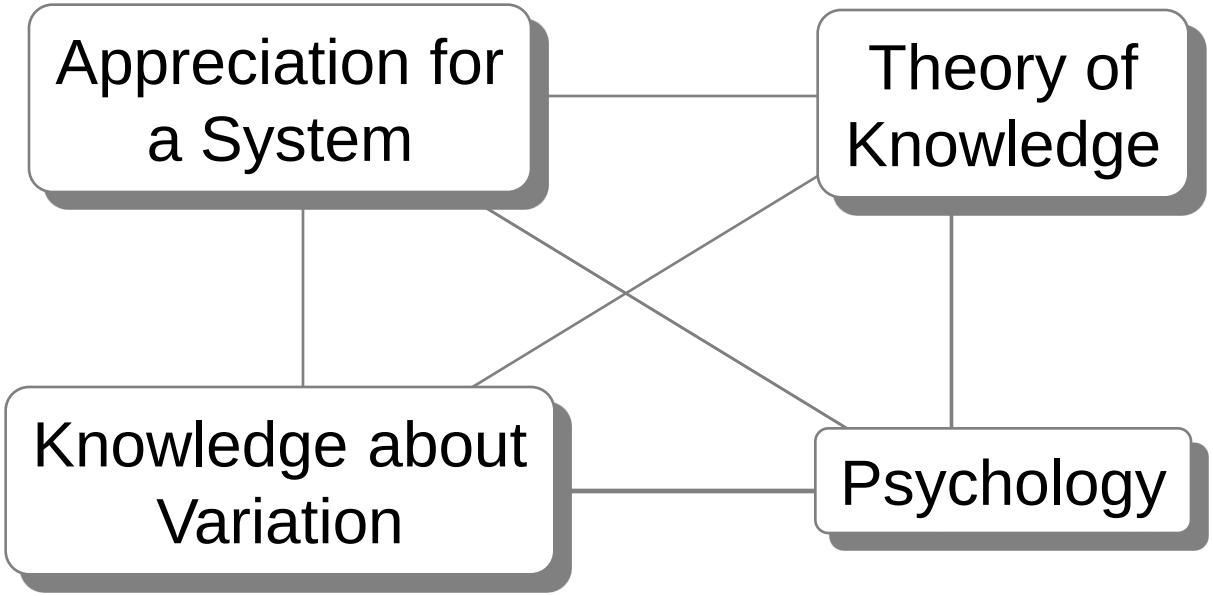
Deming's Ideas in the Twenty-first Century
Part 1

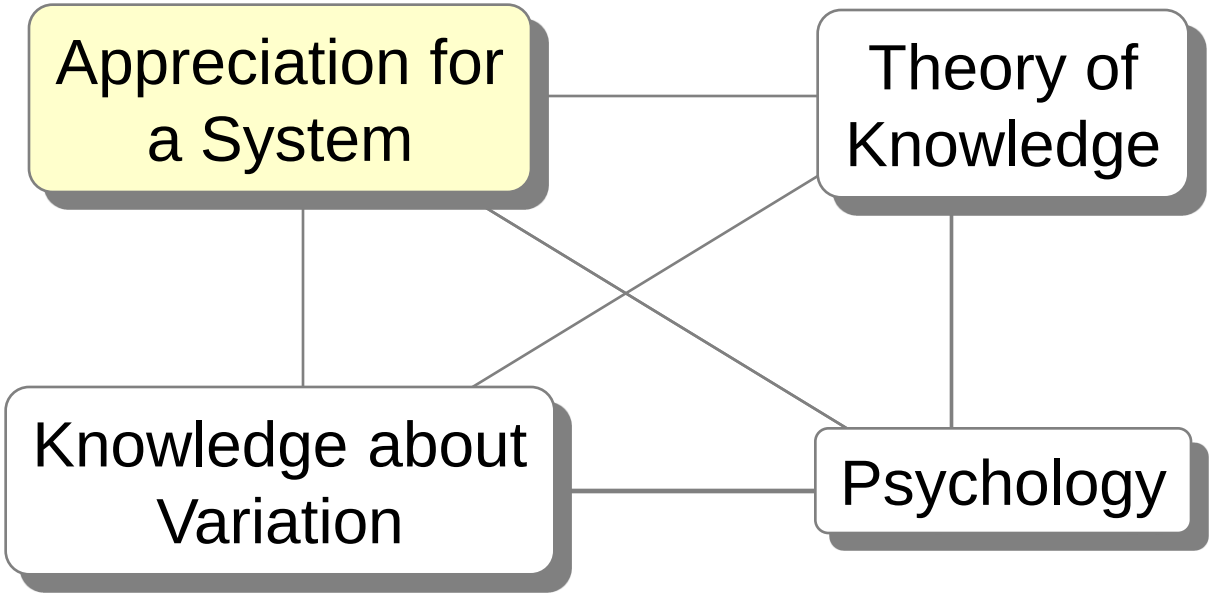
Gipsie B. Ranney

June 2014

The System of Profound Knowledge



The System of Profound Knowledge



A System Versus a Heap

A System

Interconnecting parts functioning as a whole.

Changed if you take away pieces or add more pieces. If you cut a system in half, you do not get two smaller systems, but a damaged system that probably will not function.

The parts are connected, work together, and may not work alone.

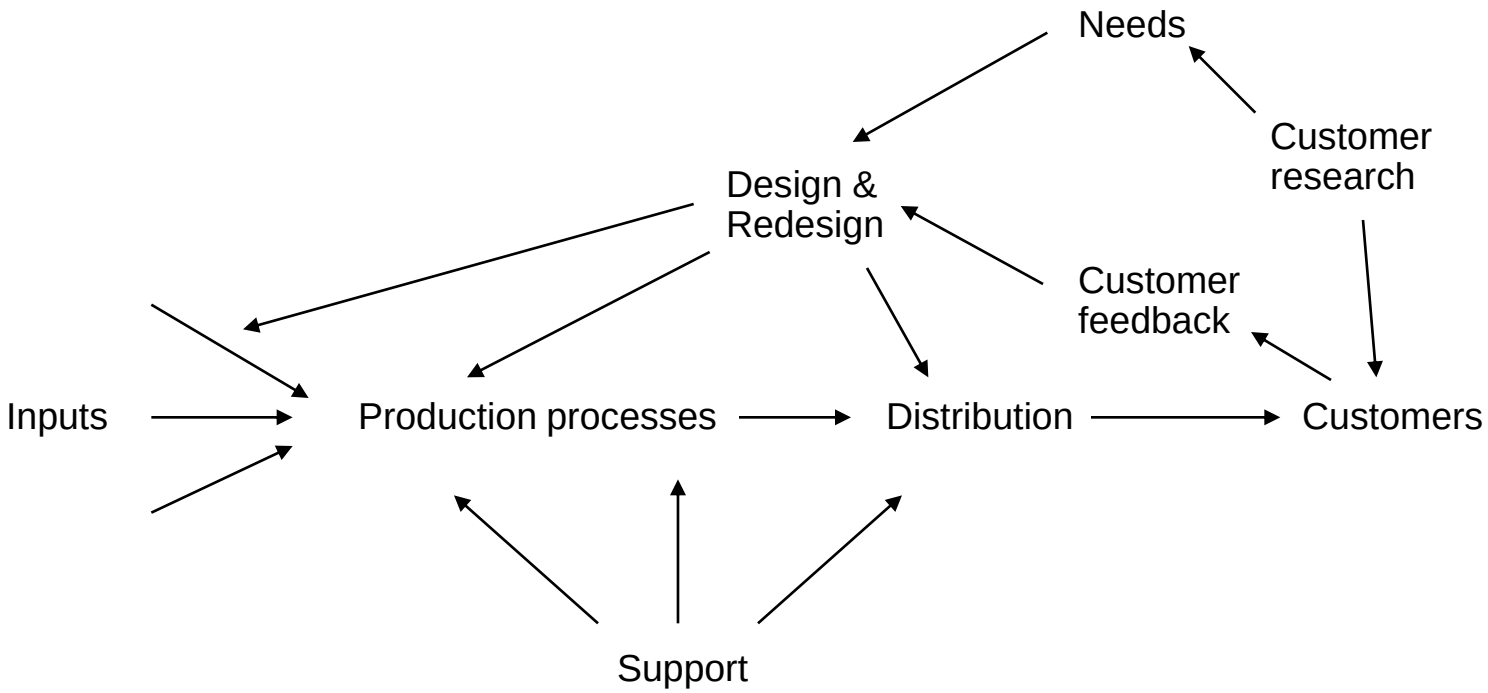
A Heap

A collection of parts

Properties are unchanged whether you add or take away pieces. When you halve a heap, you get two smaller heaps.

The parts are not connected and can function separately.

An Organization Viewed as a System



Adapted from Figure 6, p. 58
The New Economics, 2nd Ed.

Appreciation for a System

- Importance of aim(s)
- Cause and effect are often separated in time and location
- Optimization of parts doesn’t necessarily optimize the whole
- Interdependence and interaction

Deming's Recommended Aim

"The aim proposed here for any organization is for everybody to gain – stockholders, employees, suppliers, customers, community, the environment – over the long term.

For example, with respect to employees, the aim might be to provide for them good management, opportunities for training and education for further growth, plus other contributors to joy in work and quality of life."

The New Economics, 2nd Ed., p. 51

Two Statements of Aim (Purpose)

- To provide the best possible care to those needing healthcare in the community.
- To improve the health of the community, now and in the future.

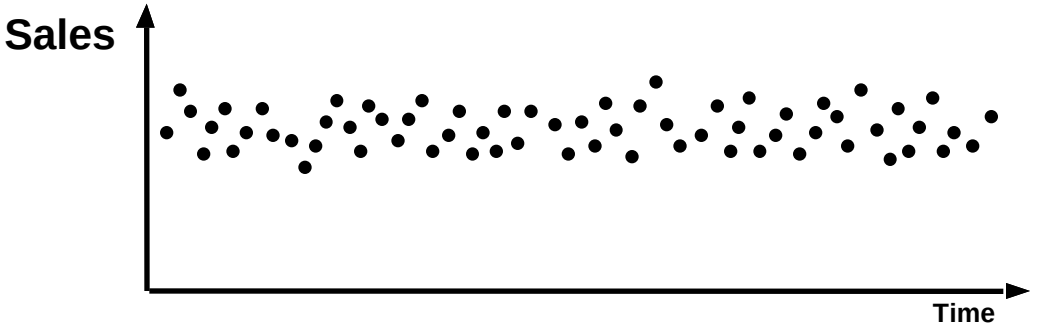
A System of Schools

Aims: “growth and development of children, and preparation for them to contribute to the prosperity of society.”

The New Economics, 2nd Ed., p. 62.

Narrow Objectives

Without intervention



With intervention

Narrow Objectives

Establishing narrow functional objectives without consideration of the potential effects on other parts of the organization can suboptimize the organization as a whole.

Perversity Principle

“If you try to improve the performance of a system of people, machines, and procedures by setting numerical goals for the improvement of individual parts of the system, the system will defeat your efforts and you will pay a price where you least expect it.”

- Myron Tribus

A Purchasing Manager's Edict

Reduce purchase price of each and every part in the product by 10%.

Emergent Properties

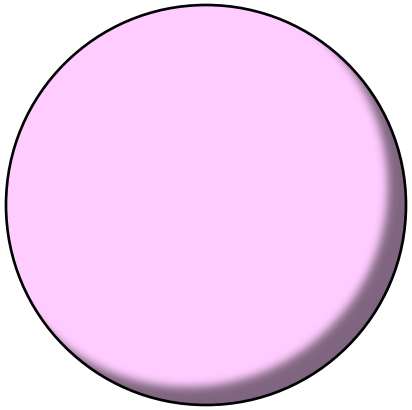
A system functions as a whole, so it has properties above and beyond those of the components that comprise it.

These are known as **emergent properties**.

Some emergent properties

- piano music
- three-dimensional vision
- a rainbow
- movement of a car
- consciousness
- profit

Emergence



Emergent Properties of Systems

The components of a human activity system should not be expected to work individually and independently on an emergent property of the entire system.

Improvement?

An improvement team reported on their improvement project.

Their improvement was to move an expense from their department to another department.

Reward Systems

Robert Rodin, CEO, Marshall Industries

- *Our salespeople would ship ahead of the schedule to make a number or win a prize…*

- *We held customer returns. We had to make sure that the returns coming in did not get counted against sales in the period for which we were trying to hit the numbers. So, if a customer returned items, sometimes our salespeople would put them in the trunks of their cars and keep them there for a few weeks until they could be counted as returns for next period. In the meantime, if we needed that inventory for another customer, we'd have to buy unnecessary stock.*

- *We opened bad credit accounts. Any order was a good order as far as a sales person paid on gross profit was concerned. Just book it.*

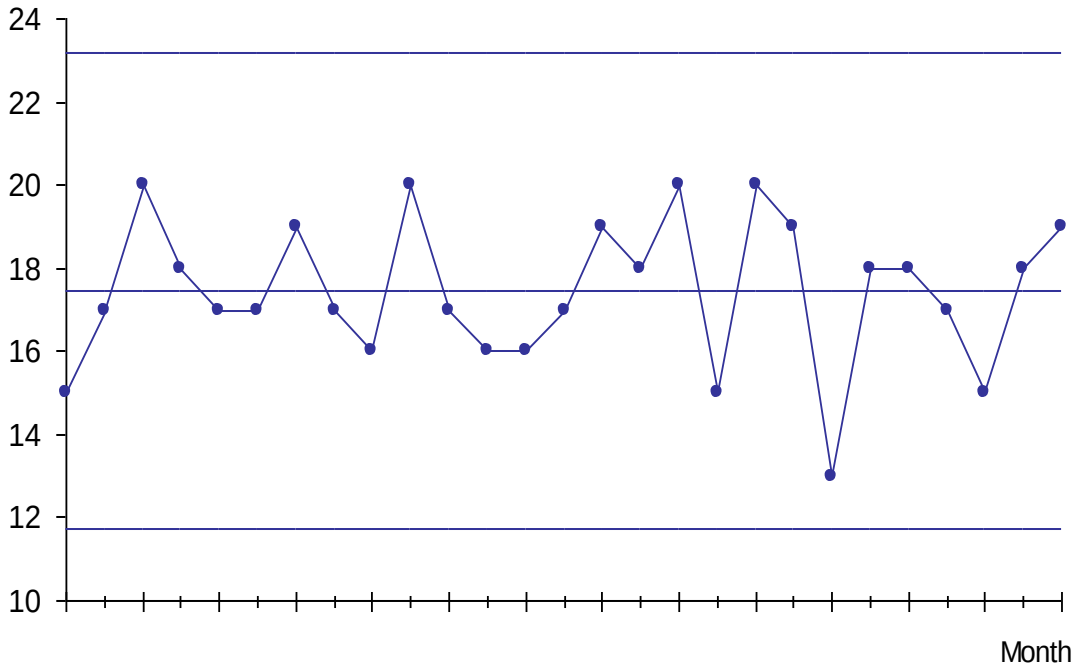
- *We found extraordinarily creative ways to charge expenses to one another's profit and loss statements…*

