"Data Insanity": The Silent Improvement Killer

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Part 1: Systems and processes…and statistical / data implications

NEEDED Realizations

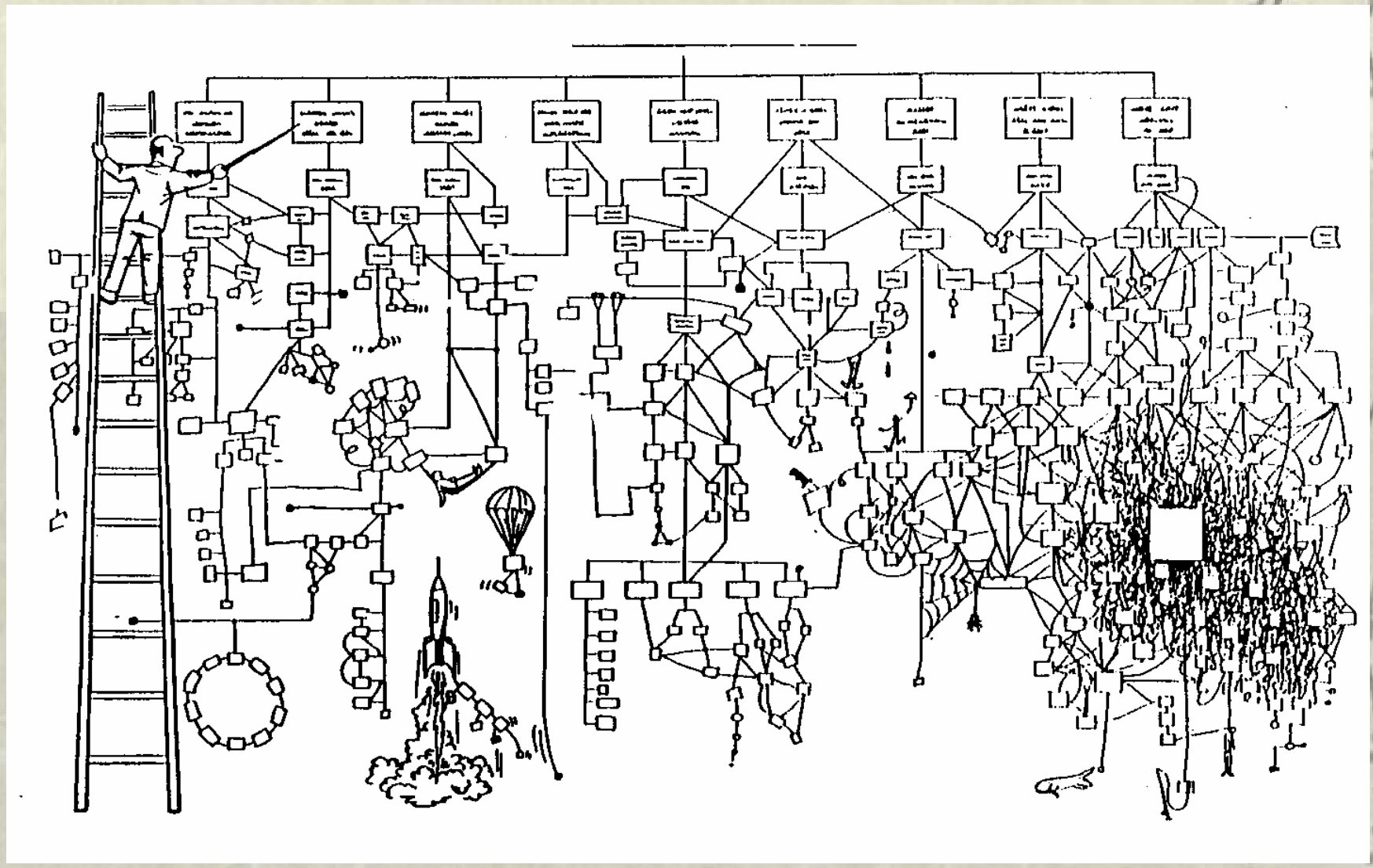
- People don't need statistics…they need to SOLVE THEIR PROBLEMS…through statistical *thinking*
- Whether or not people understand statistics, they are ALREADY using statistics
- It's NEITHER "number crunching" nor "massaging" reams and reams of data, but…
- ***Simple, efficient design, collection & analysis of data***

NOT "statistics" but "statistical thinking"

- **One major objective: Alleviate confusion and show common THEORY to TQM, CQI, Six Sigma, Lean, Lean Six Sigma, "TOYOTA Lean," [alphabet soup du jour]**

- ***Data "sanity" is fundamental to a culture of safety—There is NO choice!***

KEY framework: ALL Work is a Process!



“Microsystems”…“Complex Adaptive Systems”…

Key to Process-oriented thinking

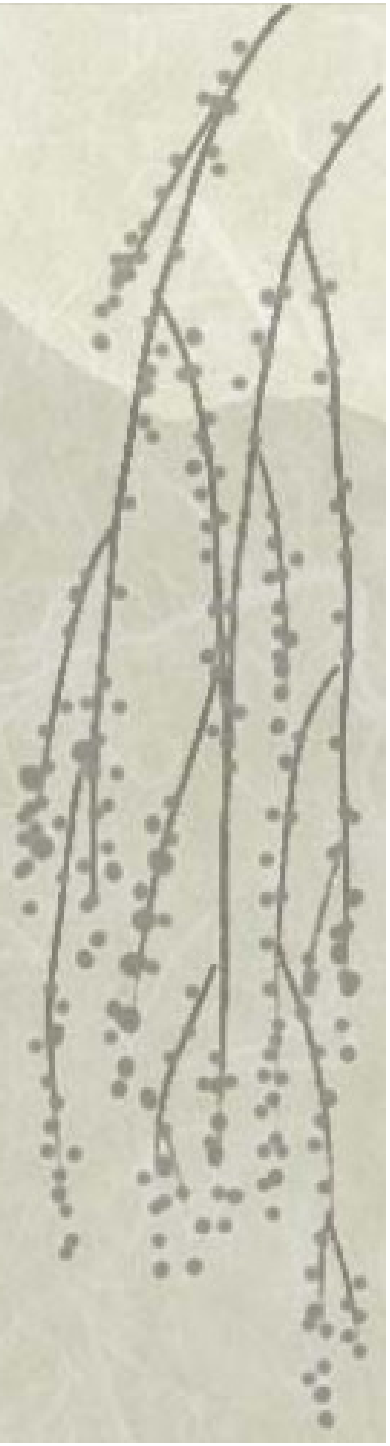
- Your current processes are *perfectly* designed to get the results they are already getting
- Corollary: Insanity is doing things the way you've always done them while expecting different results
  - Are you perfectly designed to get what you are observing (even if you "shouldn't")?

TQM, Six Sigma, Lean: In a nutshell

- ***Obsession* with waste… process thinking … using data… teamwork**
  - ***ALL work is a process,***
  - ***Toyota lean—obsession with "time" as inventory and process "flow"***
  - ***Improving quality = Improving Processes (Better Prediction)***

It's not about 'costs!'

