special Cause is occurring in System	ACTUAL SITUATION: When a Special Cause is occurring in System
Take action on individual outcome (treat special)	-$ (Mistake 1)	+ $
Treat outcome as part of system; work on changing the system (treat common)	+ $	- $ (Mistake 2)

Provost and Murray, p4-12

Shewhart Control Chart

- A statistical tool used to distinguish between variation in a measure due to common causes and variation due to special causes
  - Plots a stream of data
  - Most often in time order
  - Includes center line
  - Uses formula to determine upper and lower 3 sigma limits

Provost and Murray


Unadjusted Mortality - P Chart
Percent
4.00%
3.50%
3.00%
2.50%
2.00%
1.50%
1.00%
0.50%
0.00%
UCL
LCL
Mean = 2.61%
4/1/07
7/1/07
10/1/07
1/1/08
4/1/08
7/1/08
10/1/08
1/1/09
4/1/09
7/1/09
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How do you use Shewhart Control Charts?

- Start with a question – what are you trying to understand? What measure and statistic will provide insight?
- Decide on a method of data collection as specified in your operational definition (sampling size, frequency, procedure, etc.)
- Decide on relevant sub-groups to be examined (subject matter expertise needed)
- Select the appropriate chart for analysis
- Look for indications of special causes present in the data

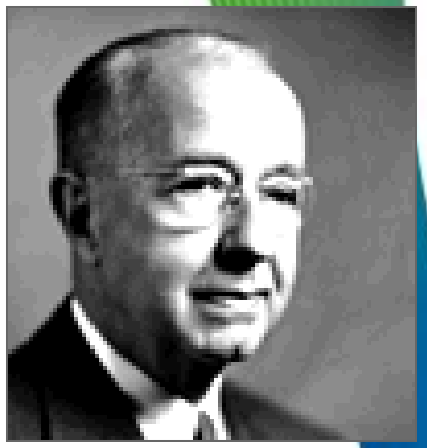
Shewhart's and Deming's rationale for the use of Shewhart's three-sigma limits

1. The limits have a basis in statistical theory

2. The limits have proven in practice to distinguish between special and common causes of variation

3. In most cases, use of the limits will approximately minimize the total cost due to overreaction and under reaction to variation in the process

4. The limits protect the morale of workers in the process by defining the magnitude of the variation that has been built into the process.



Provost and Murray

Critical Elements

- Control Charts are used:
  - Prospectively (Analytically)
  - For the purpose of management
  - Have an economic component to minimizing expenditure of resource
  - Provide insight into performance in real time
  - Passively to Monitor or Actively when generating change

Some authors overemphasize the statistical basis for Shewhart charts

"It is wrong (misuse of the meaning of a control chart) to suppose that there is some ascertainable probability that either of these false signals [fail to identify or cause investigation where there is not one] will occur. We can only say that the risk to incur either false signal is very small." (p. 176)

It is a mistake to suppose that the control chart furnishes a test of significance – that a point beyond a control limit is "significant." This supposition is a barricade to understanding (p. 177)

Deming, W. E., *The New Economics, Second Edition, page 176-7, MIT Center for Advanced Studies, 1994.*

“You can not fatten a cow by weighing it”

Proverb

Scientific Method

- Analytic in nature with the focus on the development/discovery of new knowledge

- Bruce Ratcliffe

Bruce Ratcliffe

Table Time

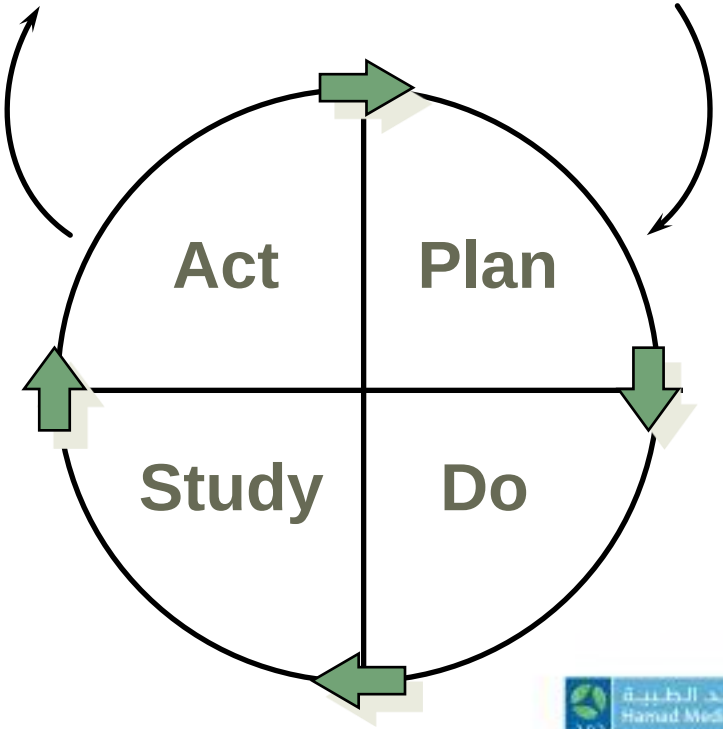
- With the person next to you spend five minutes exchanging stories of when you learned from failure
  - What was the context?
  - How did you fail?
  - What did you learn?
  - How have you acted differently since then?