- *Our divisions hid inventory from one another…our managers devised creative ways to hide the inventory they wanted to hold on to for their own customers, sometimes even sending it out of state in UPS trucks so that they could honestly tell other divisions they were out of stock. When their own customers needed the inventory, though, it would magically reappear…*

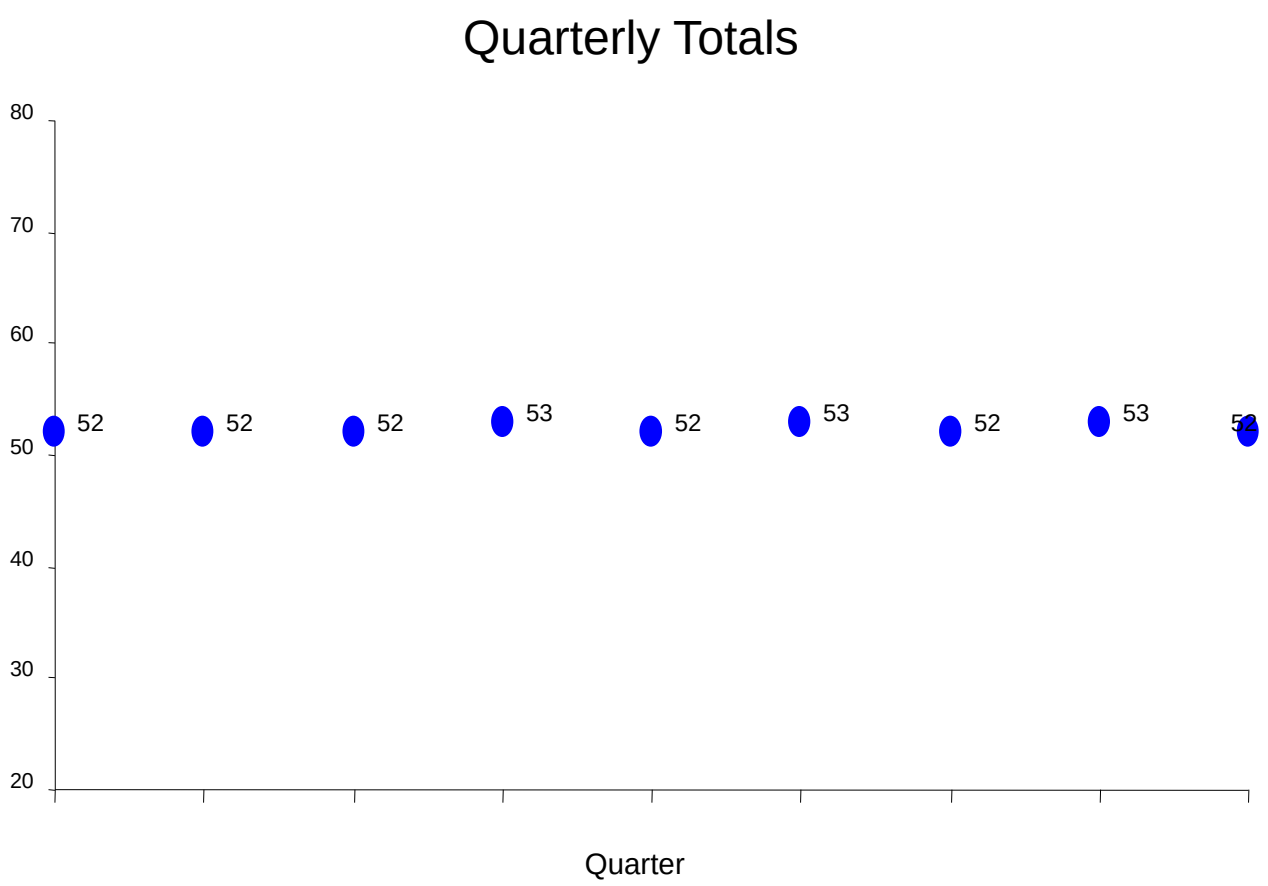
Rodin, Robert, *Free, Perfect, and Now*, New York: Simon & Schuster, 1999.

Reward Systems

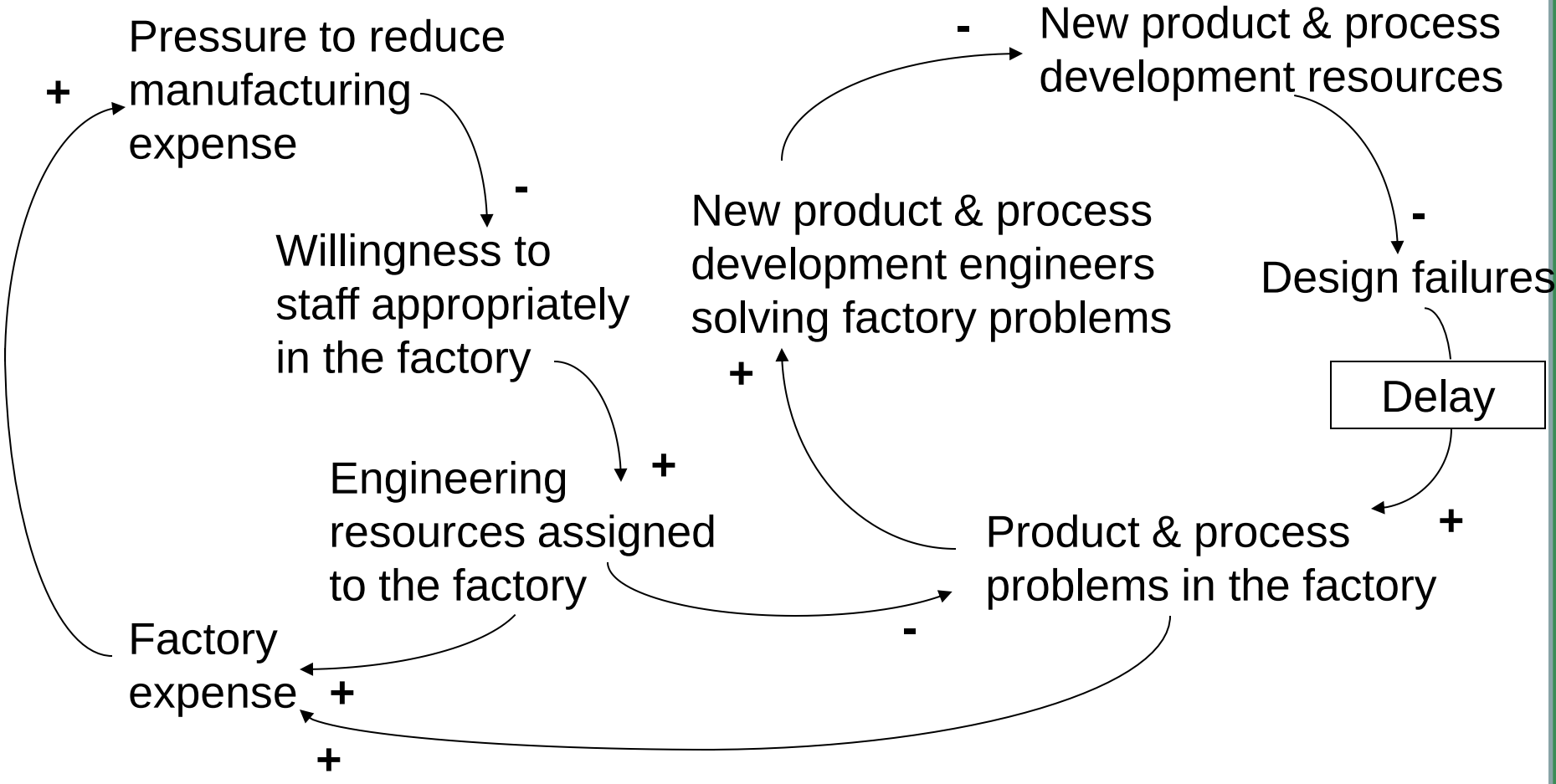
X Chart - Number of Systems Sold per Month



Reward Systems



Removing Qualified Engineering Resources from the Factory



And it will fall out as in a complication of diseases, that by applying a remedy to one sore, you will provoke another; and that which removes the one ill symptom produces others . . .

- Sir Thomas More, 1516

Study the System

- What are the purposes of the system?
- What are the components of the system?

  These may include targets, goals, policies, rules, rewards, communications, etc., as well as processes.
- What are the external factors that may affect the system?

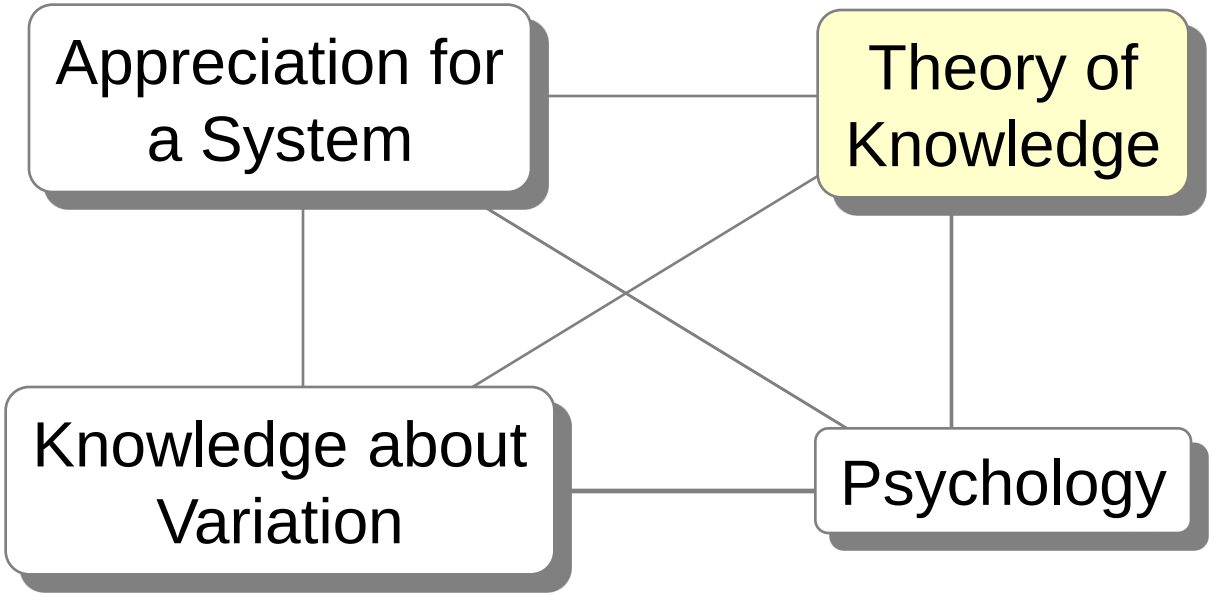
  Organizational systems and subsystems operate within larger systems.
- What are the relationships among the components of the system?
- What are the opportunities for improvement?

Deming's Ideas in the Twenty-first Century
Part 2

Gipsie B. Ranney

June 2014

The System of Profound Knowledge



Theories

Realize it or not, we all use theories.

> "Practical men who believe themselves to be quite exempt from any intellectual influences are usually the slaves of some defunct economist."

John Maynard Keynes,

The General Theory of Employment, Interest and Money

Theories

- The only purpose of a business is to make money.
- Every fluctuation in cost or profit or any other measure of performance has a specific cause.
- The most important job of the employees in a department is to make the boss look good.
-
-
-

Theory

“ Plane Euclidean geometry served the world well for a flat earth…

Use of the theory for a flat earth fails on this earth when man extends his horizon to bigger buildings, and to roads that go beyond the village...

It is extension of application that discloses inadequacy of a theory, and need for revision, or even new theory. "

Deming, *The New Economics, 2nd Ed., p. 102*

Chanticleer

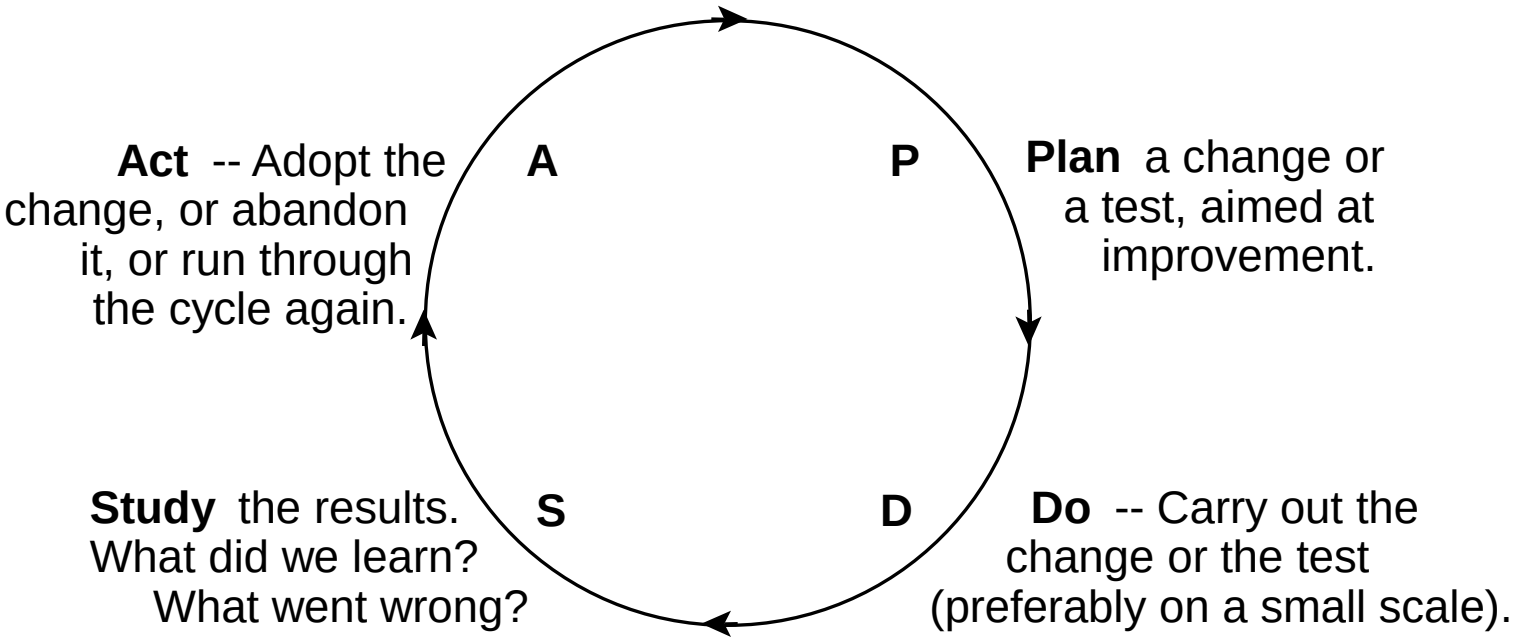
Which World? Which Theory?