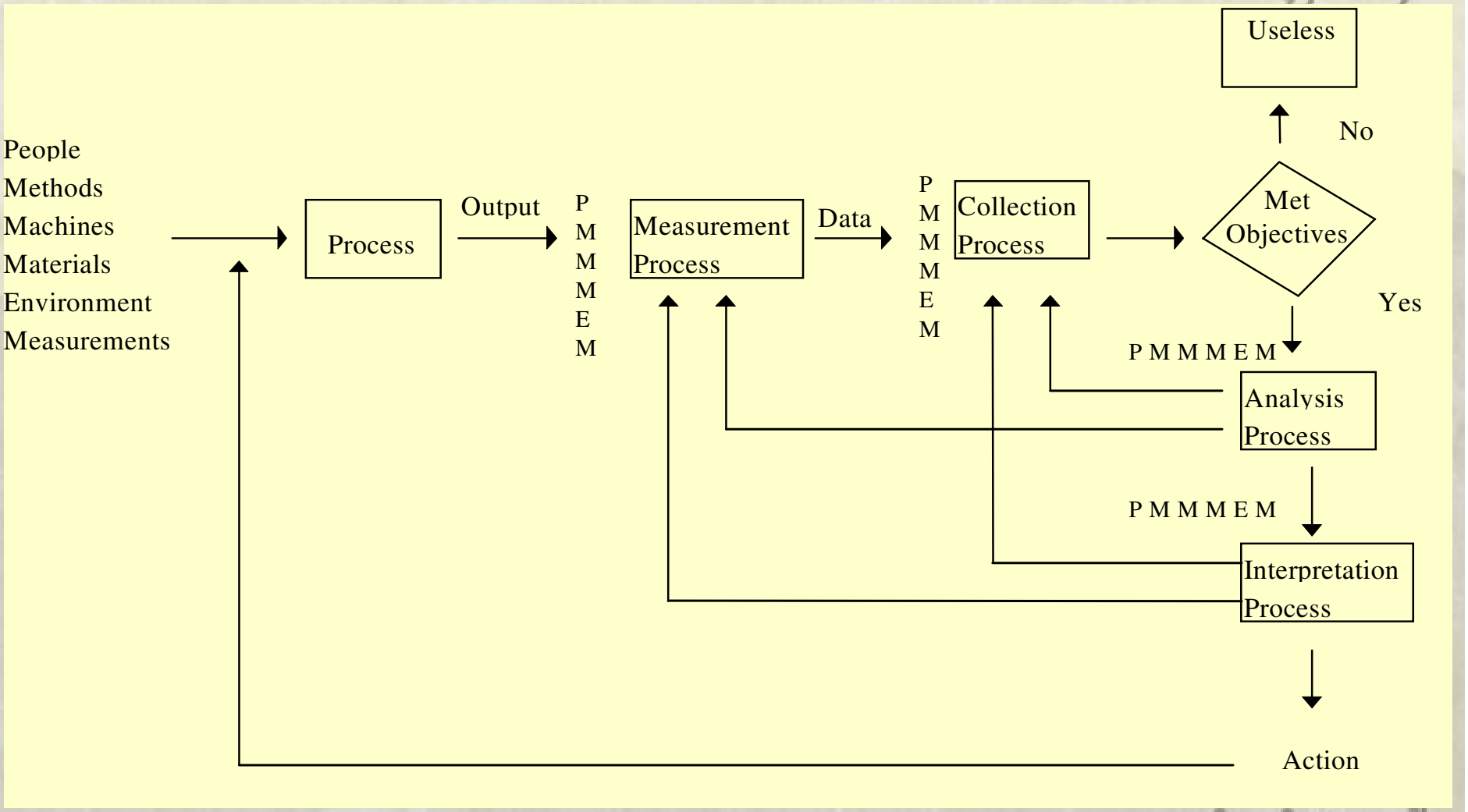
- ***Confusion…***
- ***Conflict…***
- ***Complexity…***
- ***Chaos***



It ALL Boils down to…

- …understanding *variation*,
  - I will expand your concept of variation
- …reducing *inappropriate* and *unintended* variation

Use of Data as a Process

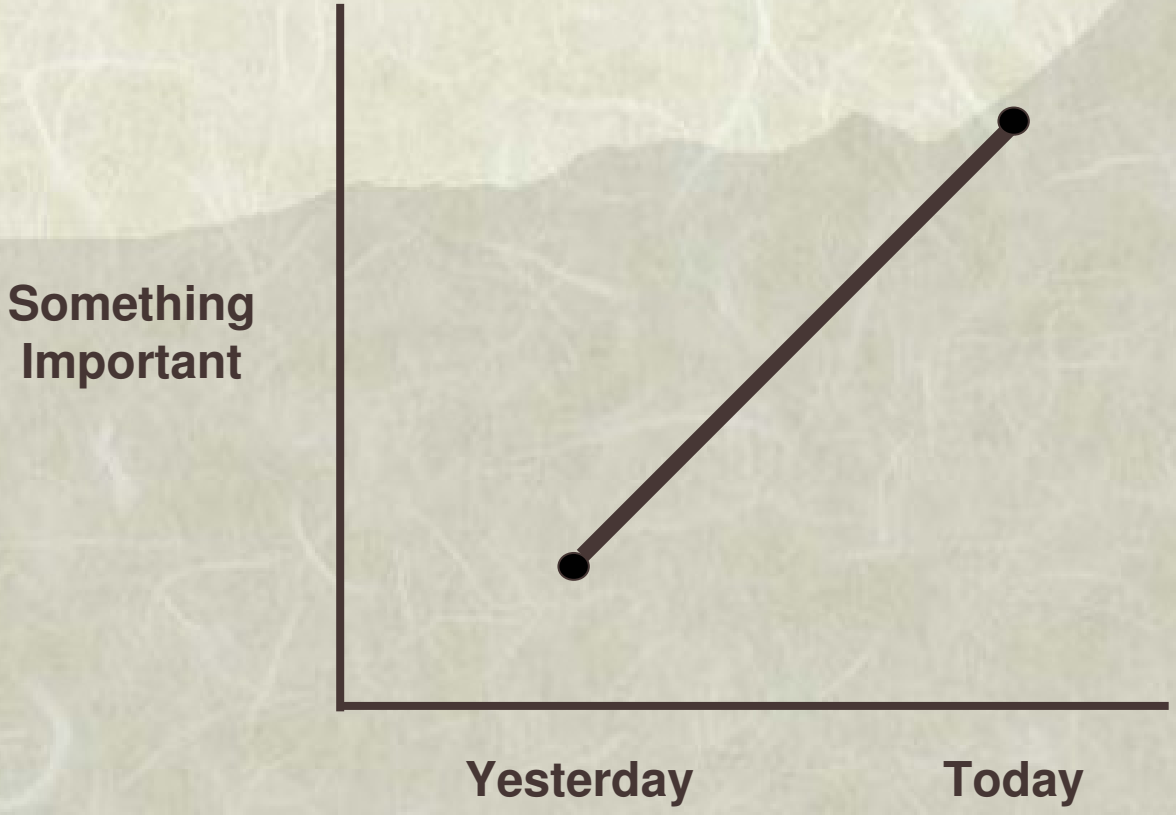


Definition, collection, analysis, interpretation

Implementing a Guideline is a Process

- There will be variation in how people interpret it
- There will be variation in how people apply it
- There will be uncontrollable variations in the environments in which it is applied
- There will be variation in how people assess its value
- ***Any collected data will contain this aggregated variation***
  - ***"How would you know" it's being used…and working?"***

Given two numbers…



…one will be bigger!

Process Context

- Statistics on the number of incidents does not help to reduce the number of incidents
- ***"Is the process that produced the most recent number the same as the process that produced the previous number(s)?"***
- *Understand the process that produces your incidents*
- The presence of everyday variation generally *invalidates* most of the statistics you've learned in "basic" courses!