Model for Improvement

What are we trying to accomplish?

What change can we make that will result in improvement?

How will we know that a change is an improvement?



Langley, et al.

This comparison/examination generates knew knowledge about what change might work or what modification is needed

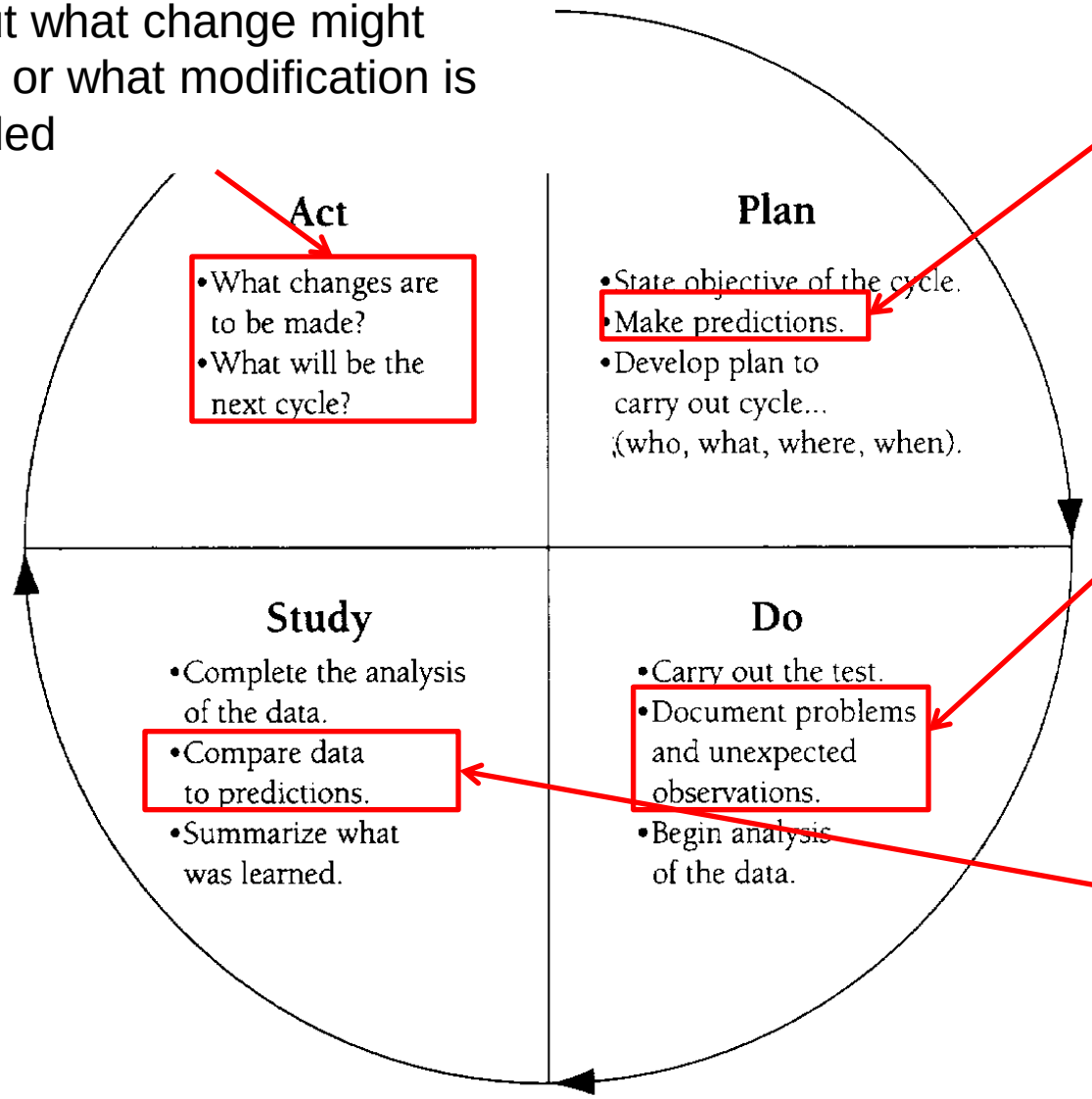


Figure 4.1. Elements of the PDSA Cycle.

Langley et. al

PDSA Learning Cycle:

Most important part of any PDSA cycle is the Prediction as it represents current knowledge about how a process or system will behave in the future.

Inductive learning begins here

When predictions are compared with actual outcomes they can reveal gaps in our current understanding of why a process or system behaves the way it does

Summary of Key Points

- Know and communicate the purpose of the information you present
- Carefully define what quality means to you and how you can assess it along several dimensions
- Understand measuring across the whole system
- Distinguish between common and special cause variation within a measure
- When improvement is needed apply the Model for Improvement as a mechanism for learning your way into solutions

Thank you

- Questions?

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