"Any theorem is true in its own world. But which world are we in? Which of several worlds makes contact with ours? That is the question."

Deming, *The New Economics*

Theory of Knowledge

The Shewhart Cycle for Learning and Improvement
The P D S A Cycle



The Prediction Game

Adapted from work of Tom Nolan and Lloyd Provost

To illustrate

- use of the PDSA cycle
- role of theory and prediction in learning

A new technology

- generates numbers

Aim:

- to learn about the new technology

Options

° Buy information

Cost: $1000

No prediction required

° Small scale test

Cost: $2000

Prediction required

Correct - $4000 gain,

Incorrect - $4000 loss

° Large scale test

Cost: $4000

Prediction required

Correct - $8000 gain,

Incorrect - $8000 loss

The Prediction Game

- Did predictions improve with repeated trials?
- What happened when the result agreed with the prediction?
- What happened when the result did not agree with the prediction?
- Was there learning? Did learning occur with or without benefit of a theory?
- If we continued to play the game, is there a guarantee that the same rule would continue to provide correct predictions?

Examples

Often repeated statement:

Show me an example, so I can see that this works.

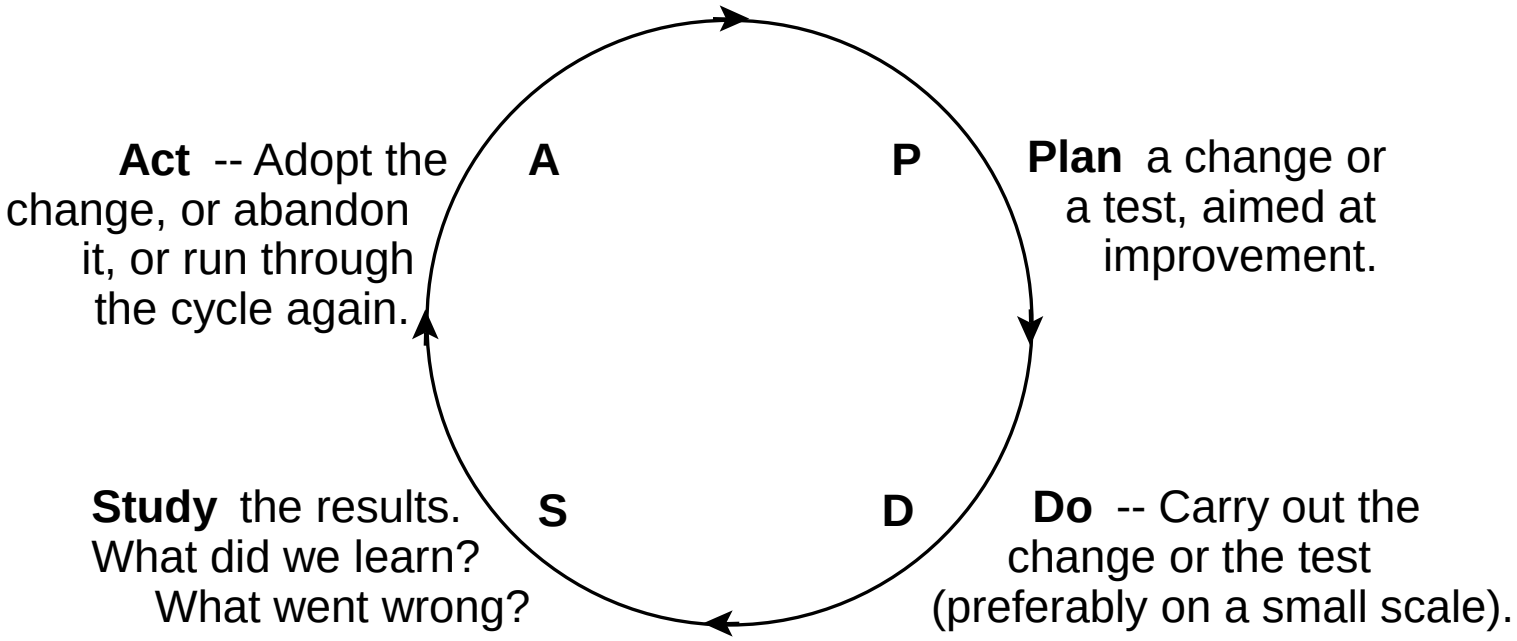
“ No number of examples establishes a theory, yet a single unexplained failure of a theory requires modification or even abandonment of the theory.

It is extension of application that discloses inadequacy of a theory, and need for revision, or even new theory. Again, without theory, there is nothing to revise. Without theory, experience has no meaning. Without theory, one has no questions to ask. Hence without theory, there is no learning. “

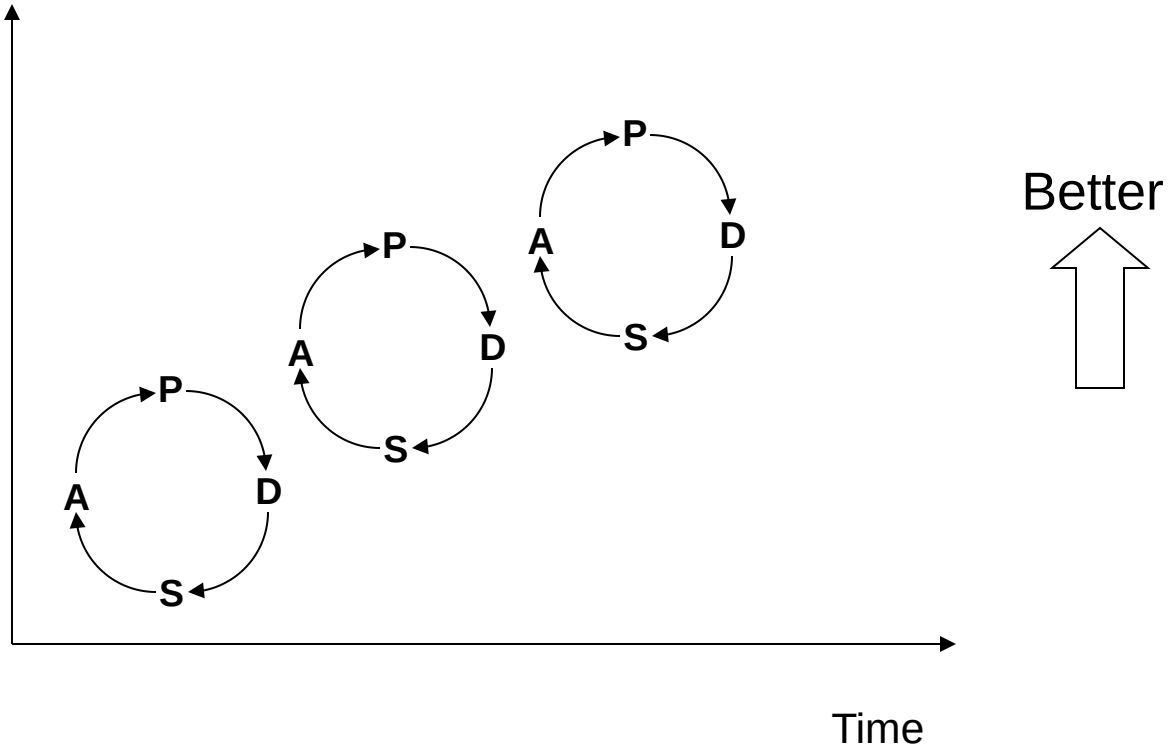
The New Economics, 2nd Ed., pp. 103-104

Learning and Improvement

The Shewhart Cycle for Learning and Improvement
The P D S A Cycle



Learning and Improvement

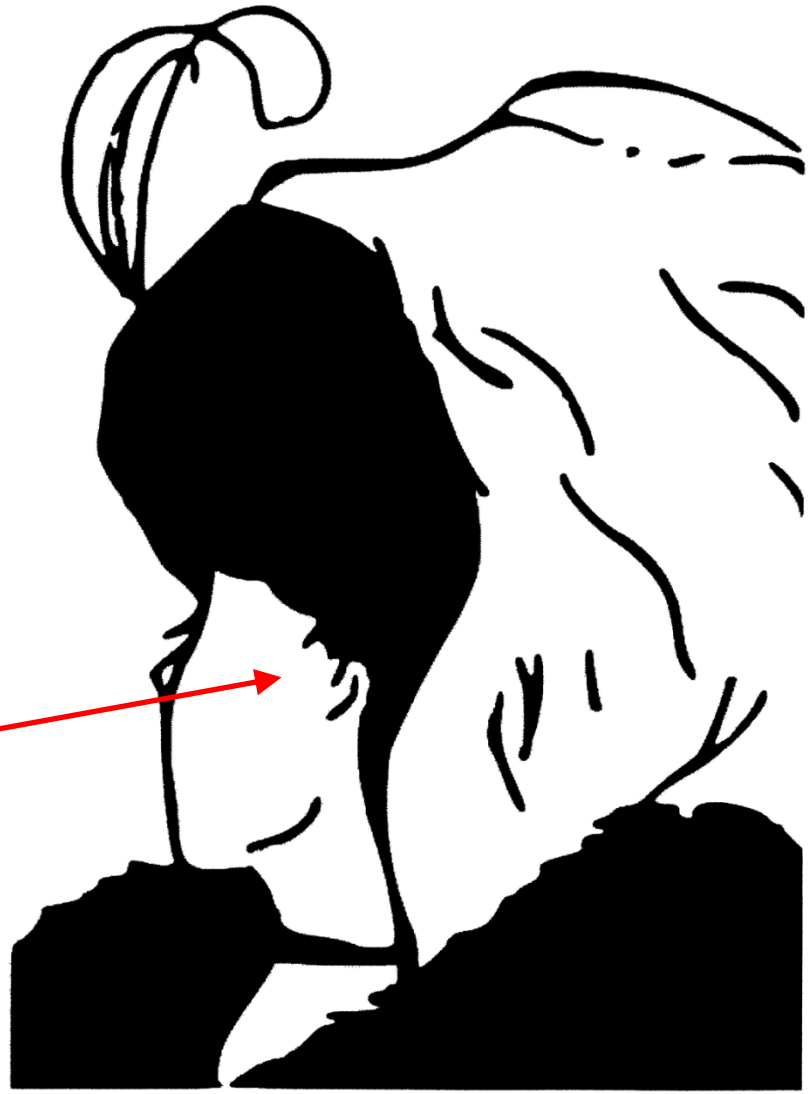


Mental Models

We have mental models in our heads. Those mental models govern what we are able to see.

“We don’t see things as they are, we see them as we are.”

- Anais Nin


What is this?

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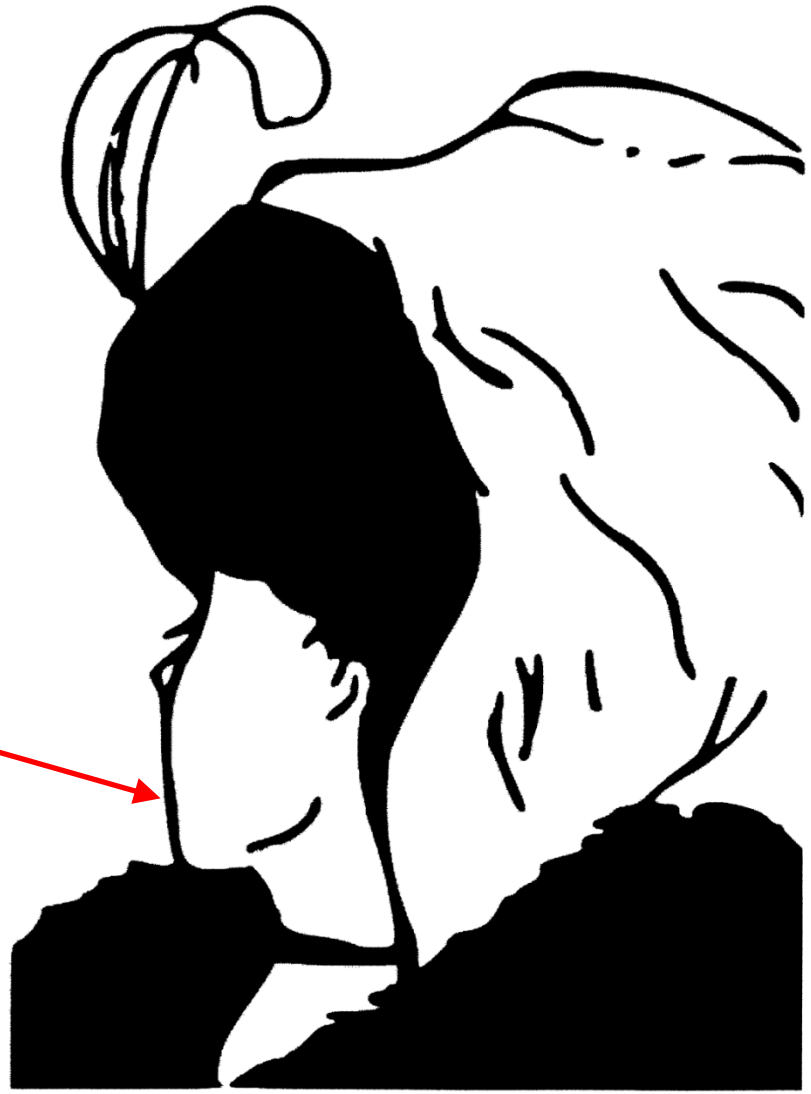