Different kind of statistics

- **Descriptive**: What can I say about this *patient*?
- **Enumerative**: What can I say about this *specific group* of patients?
  - Goal: Estimation (of an underlying "population")
- **Analytic**: What can I say about the *process* that produced this group of patients and its results?
  - Goal: Prediction of the future

- Quality Improvement is analytic

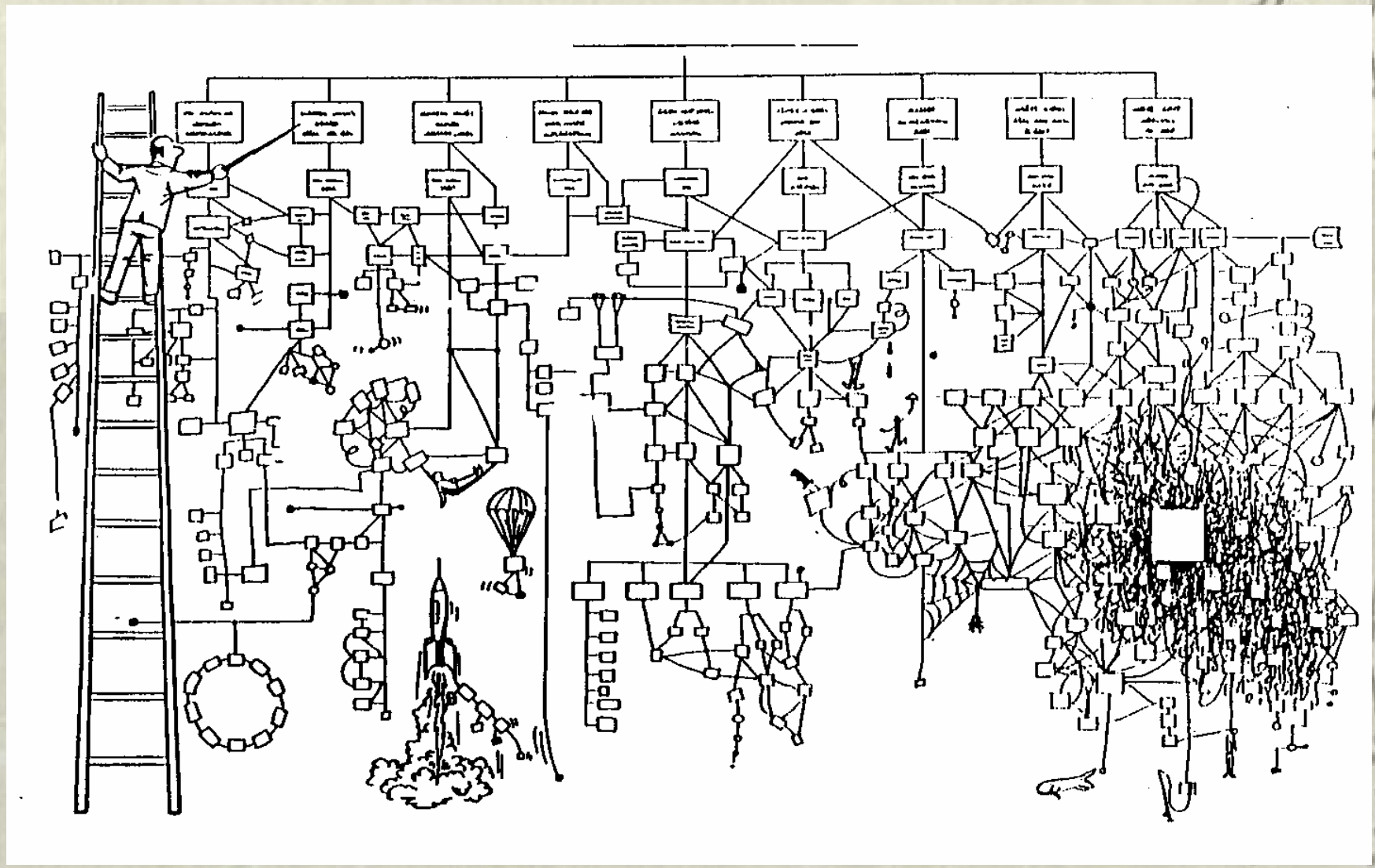
"Process-oriented" definition of "incident"

- **"A hazardous situation that was unsuccessfully avoided."**

"Incident" = "Variation"

- Variation is one of TWO types
- Treating one as the other *will make things worse*
  - **Special cause**: Unique, "one off"
  - **Common cause**: Inherent in the process – "perfectly designed" to happen

Unique…or waiting to happen?



Sobering explanation of common cause

- **Because of the current "design" of our processes, we are "perfectly designed" to kill 10 patients a year**
  - **The trouble is: It WILL happen randomly – You can't predict which 10 patients where events will conspire such that "*everything* in the process that can go wrong does go wrong" simultaneously**
  - **In any one year, you will observe between 1 and 19**

Human tendency: "ALL variation is special!"

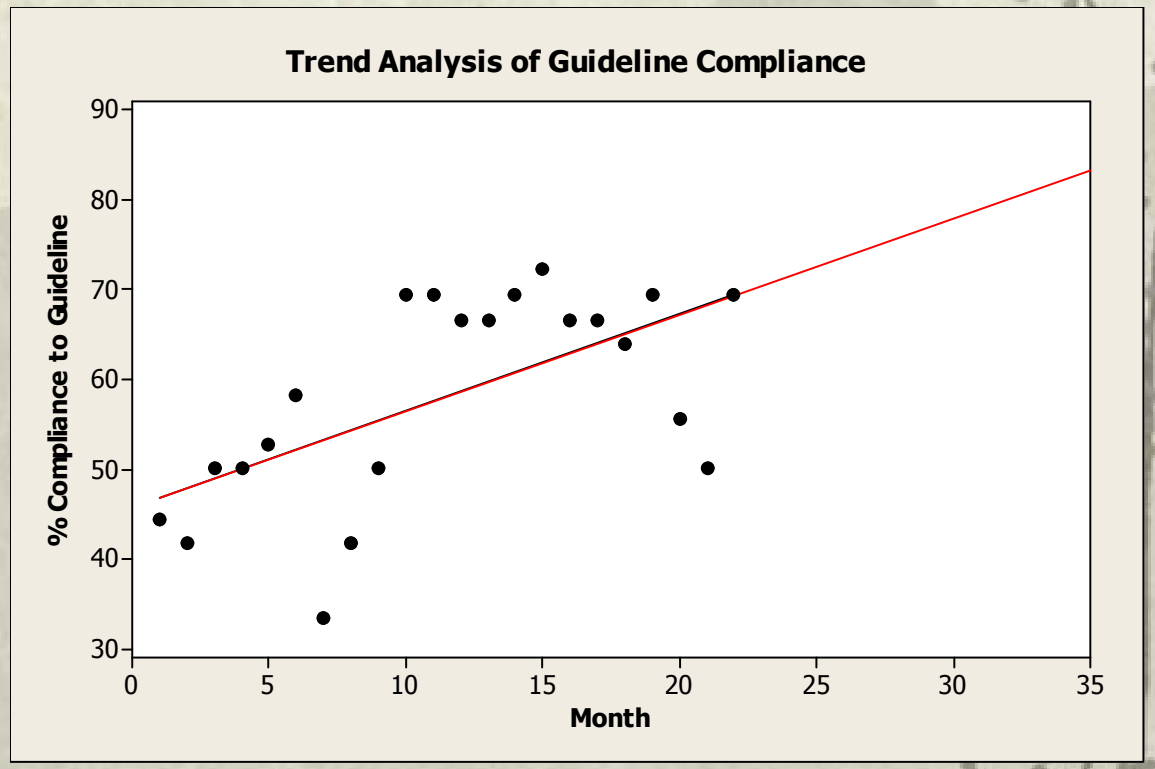
- Sentinel event analysis, "near miss" analysis, root cause analysis (RCA)
  - "But, Davis…we *shouldn't* have these incidents!"
  - "I know…but are you *perfectly designed* to have them?"

