What is Statistical Thinking?

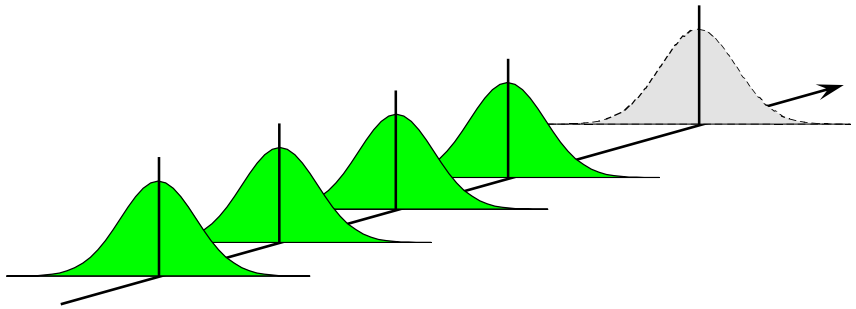
Statistical Thinking is a philosophy of learning and action based on the following fundamental principles:

- All work occurs in a system of interconnected processes
- Variation exists in all processes, and
- Understanding and reducing variation are keys to success

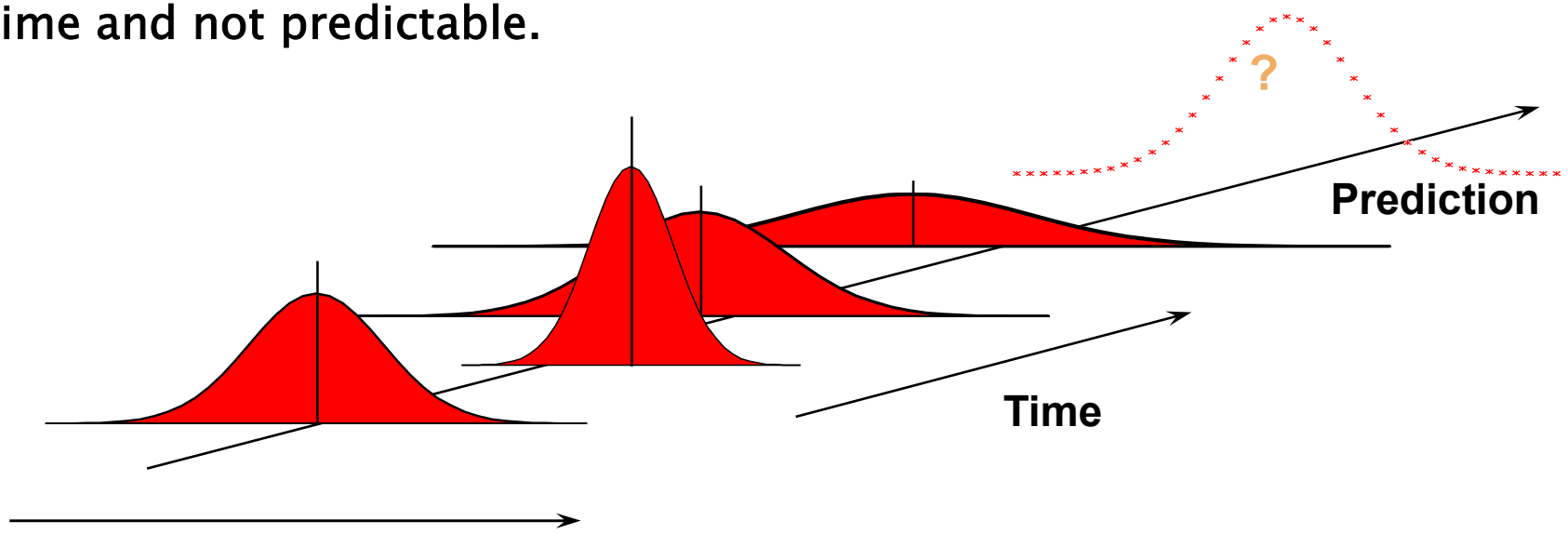
Source: Glossary of Statistical Terms, ASQ Quality Press

Understanding Common & Special Causes

If common causes of variation dominate, the output of a process forms a distribution that is stable and predictable over time.



If special causes of variation dominate, the output of a process is not stable over time and not predictable.



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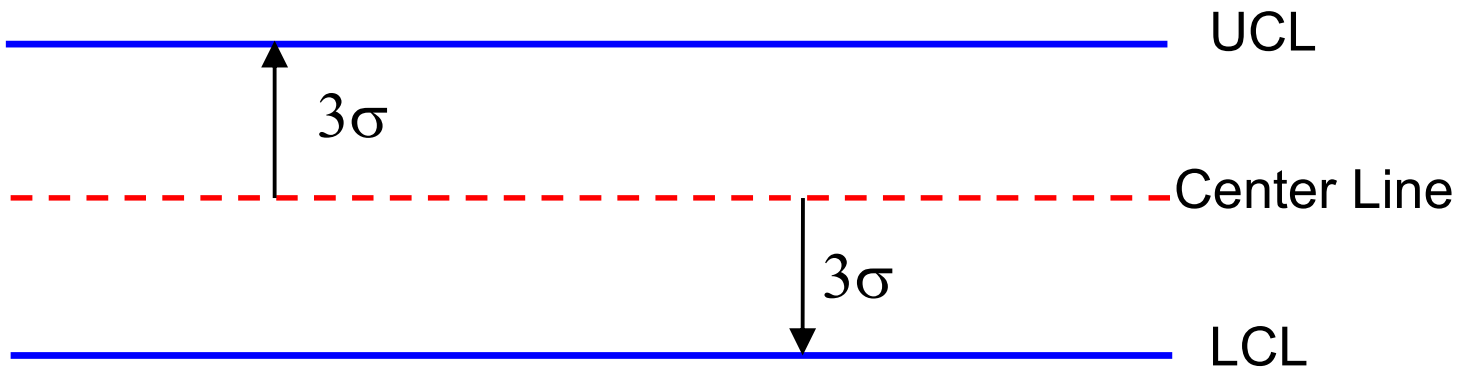
How to distinguish Common & Special Causes?