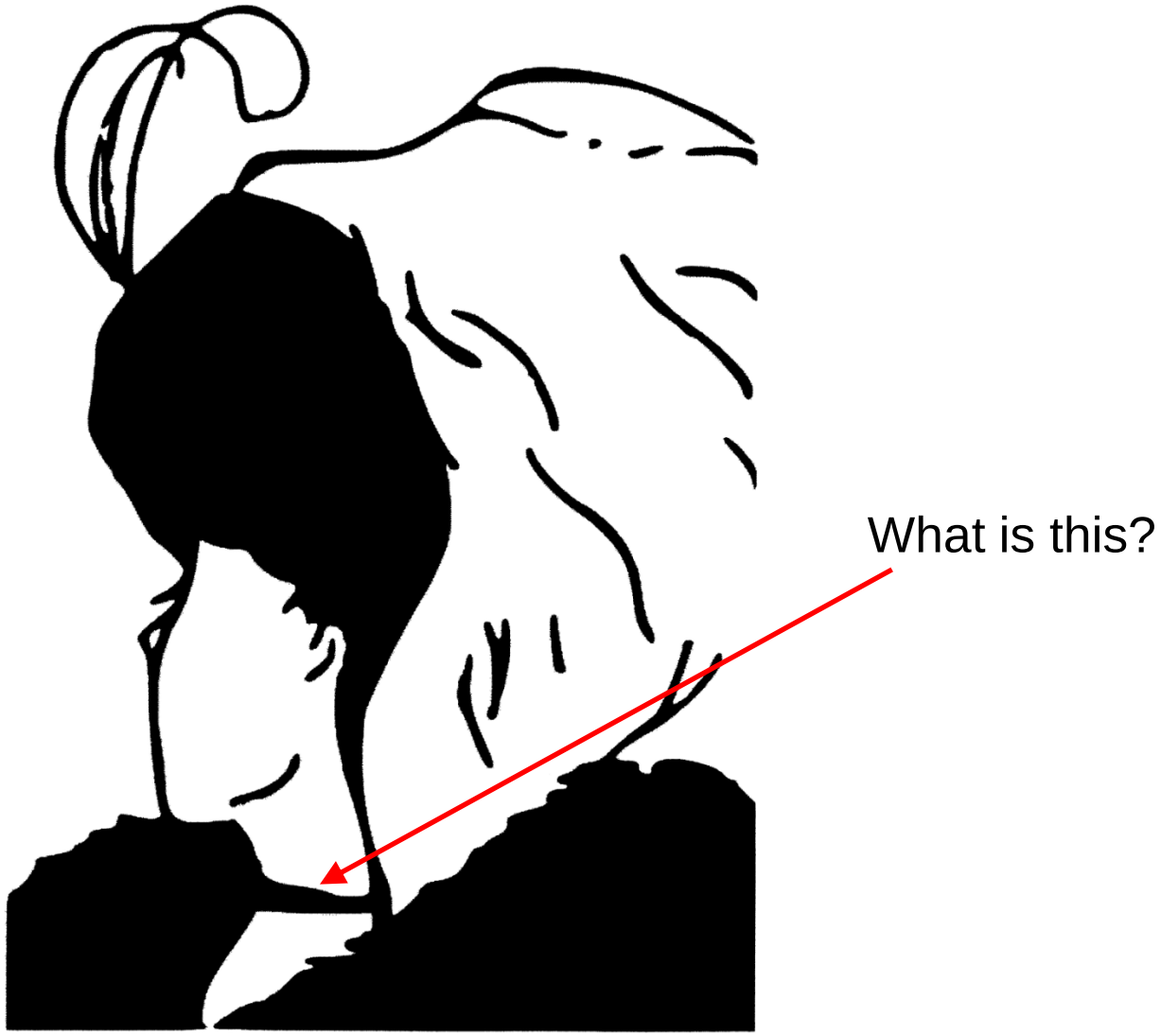
What is this?

Policies and Practices

The executives of a company have company cell phones. The company requires that each user reimburse the company for any use of the cellular phone for personal calls. One executive related that he wrote a check to the company for $2.76 for his personal calls in one month.

How much will it cost the company to process the check?

What assumptions lie behind the requirement?

Policies and Practices

A company has parking for employees' cars inside the fence that surrounds the property. The personnel manager announces that, in order to protect product design secrets, random searches of employee vehicles will be carried out at the exit gates.

What assumptions lie behind this practice?

What would have been useful questions to consider prior to adopting this practice?

Best Practices

Advice is often given to identify “best practices” and use them in your organization.

Given our discussion of systems, what might be some considerations in deciding to use a “best practice?”

Theory of Knowledge

"Any theorem is true in its own world. But which world are we in? Which of several worlds makes contact with ours? That is the question."

The New Economics, 2nd Ed., p. 227

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Part 3

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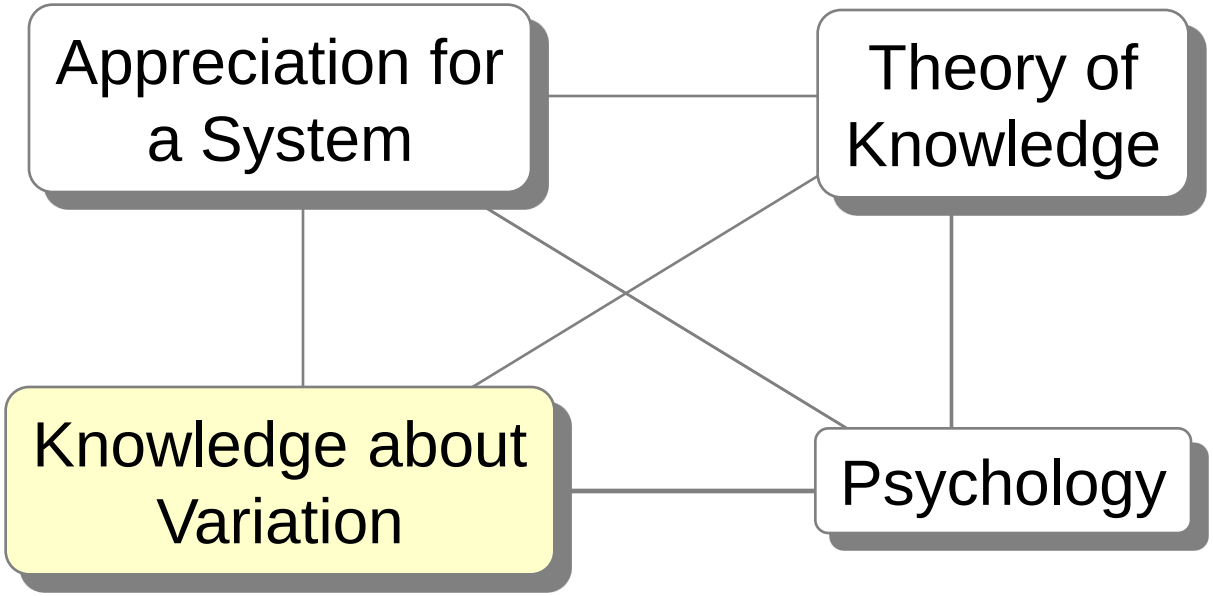

Evaluating Performance Indicators

Indicator	Jan, 10
●●●●●●●	●●●
●●●●●●●	●●●
●●●●●●●	●●●
●●●●●●●	●●●
Unit Cost	136.60
●●●●●●●	●●●
●●●●●●●	●●●

Evaluating Performance Indicators

Indicator	Dec, 09	Jan, 10
●●●●●●●		●●●
●●●●●●●		●●●
●●●●●●●		●●●
●●●●●●●		●●●
Unit Cost	134.80	136.60
●●●●●●●		●●●
●●●●●●●		●●●

Evaluating Performance Indicators

Indicator	Jan, 09	Dec, 09	Jan, 10
●●●●●●●			●●●
●●●●●●●			●●●
●●●●●●●			●●●
●●●●●●●			●●●
Unit Cost	119.00	134.80	136.60
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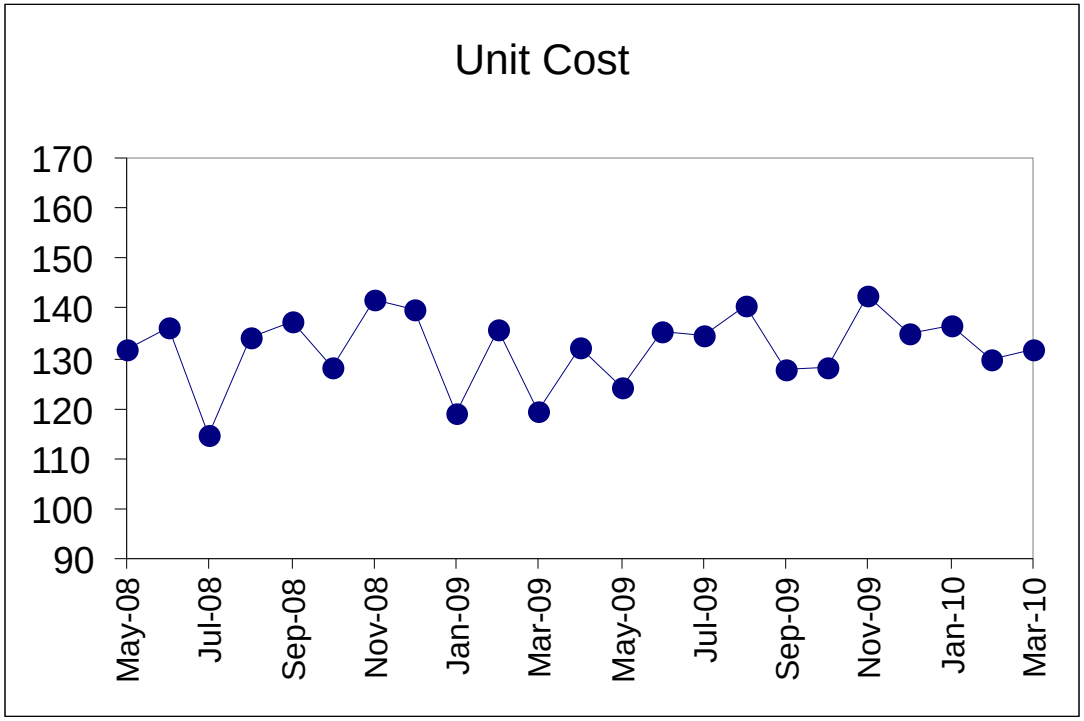
Evaluating Performance Indicators