Goal: Improve bundle implementation from 50 to 75%

% Compliance		
6/97	44.44	%
	41.67	
	50.00	
9/97	50.00	
	52.78	
	58.33	
12/97	33.33	
	41.67	
	50.00	
3/98	69.44	
	69.44	
	66.67	
6/98	66.67	
	69.44	
	72.22	
9/98	66.67	
	66.67	
	63.89	
12/98	69.44	
	55.56	
	50.00	
3/99	69.44	

Average: 58.1%

P-value for Normality: > 0.1

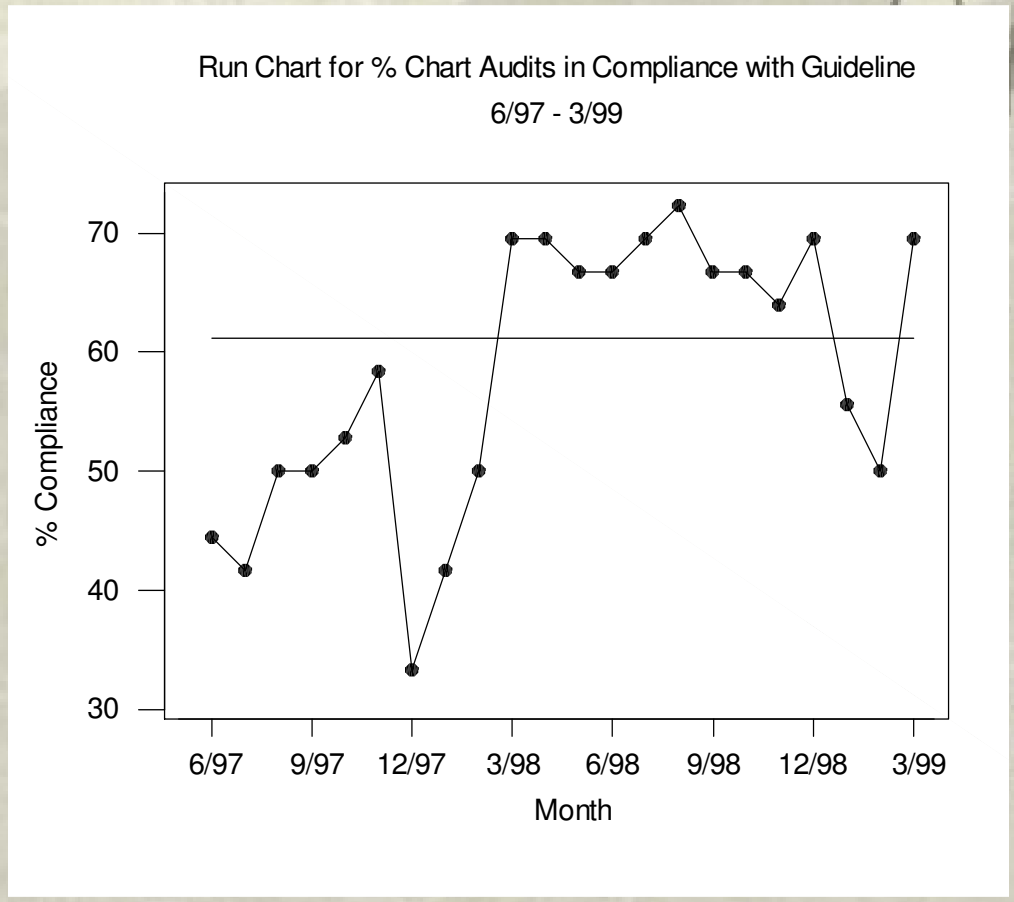


R-squared: 36.5%, p-value: 0.003

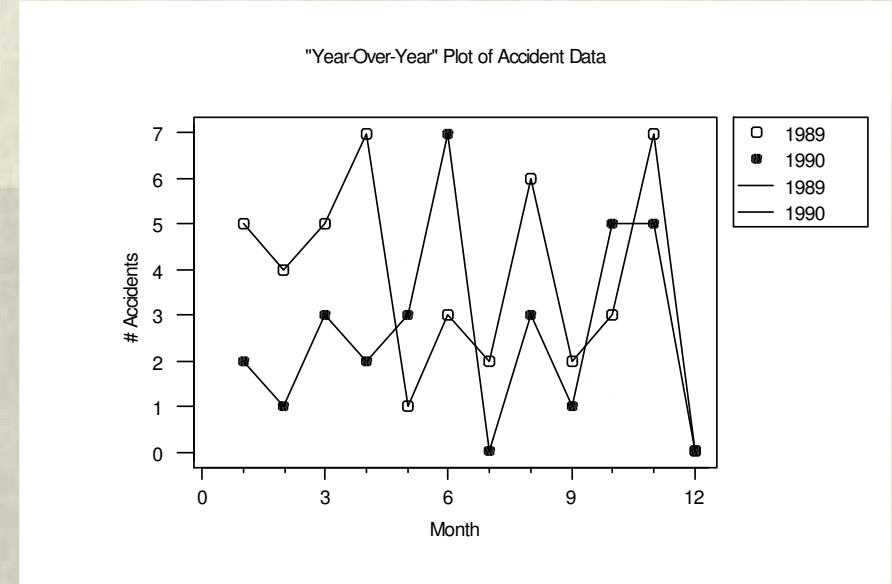
Only 3 – 4 more months to go!

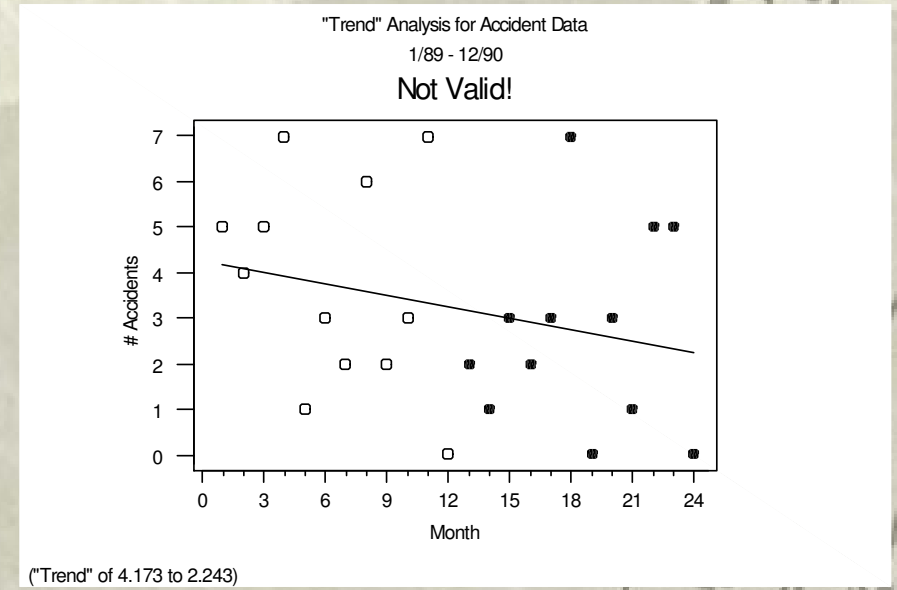
Key transition in thinking…Simple, but not

% Compliance			Sorted
6/97	44.44	%	33.33
	41.67		41.67
	50.00		41.67
9/97	50.00		44.44
	52.78		50.00
	58.33		50.00
12/97	33.33		50.00
	41.67		50.00
	50.00		52.78
3/98	69.44		55.56
	69.44		***58.33***
	66.67		***63.89***
6/98	66.67		66.67
	69.44		66.67
	72.22		66.67
9/98	66.67		66.67
	66.67		69.44
	63.89		69.44
12/98	69.44		69.44
	55.56		69.44
	50.00		69.44
3/99	69.44		72.22



Safety Reward Luncheon





8 months are lower than previous year

Reduction is 46.2% !