Process Behavior Chart (BPchart)

- A point outside the control limits is a signal of a special cause, which indicate the need for action
- If all the points fall with the control limits, then the process is dominated by common causes only (other rules for special cause may also apply)



Common & Special Cause – Why Bother?

Customers don't care whether problems are from common cause or special cause. They just want them fixed.

Important to distinguish between common and special cause because the improvement strategy differs

Cause of variation vs Improvement methods

Causes of the Variation

Common Cause Variation

- Systemic, chronic variation
- Affects every result
- Often thought of as “random variation”
- A process is stable, predictable, and in-control when only common cause variation exists in the process.

Special Cause Variation

- Sporadic, exceptional variation
- Affects the results either:
  - In a one-time, temporary way (e.g., an outlier)
  - In a one-time, permanent way (e.g., a step change)
- A process exhibiting special cause variation is said to be out-of-control and unstable

Improvement Strategy

Common Cause Variation

- All the data are relevant, not just the “bad” data
- a fundamental change in process is needed to achieve different results
- Systematic stratify, disaggregate, design
- Don’t react to single event but to process.

Special Cause Variation

- Work to get timely data
- Immediately search for the special causes and take immediate
- Develop preventative device to prevent the “bad” special causes
- Learn from the “good” special cause and change the process to the better

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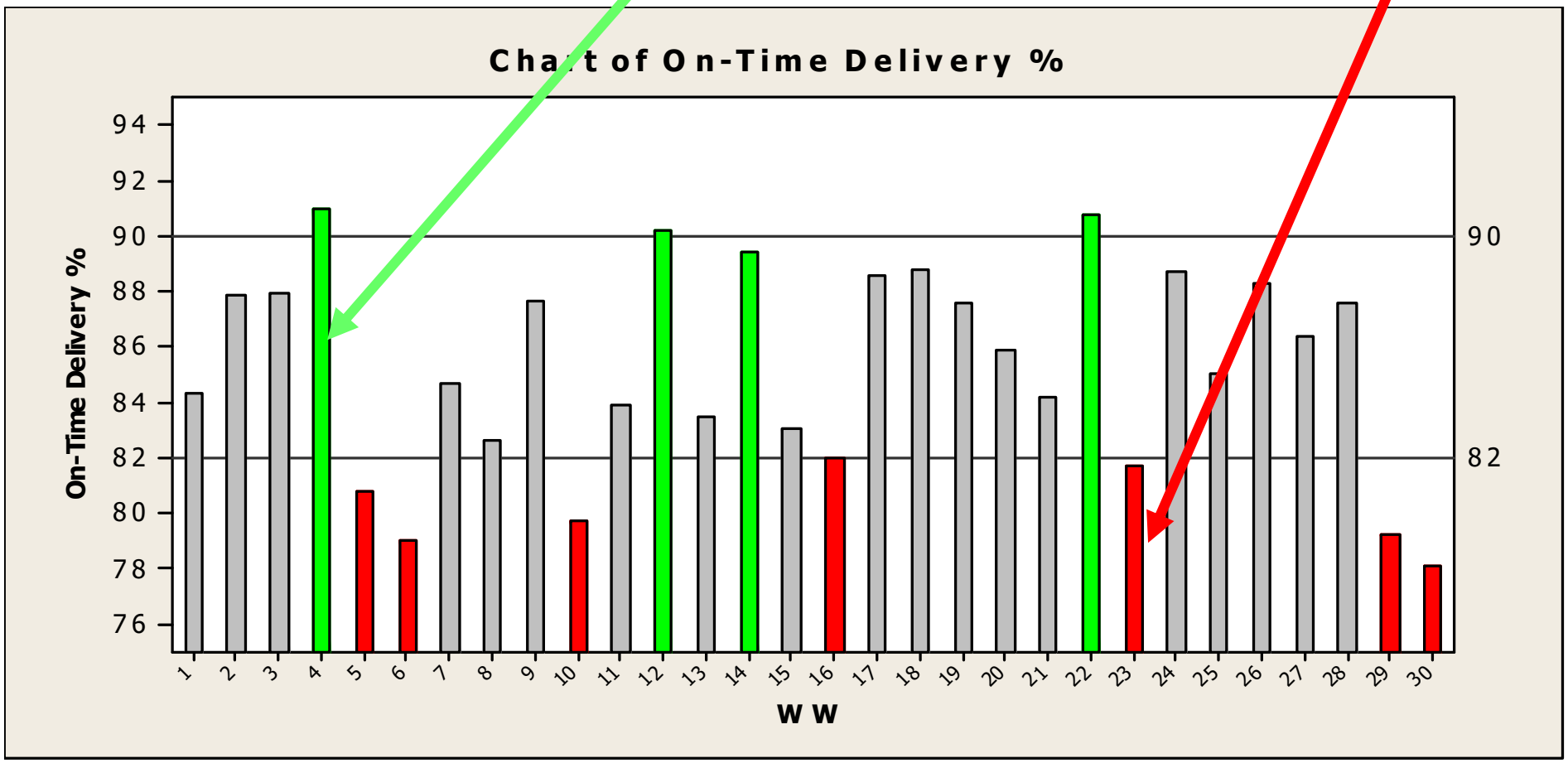
Decision based on "DATA"

We learn false lessons and put in false solutions.

Good work!!

What happened??!!



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Statistical Thinking vs Methods