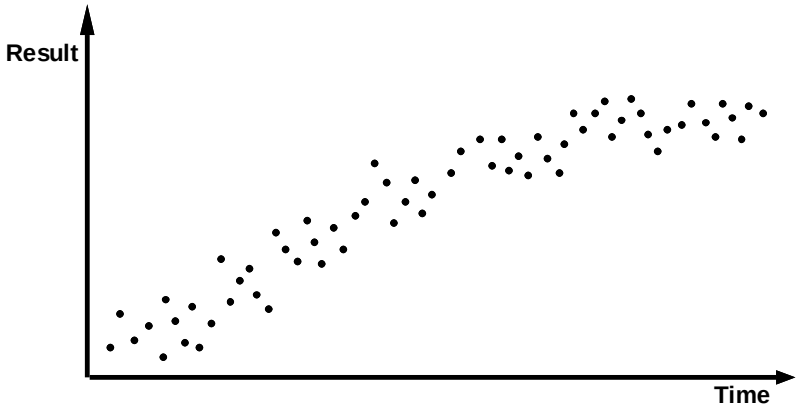


Patterns of Variation

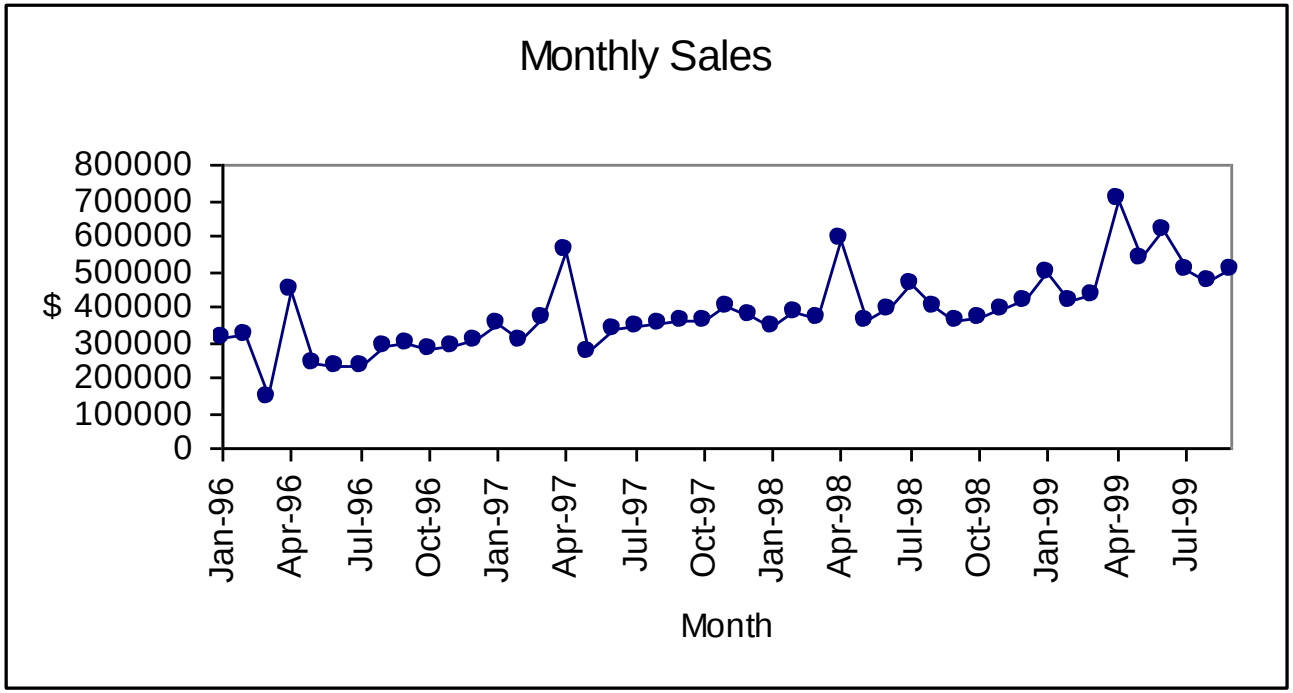
A

B

C



Patterns of Variation



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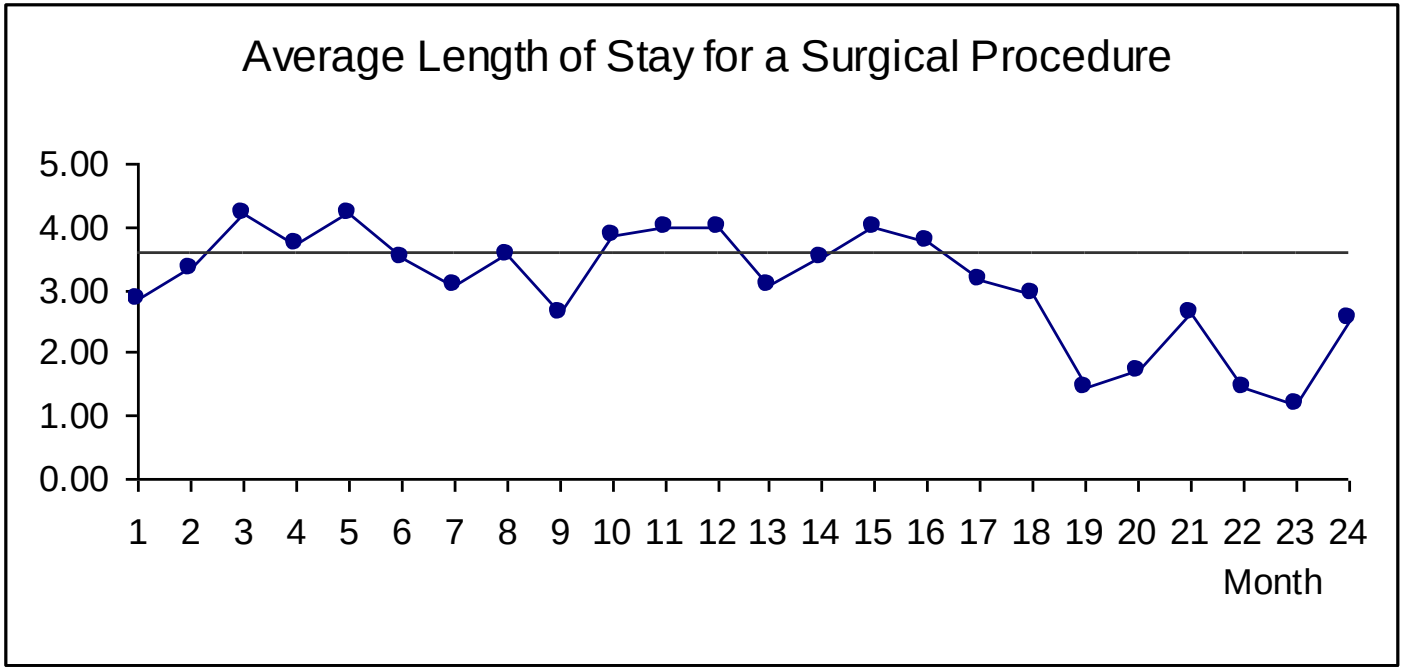


Patterns of Variation

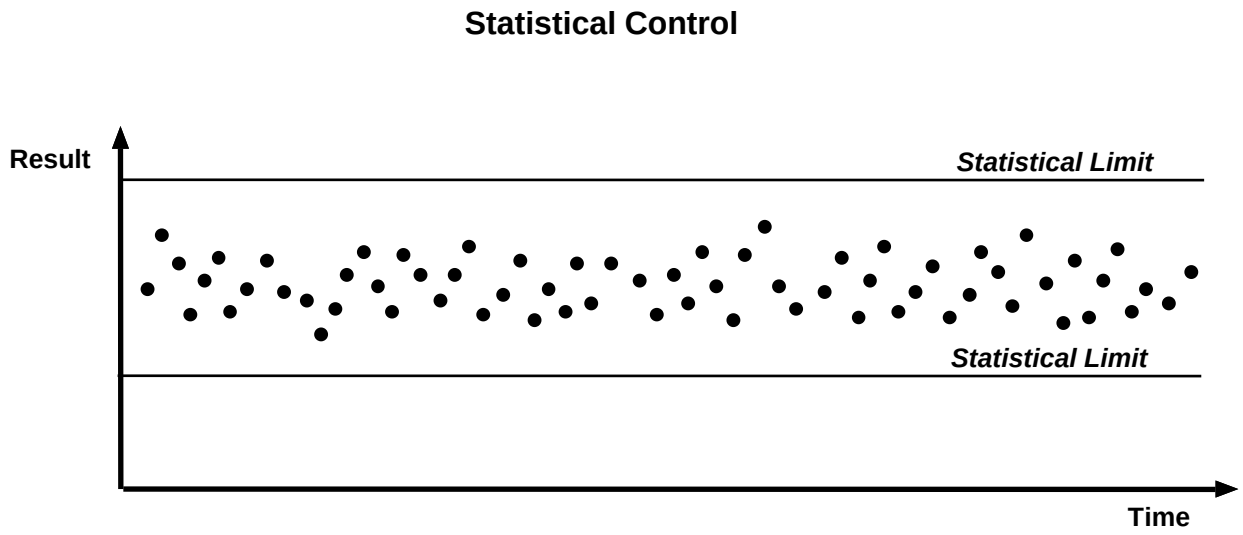
The Statistical Control Chart

Invented by physicist and statistician Walter Shewhart.

Provided a means by which variation could be interpreted and appropriate actions taken.

The Statistical Control Chart

A control chart with statistical limits

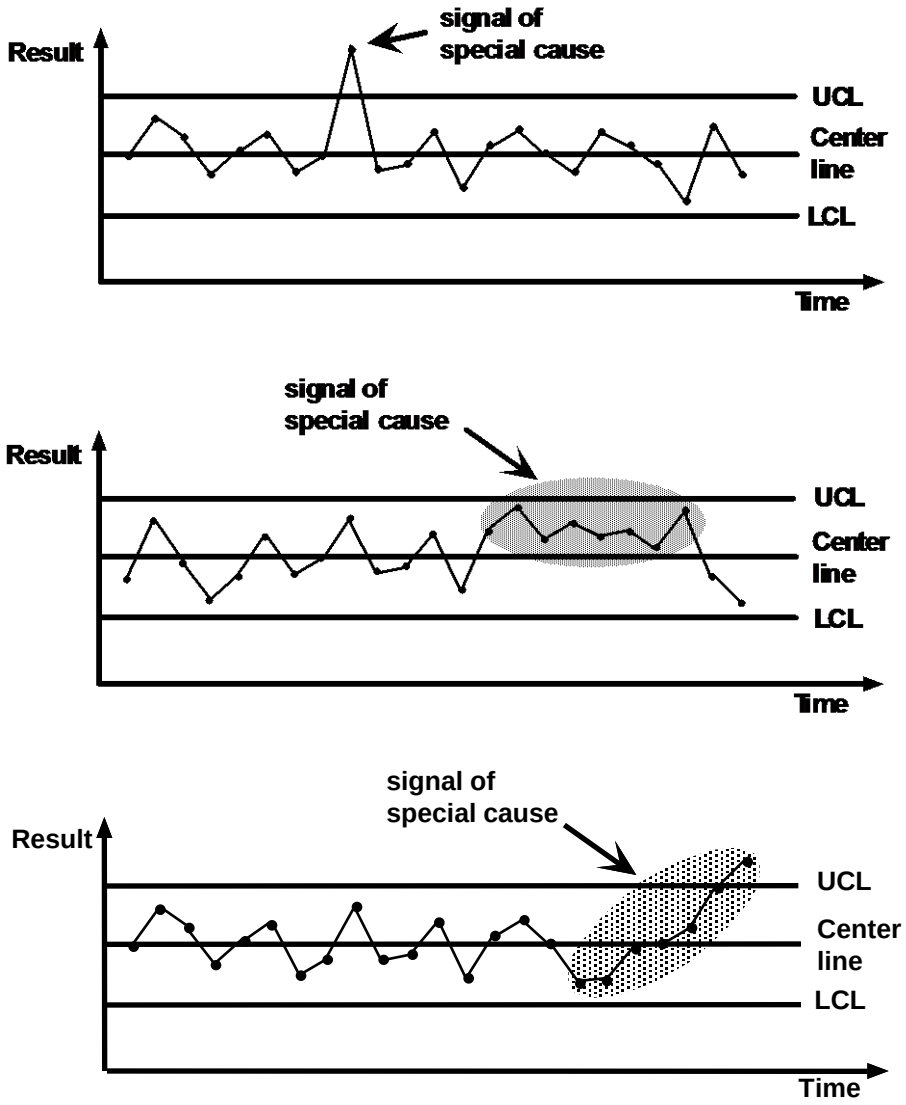


allows one to make an informed judgment about the variation in results and the appropriate actions to be taken.

Statistically controlled variation is produced by common causes -
causes that are inherent to system design and daily management and operating practice.

Variation in results that exhibits statistical control indicates that improvement in performance will occur by redesign of the system or change to the management practices that produce the results.

Signals of a Lack of Statistical Control



Why Use a Statistical Control Chart?

To prevent over-reaction to variation

To guide actions for improvement

Avoiding two kinds of mistakes:

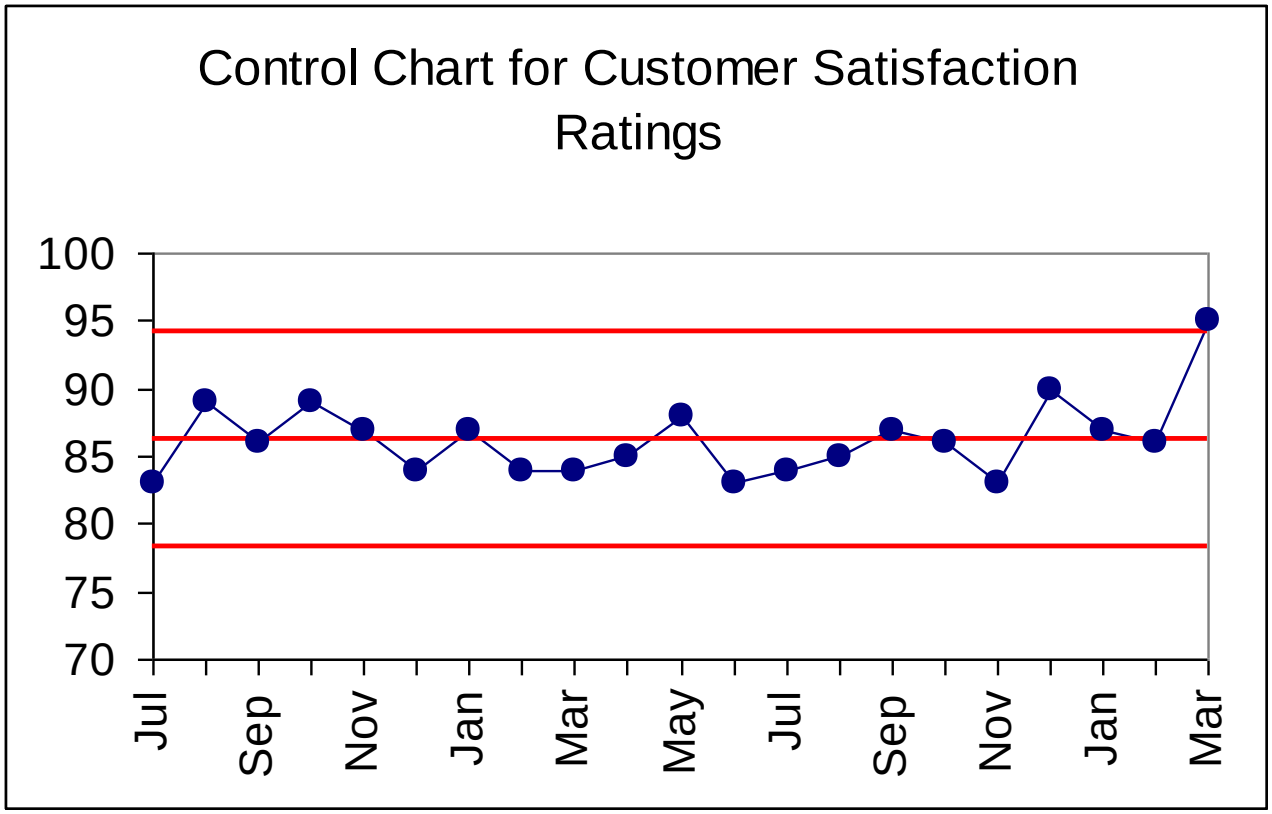
Efforts directed	Origin	
	Common Cause	Common & Special Cause
At a special cause	Mistake	Good
At the cause system (common causes)	Good	Mistake

Why Use a Statistical Control Chart?

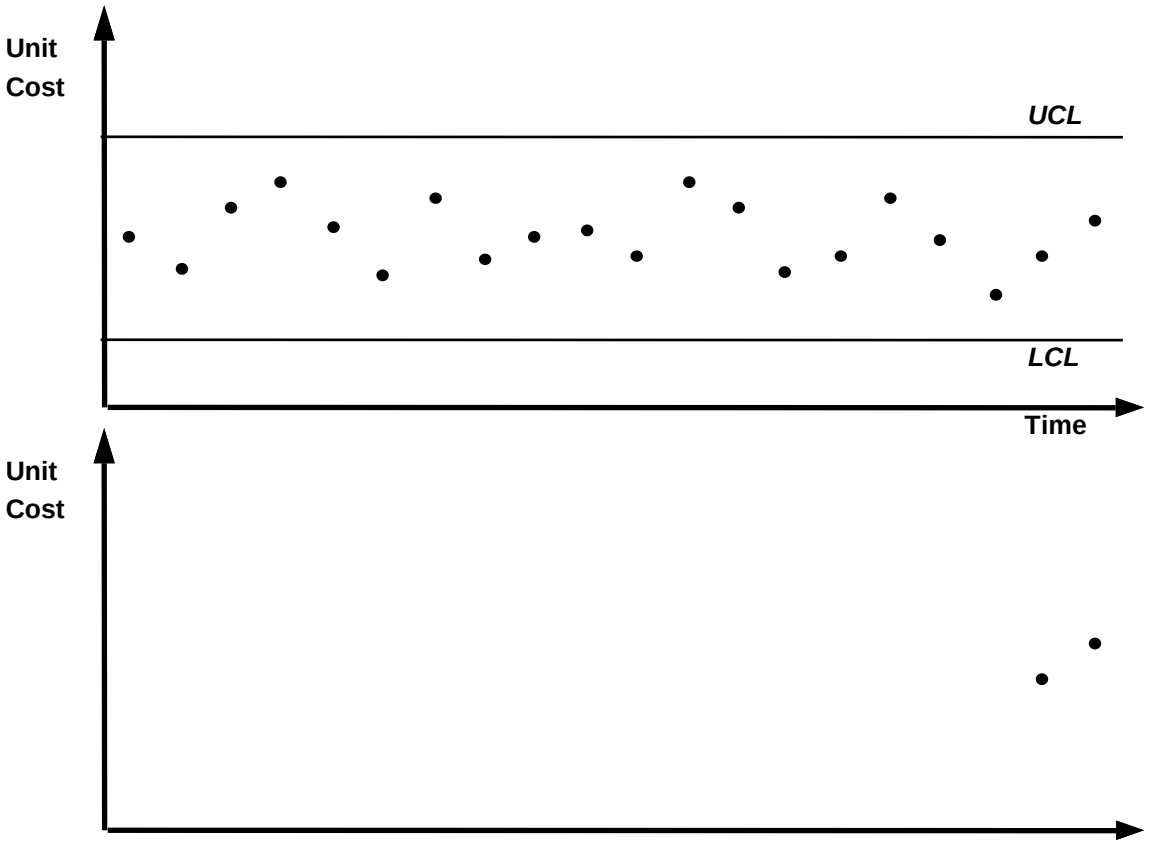
"... the type of action required to reduce special causes of variation is totally different from the action required to reduce variation and faults from the system itself..."