Every month—Safety review of each incident…

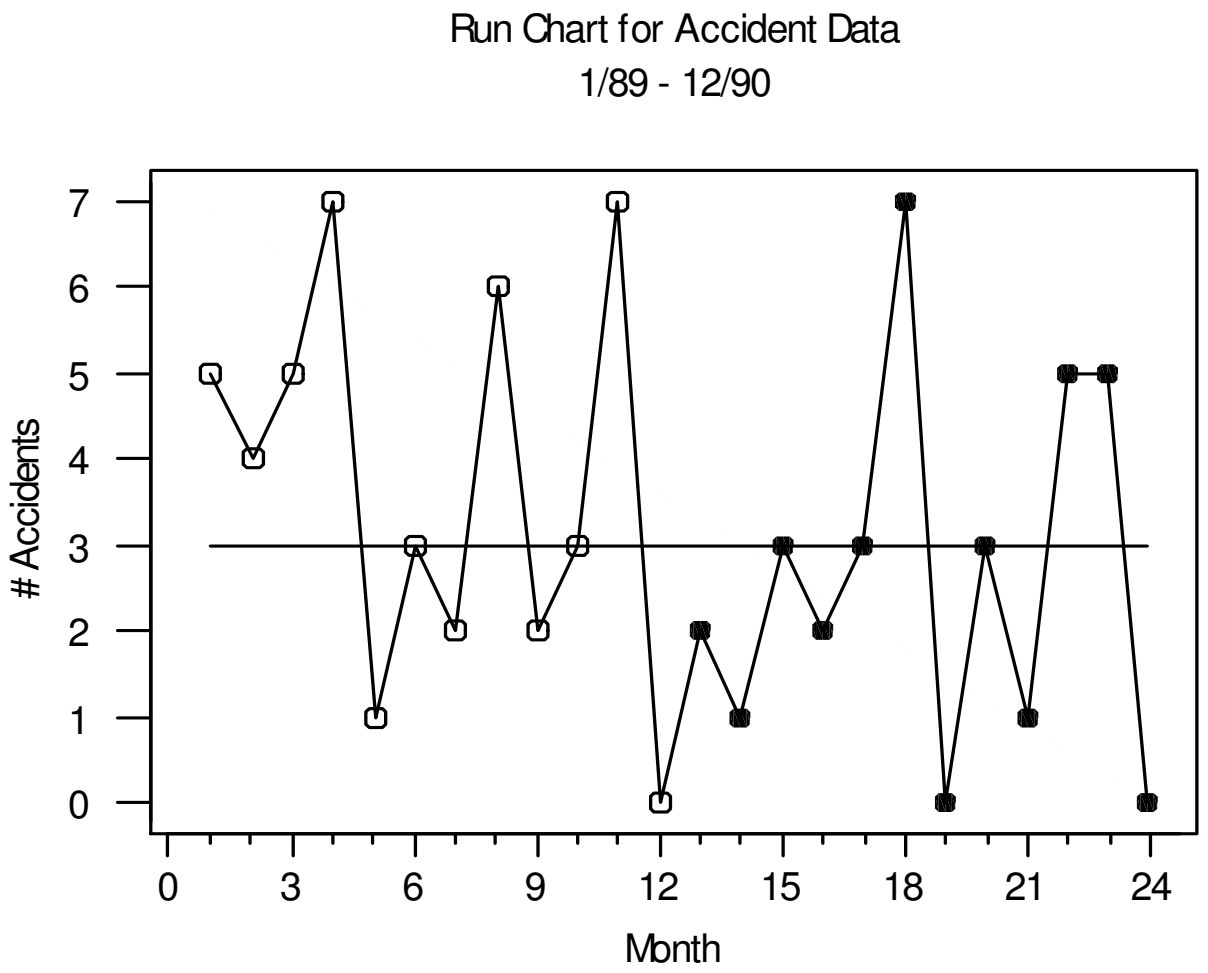
…Common or Special cause strategy?

Goals a la Dilbert

- **Boss:**
  - **Our goal this year is ZERO disabling injuries.**
  - **Last year our goal was 25 disabling injuries; however, in retrospect, that was a mistake…**
  - ***We had to injure 9 employees to meet the goal***

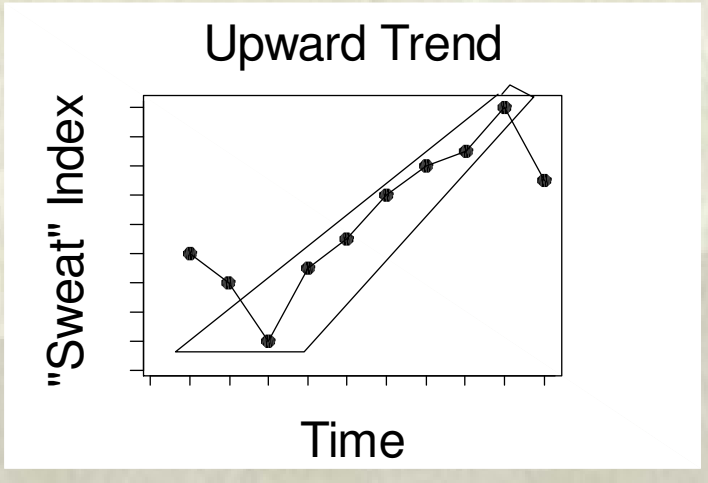
Are we at the lowest inherent level for which we are perfectly designed?

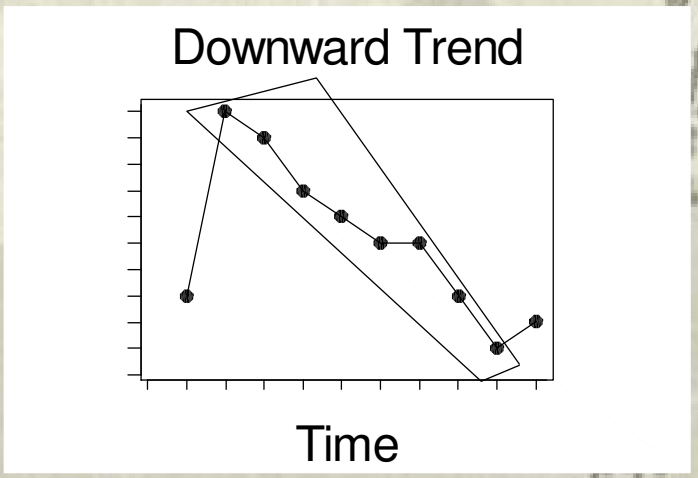
"Plot the dots!"



(Median = 3)

Runs analysis Rule 1: "Statistical" definition of "trend"





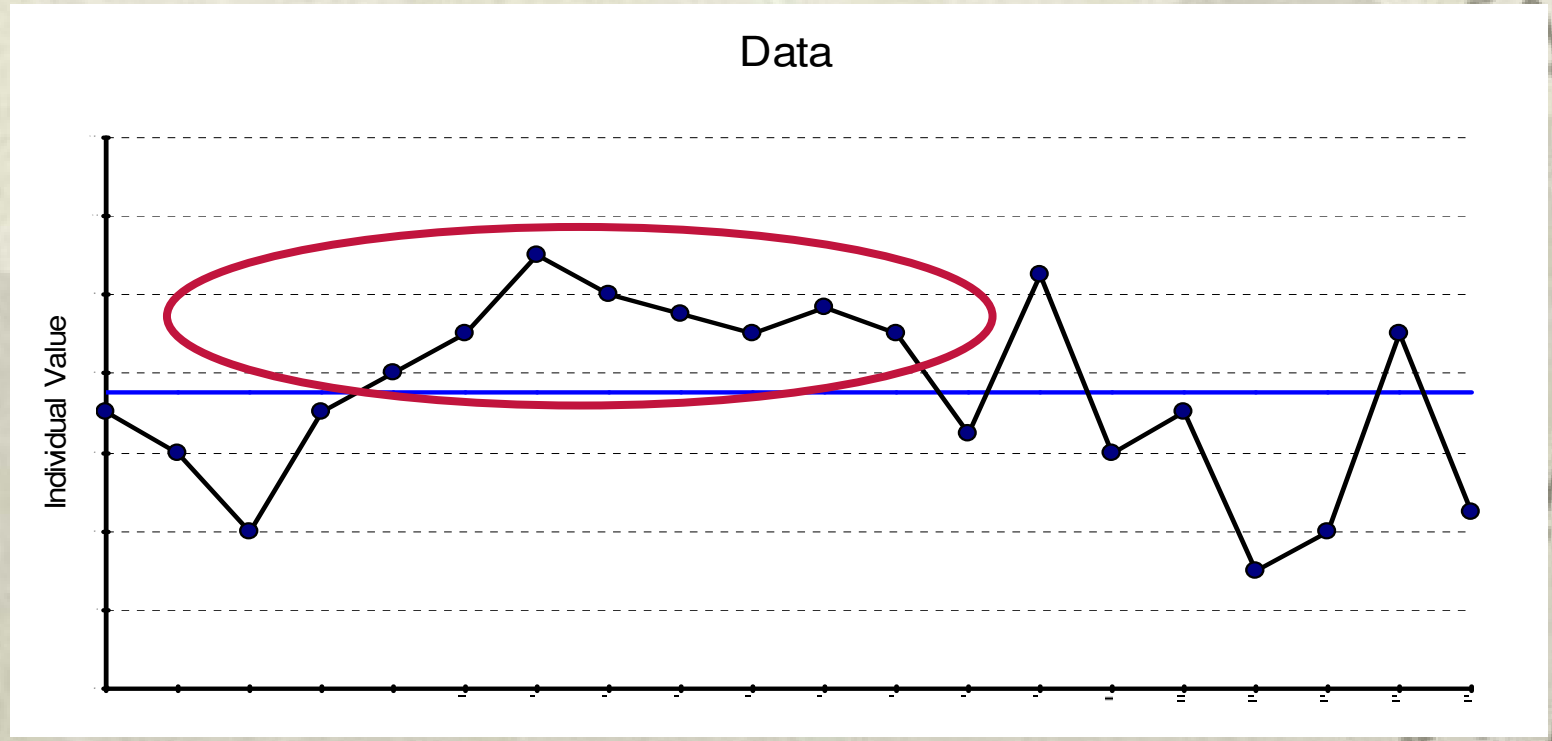
Special Cause – A sequence of SEVEN or more points continuously increasing or continuously decreasing.

Note 1: Omit entirely any points that repeat the preceding value. Such points neither add to the length of the run nor do they break it.

Note 2: If the total number of observations is 20 or less, SIX continuously increasing or decreasing points can be used to declare a trend.

This rule is to be used only when people are making conclusions from a tabulated set of data *without any context of variation* for interpretation.

Rule 2: A consecutive sequence of 8 or more points on one side of the median



Note: Omit entirely any data points literally on the median—They neither add to nor break the current run.

GOAL: Improve from 50 to 75%
How are they doing?

% Compliance			Sorted
6/97	44.44	%	33.33
	41.67		41.67
	50.00		41.67
9/97	50.00		44.44
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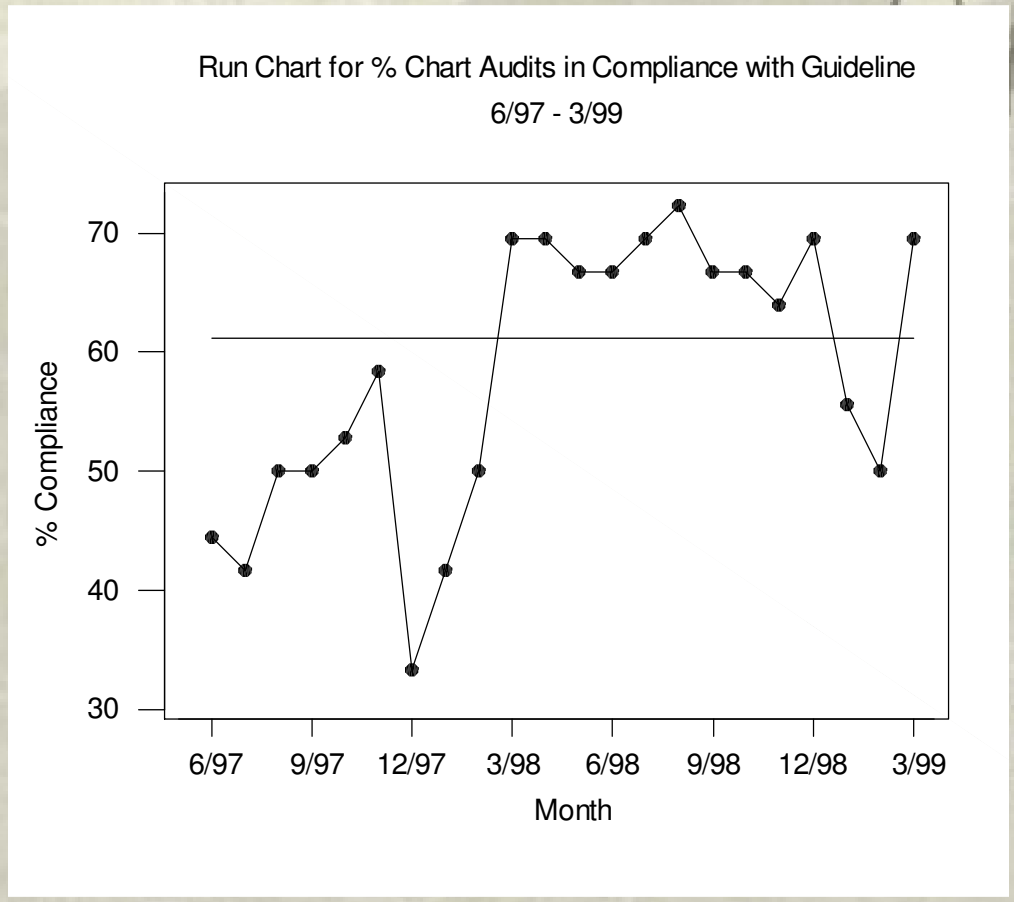
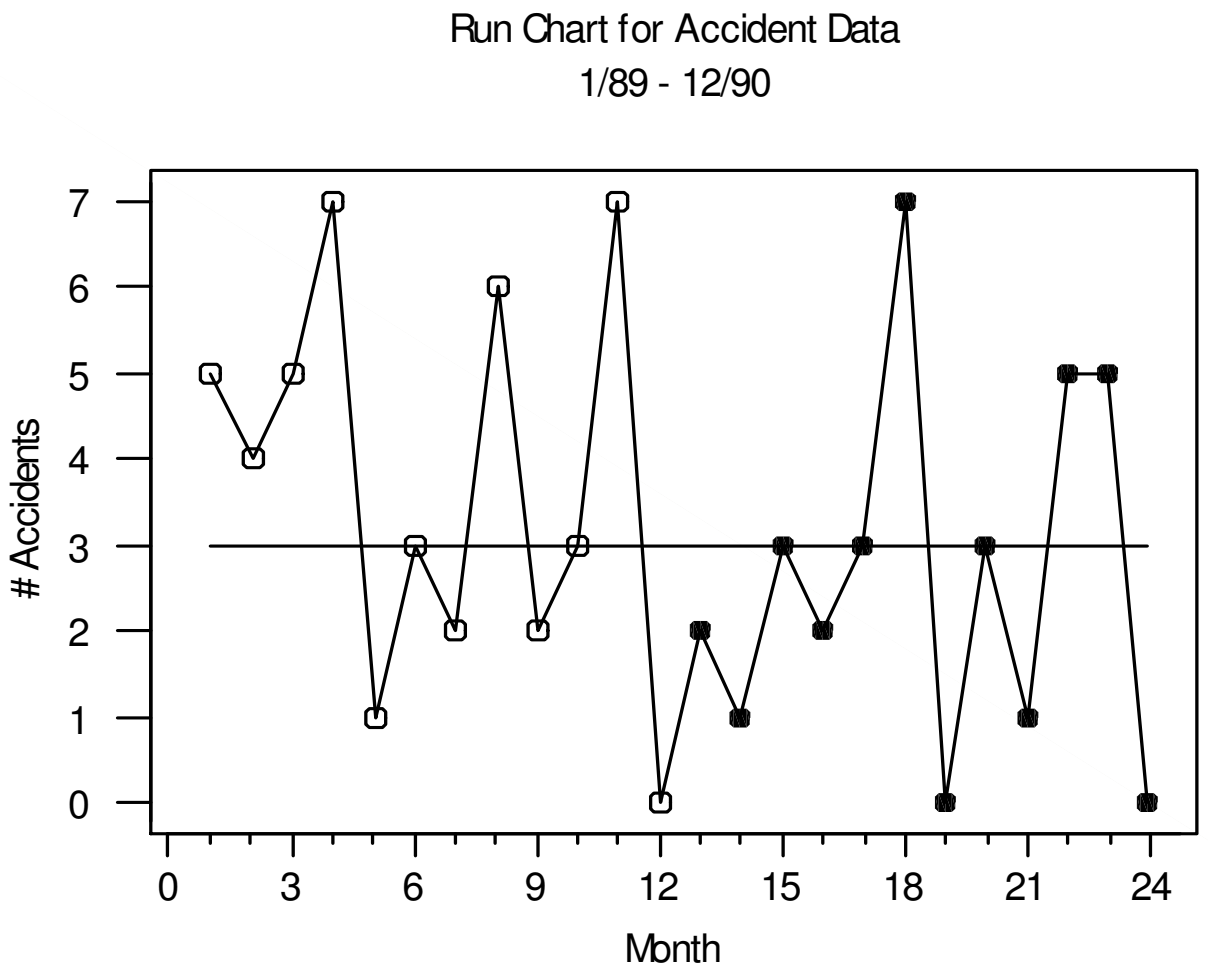