Out of the Crisis

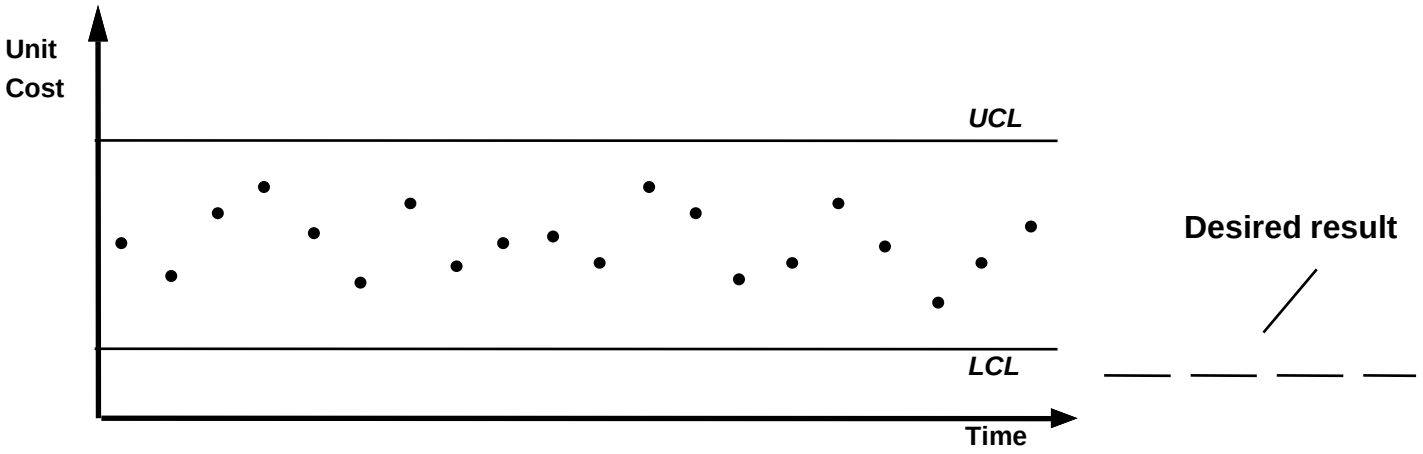
How Will We Know a Change Is an Improvement?



Interpreting Results

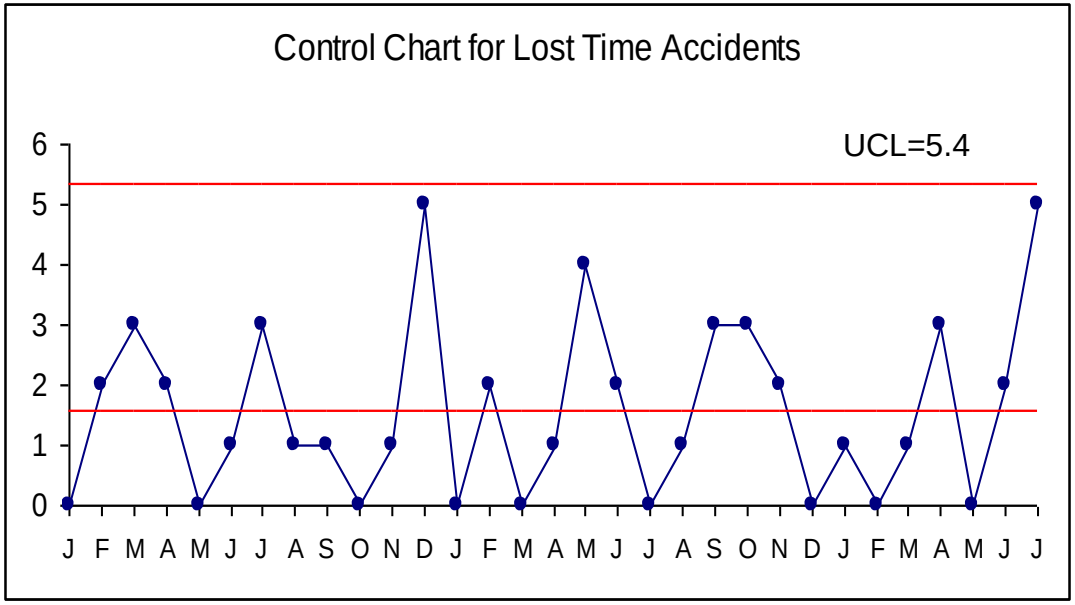


Interpreting Results



Lost Time Accidents

The number of lost time accidents in a facility jumped from two in June to five in July. The facility manager was concerned when he learned about the increase. Here is a control chart for monthly lost time accidents:



What do you conclude about the increase?

What Should Be Done?

Here are some options the facility manager is considering. What would you recommend?

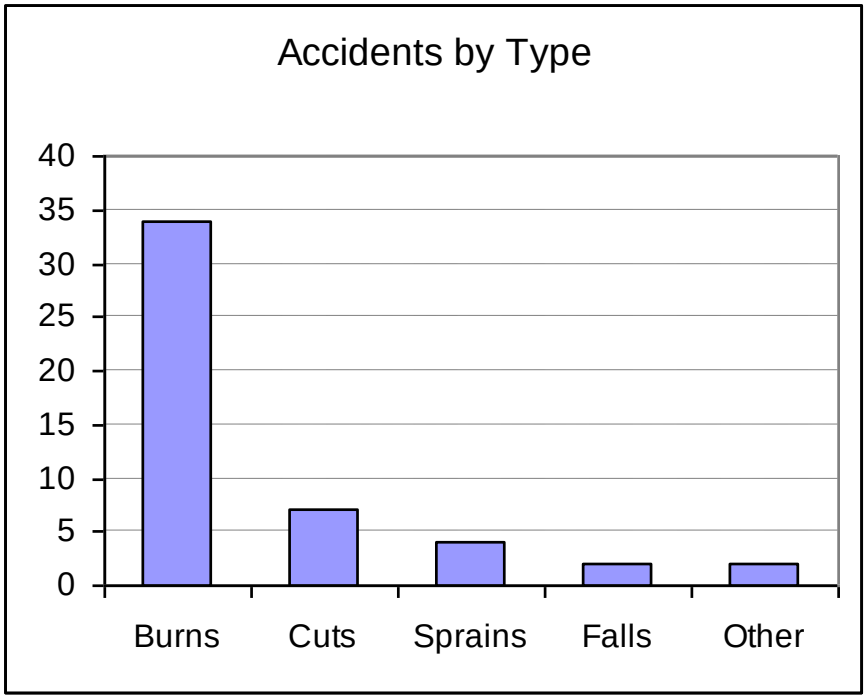
1. Direct the personnel manager to immediately begin a safety training program.

2. Have the personnel manager find out who had accidents in July and put them into a safety training program.

3. Ask the personnel manager to dig up the records of lost time accidents for the past several months and categorize them by type and by location. Look for patterns.

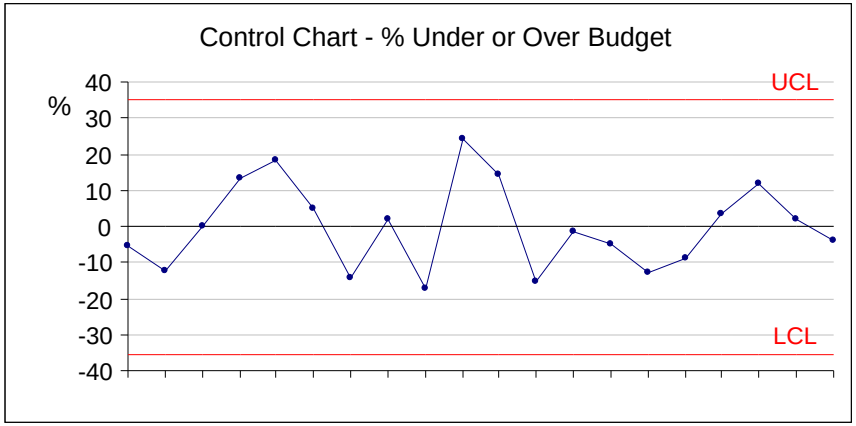
4. Have the personnel manager hire a company to make signs with messages such as “Safety begins with you” so that they can be posted in conspicuous places around the facility.

Lost Time Accidents



Projects

A policy was put into place for a part of a firm that did its work project by project: "When a completed project's costs are more than 10% over or under budget, the project manager will provide an explanation for the variance." Refer to the control chart below. The statistical control limits are about ±35%.

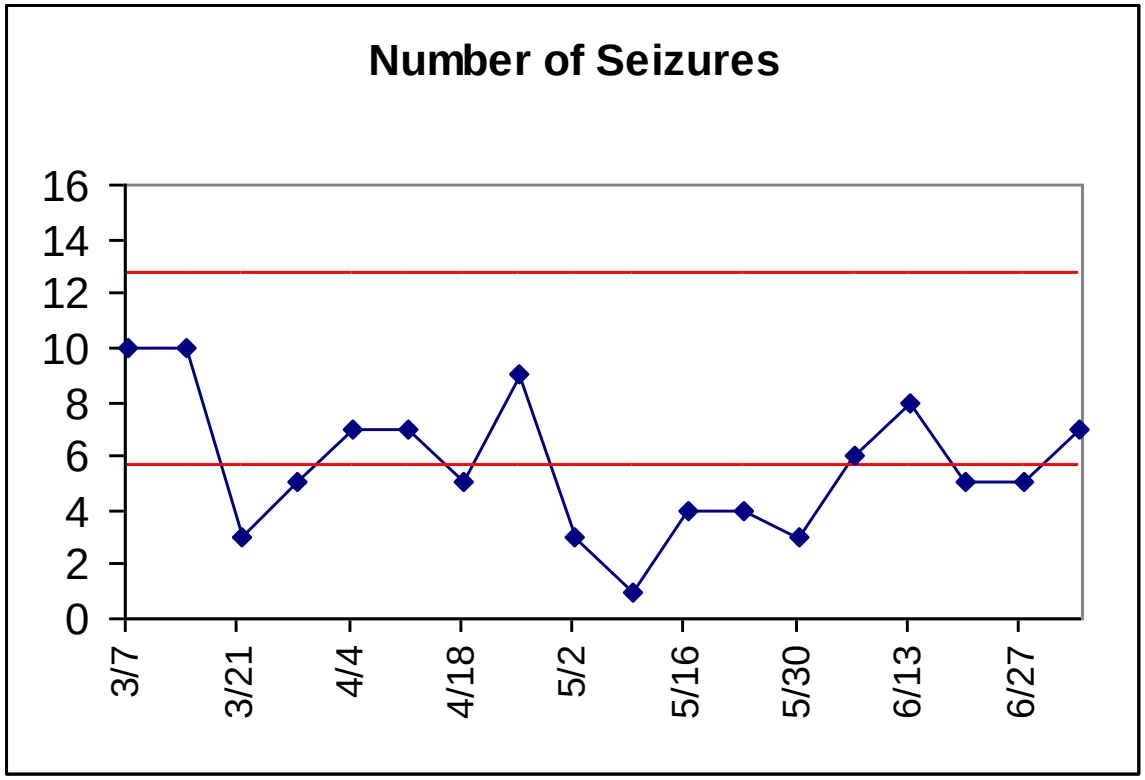


What does the chart indicate about variation in budget variances?

What do you predict will happen as a result of having the policy?

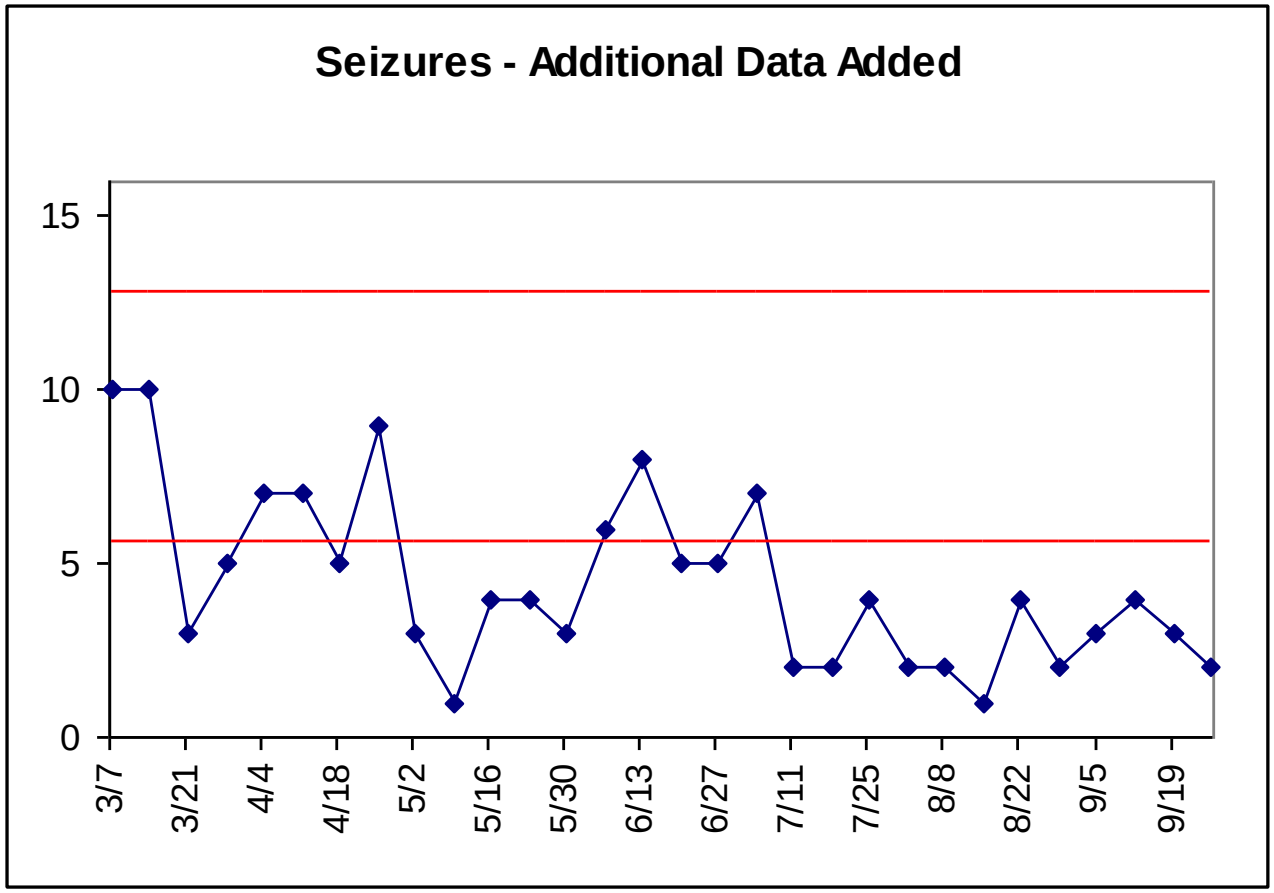
What might be done to improve performance to budget?