Common or Special Cause Variation?



(Median = 3)

Need "common cause" strategy

- Statistics on the number of accidents does not improve the number of accidents
- You cannot treat data points individually or "dissect" an accident individually as THE analysis for 'root cause'
- You cannot compare two points
  - % change, "too big" a change…

Common Cause Strategies

1. Stratification

   Where is the 20% of the process causing 80% of the problem?

2. Disaggregation – Process "dissection"

3. Designed experiments

Myth of Common Cause Helplessness

Matrix of Adverse Events

Event Type	Unit A	B	C	D	E	F	Total
1	0	0	1	0	2	1	4
2	1	0	0	0	1	0	2
3	0	**16**	1	0	2	0	**19**
4	0	0	0	0	1	0	1
5	2	1	3	1	4	2	**13**
6	0	0	0	0	3	0	3
27							
28					(less than 6 each)		
29							
Totals	6	**19**	7	3	**35**	7	77

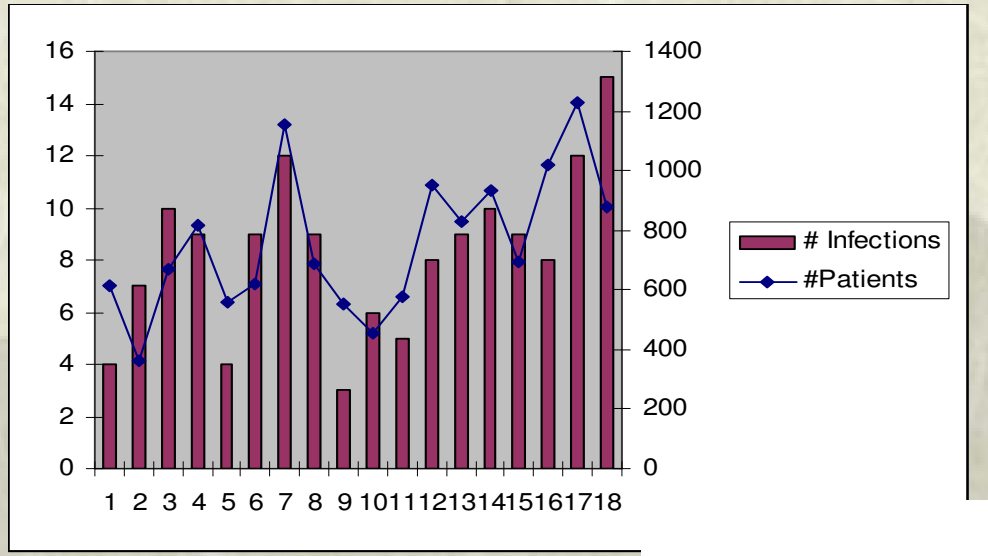
Common Cause Strategies

1. Stratification
   - Dept. B, Dept. E, Type 3, Type 5
   - Dept. B problem with Type 3

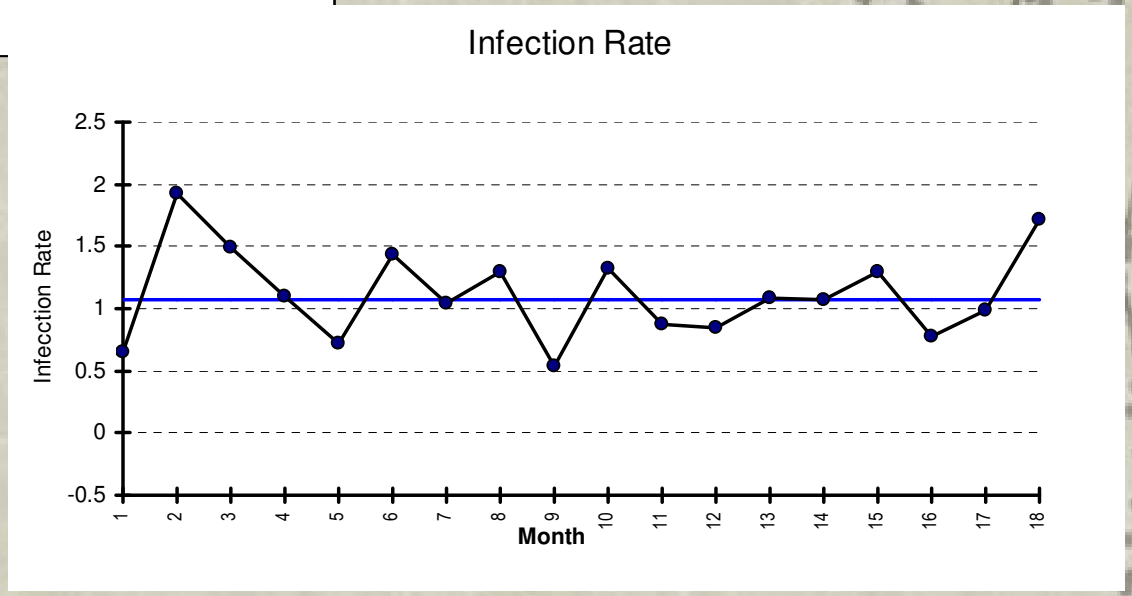
2. Disaggregation – Process "dissection"
   - Dept. E and Type 5

3. Designed experiments

"We made a difference!"—Reduced NICU Infections



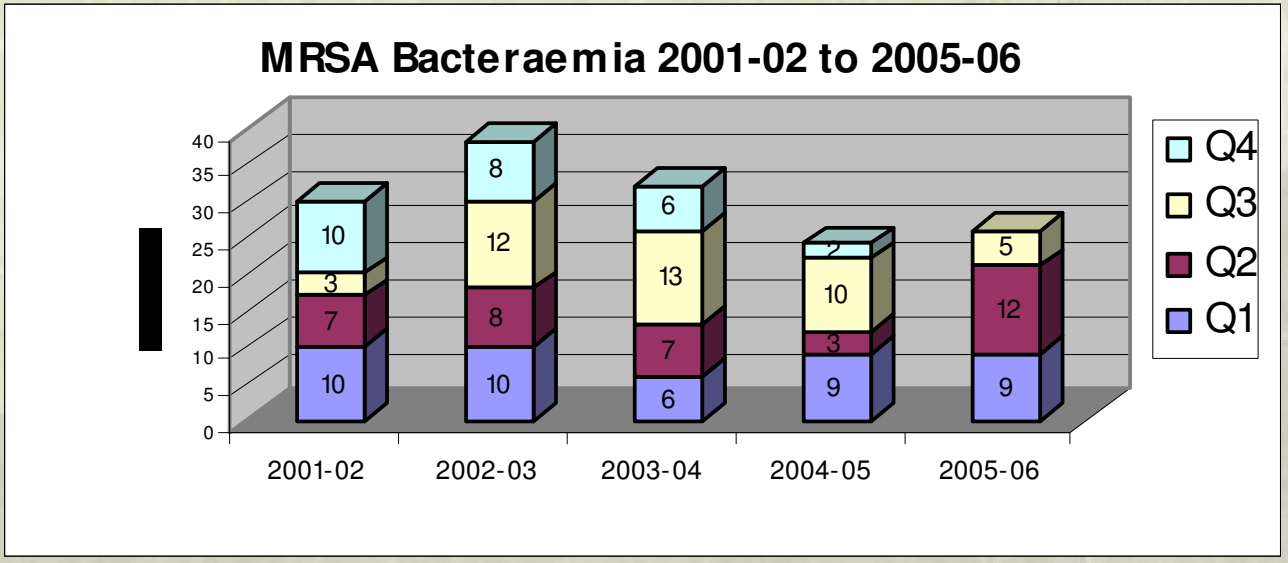
They worked SO hard!

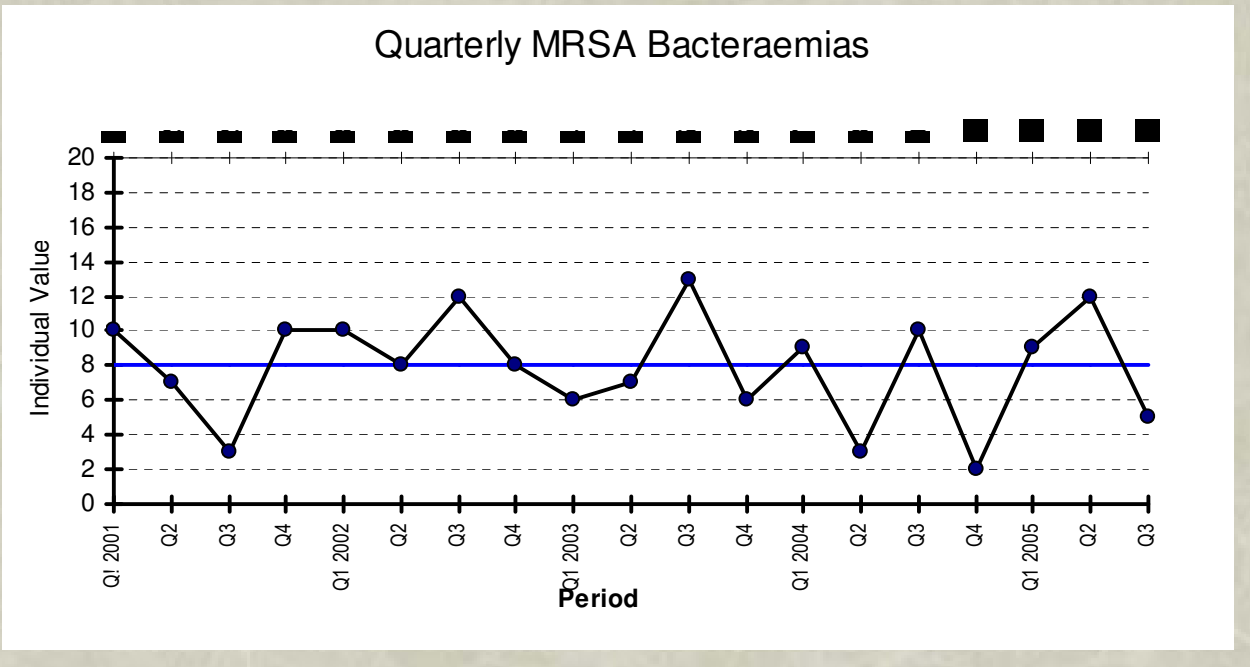


Really?

Matrix the sum of the numerators (149)

What to do in a boring meeting NOW?





Plot the Dots!

"Assignment" before Part 2

1. Calculate the moving ranges (19 data points produce 18 moving ranges):

   Data: 10, 7, 3, 10, 10, 8, 12, 8, 6, 7, 13, 6, 9, 3, 10, 2, 9, 12, 5

   Absolute values: (7-10), (3-7), (10-3), (10-10), (8-10)…(5-12)

2. Determine MR_{Med} : Sort them from smallest to largest
   Average the 9^{th} & 10^{th} in this SORTED sequence

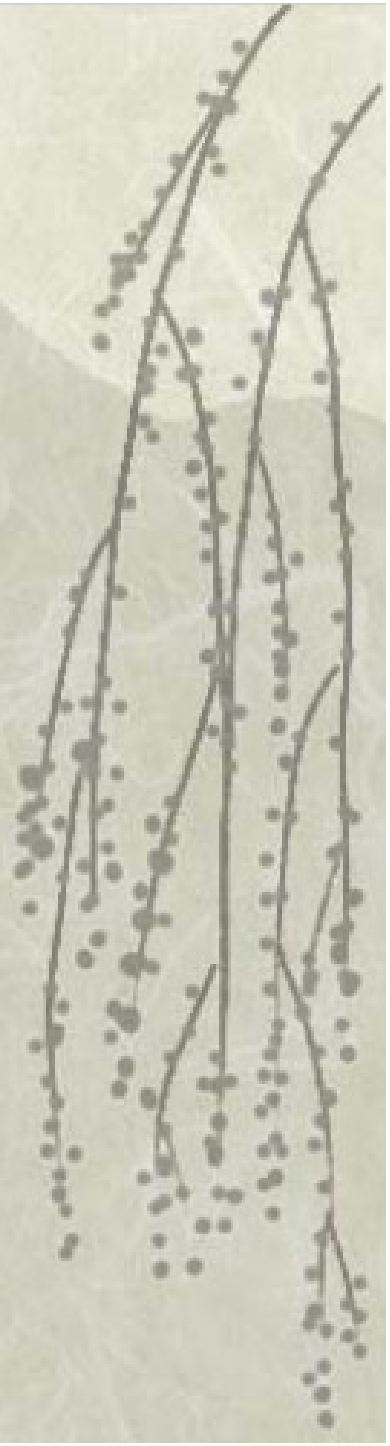
3. Multiply MR_{Med} by 3.865 (round it)

4. The average of the 19 data point is 7.9, let's call it ~8
   Calculate $8 \pm [3.14 \times MR_{Med}]$

"Perfectly designed" vs. Special cause

- I am talking about "hardwiring" safety
  - Reducing common cause
  - Finding "hidden" special causes that aggregate predictably
- Pandemic or epidemic is a "new process" entering your current process (special cause)
  - Root cause analysis (special cause strategy) is appropriate
  - "Plotting the dots" will tell you if it worked

It's not the problems that march into your office that are important. The most important problems are the ones *no one is aware of*.



Questions for Group Dialogue

- How does your organization react to, report, and analyze "incidents?"
- Have you ever considered "safety" in a process-oriented context?
- Have you, with the best of intentions, been using "special cause" strategies? Could you "plot the dots" to see whether you have been successful?
- Does this material suggest situations in your organizations that might respond better to "common cause" strategies?