A Child's Weekly Number of Seizures

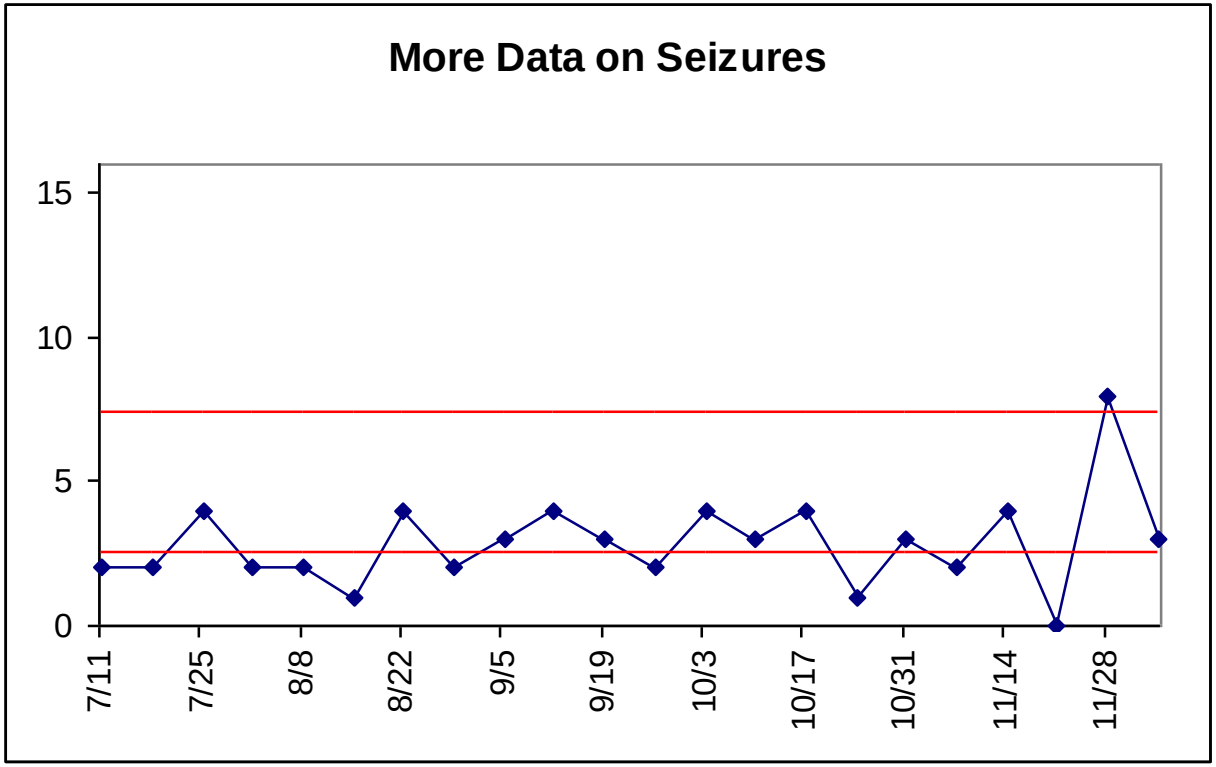


A Child's Weekly Number of Seizures

A change was made to the drugs the child was taking in the week of July 11

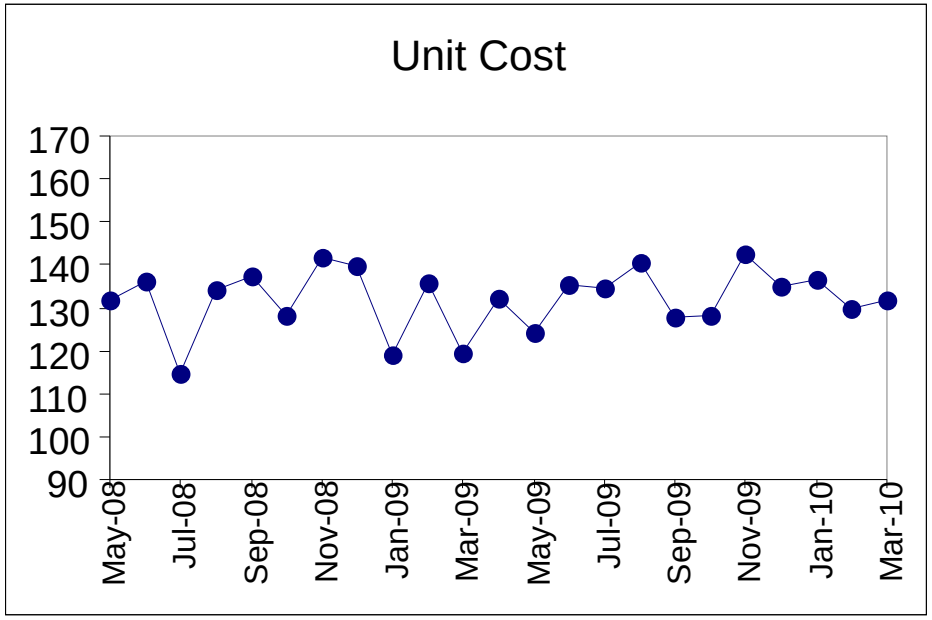


A Child's Weekly Number of Seizures

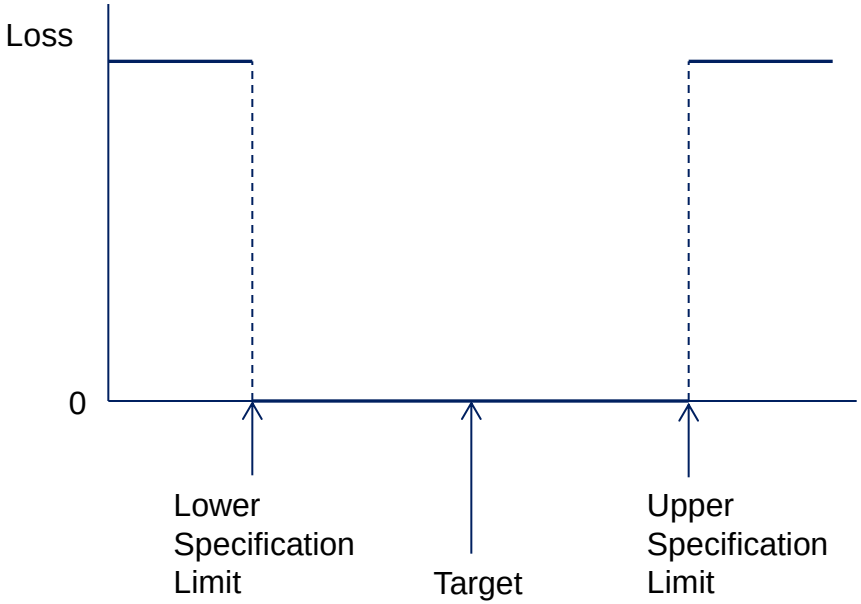


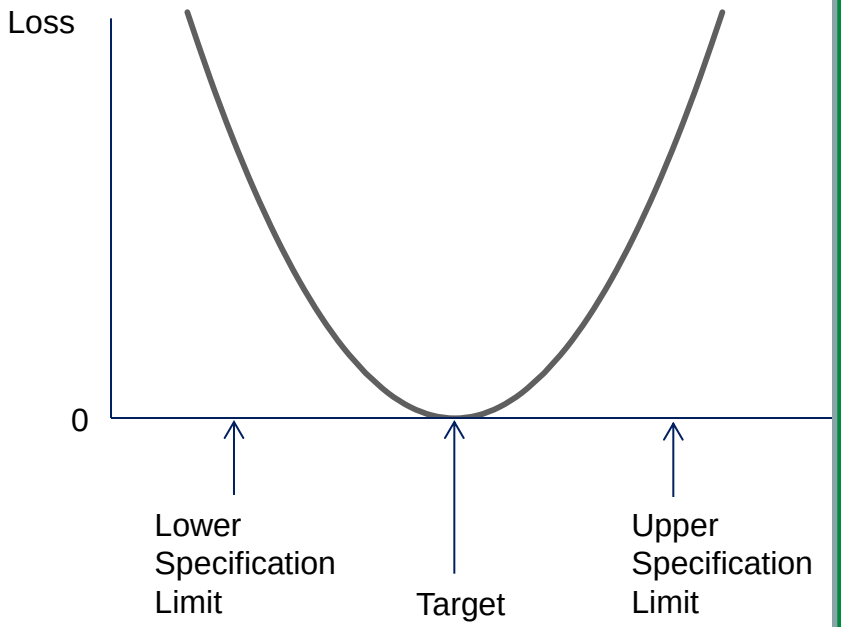
Plotting Points

Performance indicators and other measures looked at regularly should be plotted over time to avoid some of the pitfalls we have discussed.



Two Views of Loss





Taguchi

Two Aims for Process Control

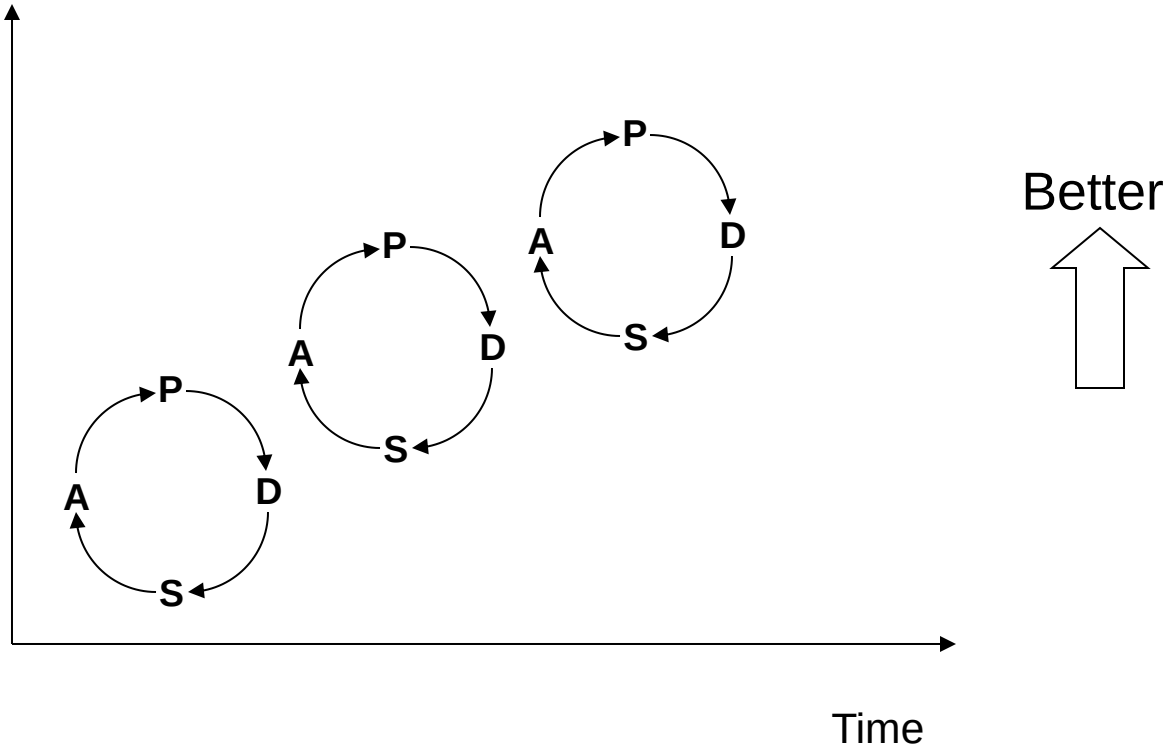
- Maintenance of status quo

- Improvement

"Once statistical control is achieved..., the next step is improvement of the process, provided the economic advantage hoped for will be a good investment, in view of the expected cost of improvement."

The New Economics

Learning and Improvement



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Part 4

Gipsie B. Ranney

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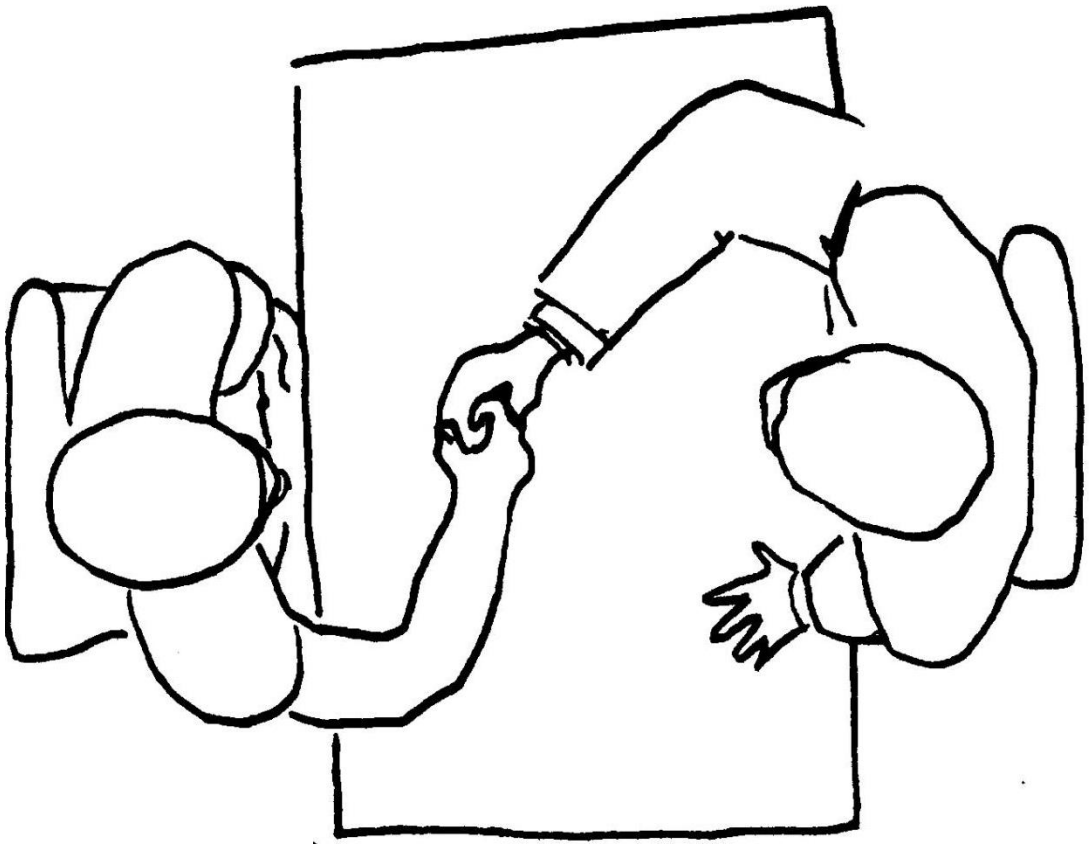
Thumb Wrestling

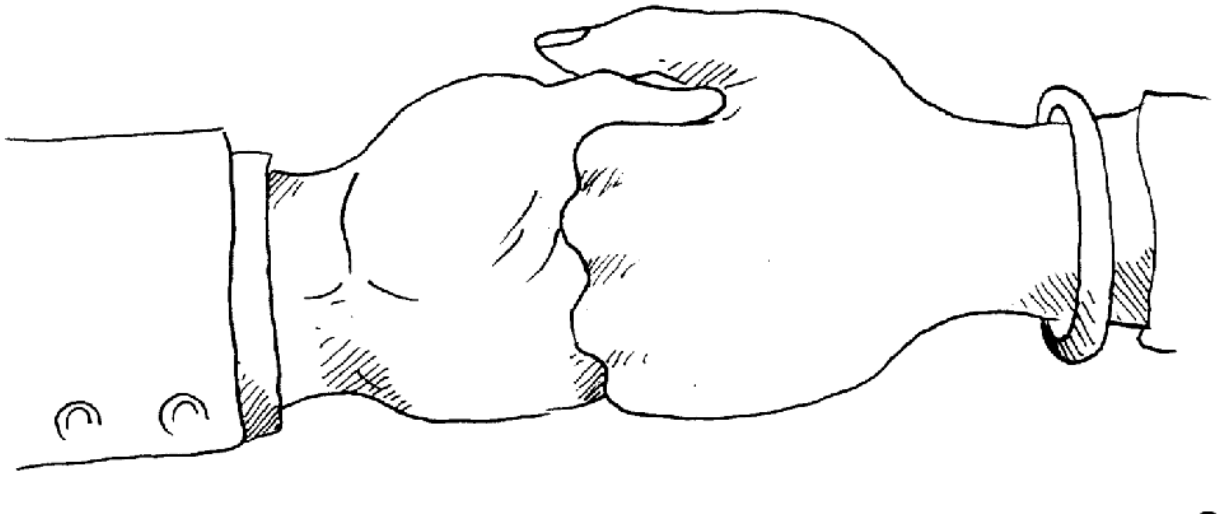


Form pairs to play the game.

Thumb Wrestling

- Each pair will grasp fingers.
- The goal of the game is to collect as many points as you can in one minute.

Thumb Wrestling

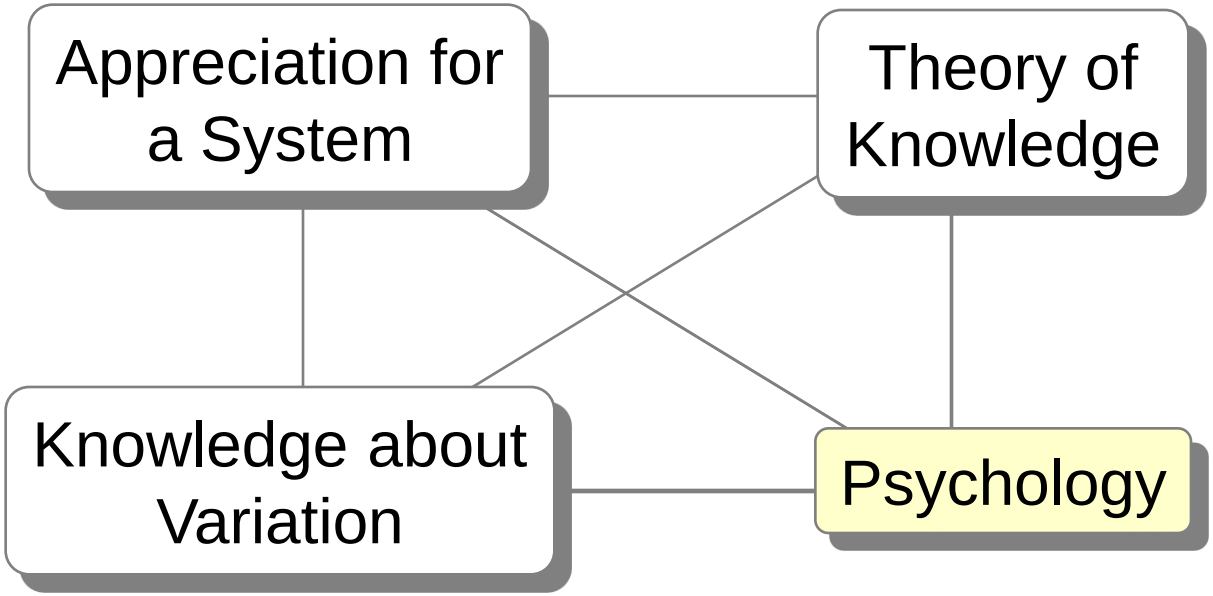


- To get a point, one partner pins the thumb of the other partner. Keep track of the number of points accumulated.
- Warm up by tapping your thumbs back and forth three times.
- Begin when the timekeeper says “go.”

Thumb Wrestling

- What assumptions were made about the game?
- What relationships could the two players have?
- If the aim of the game is for the partnership to get as many points as possible, which is the higher leverage form of relationship?
- If you chose the lower leverage form of relationship, what was the unintended consequence?

The System of Profound Knowledge



Psychology

- Cooperation.
- Improved management of people.
- Motivation.
- Enhancement of ability of people to contribute.
- Pride and joy in work.

Role of a Manager of People

System thinking

1. A manager understands and conveys to his people the meaning of a system. He explains the aims of the system. He teaches his people to understand how the work of the group supports these aims.

2. He helps his people to see themselves as components in a system, to work in cooperation with preceding stages and with following stages toward optimization of the efforts of all stages toward achievement of the aim.

14. He understands the benefits of cooperation and the losses from competition between people and between groups.

The New Economics, 2nd Ed.

Role of a Manager of People

Continual improvement

7. He has three sources of power: 1. Authority of office. 2. Knowledge. 3.Personality and persuasive power; tact. A successful manager of people develops Nos. 2 and 3; he does not rely on No. 1. He has nevertheless obligation to use No. 1, as this source of power enables him to change the process … to bring improvement….

4. He is an unceasing learner. He encourages his people to study….

8. He will study results with the aim to improve his performance as a manager of people.

The New Economics, 2nd Ed.

Role of a Manager of People

Understanding the effects of the system on performance

6. He understands a stable system. He understands the interaction between people and the circumstances that they work in. …

9. He will try to discover who if anybody is outside the system, in need of special help. This can be accomplished with simple calculations, if there be individual figures on production or on failures. Special help may be only simple rearrangement of work. It might be more complicated. He in need of special help is not in the bottom 5 per cent of the distribution of others: he is clean outside that distribution.

11. He does not expect perfection.

The New Economics, 2nd Ed.

Interpretation of chart

Record of the number of defective items by Willing Workers, per day. Lot size 50, each Willing Worker per day.

Willing Workers	DAY 1	2	ZD 3	4	ALL 4	5	
RICH	8	12	12	10	42		
RANDY	13	7	16	12	48		
JERRY	6	8	13	13	40	11	13
CINDA	15	9	9	8	41	10	13
BRIAN MIKE	8	10	11	7	36	8	4
MIMI MARK	16	14	8	7	45		
ALL 6	66	60	69	57	252		59
Cum $\bar{x}$	11	10.5	10.8	10.5	--	--	

The chart at the left is for Nashville, 14 November 1990. The control limits therefor, extended, predict the range of variation to be expected in the future. The present experiment is an example of the future.

$$\bar{\bar{X}} = \frac{252}{6 \times 4} = 10.5$$

$$\bar{\bar{P}} = \frac{252}{6 \times 4 \times 50} = .21$$

$$\text{UCL}_{\text{LCL}} = \bar{\bar{X}} \pm 3\sqrt{\bar{\bar{X}}\,(1 - \bar{\bar{p}})}$$

$$= 10.5 \pm 3\sqrt{10.5 \times .79}$$

$$\text{UCL}_{\text{LCL}} = \begin{matrix} 19.14 \\ 1.86 \end{matrix} \rightarrow \begin{matrix} 19 = \text{UCL} \\ 2 = \text{LCL} \end{matrix}$$

Wooden beads
Census count, one by one
Total 4000
Red 800
White 3200

Paddle No. 4

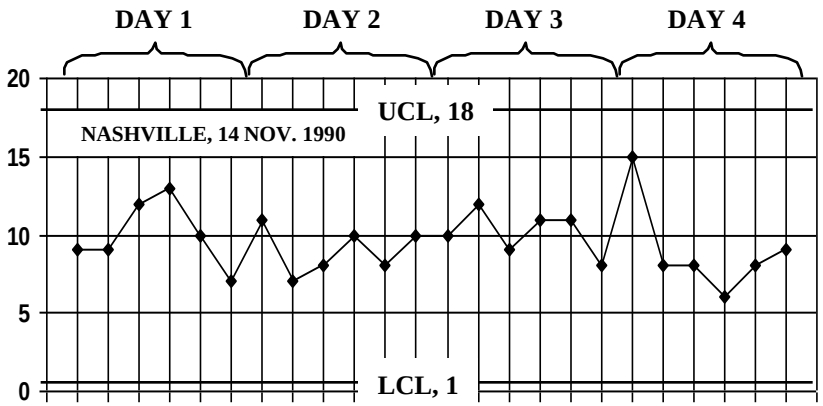
The process exhibits good statistical control. This conclusion is based on intimate knowledge of the procedures prescribed and followed by the six Willing Workers, as well as on study of the chart. This is an example of a constant cause system. There is no evidence that one Willing Worker will in the future be better than any other. Difference between Willing Workers and between days are attributable to variation inherent in the system, common causes.

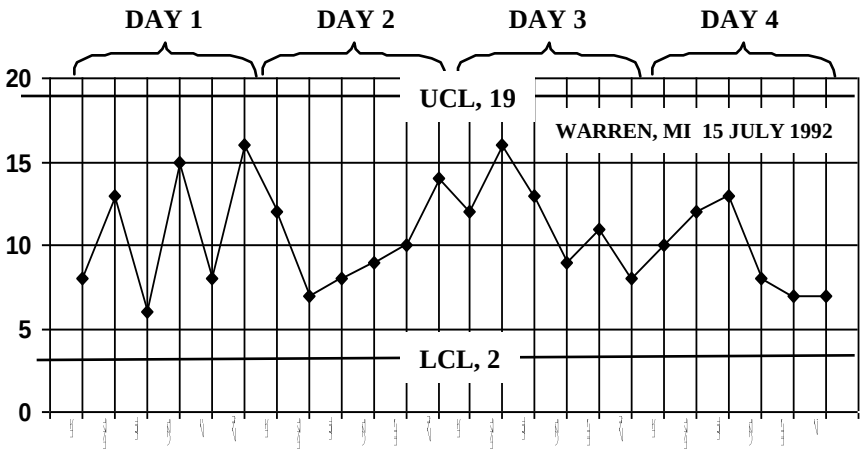
The Willing Workers have put into the job all that they have to offer.

One way to decrease the proportion red in the product is to reduce the proportion of red beads in the incoming material (management's responsibility).

The control limits may be extended into the future as prediction of the limits of variation to expect from continuation of the same process.

Inspector: JIM
JOE
Recorder: COLLEEN
Inspector General: LORI





Role of a Manager of People

6. *…He understands the interaction between people and the circumstances that they work in…*

Person	Result
1	8
2	6
3	5
•	•
•	•
•	•

x + (yx) = 8

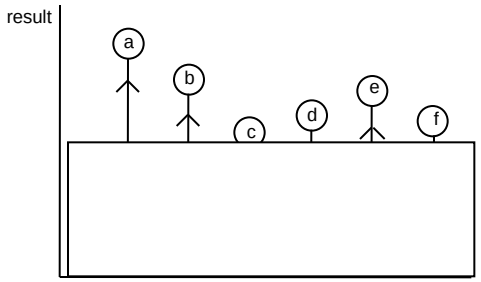
effect of the individual on the result

effects of the system, interactions of the individual with the system

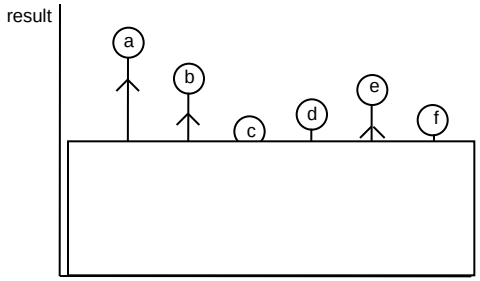
result

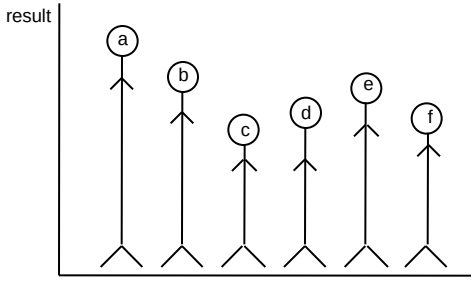
Source for x + (yx) = 8: *The New Economics, 2nd Ed., pp 25-26.*

$$x + (yx) = 8$$

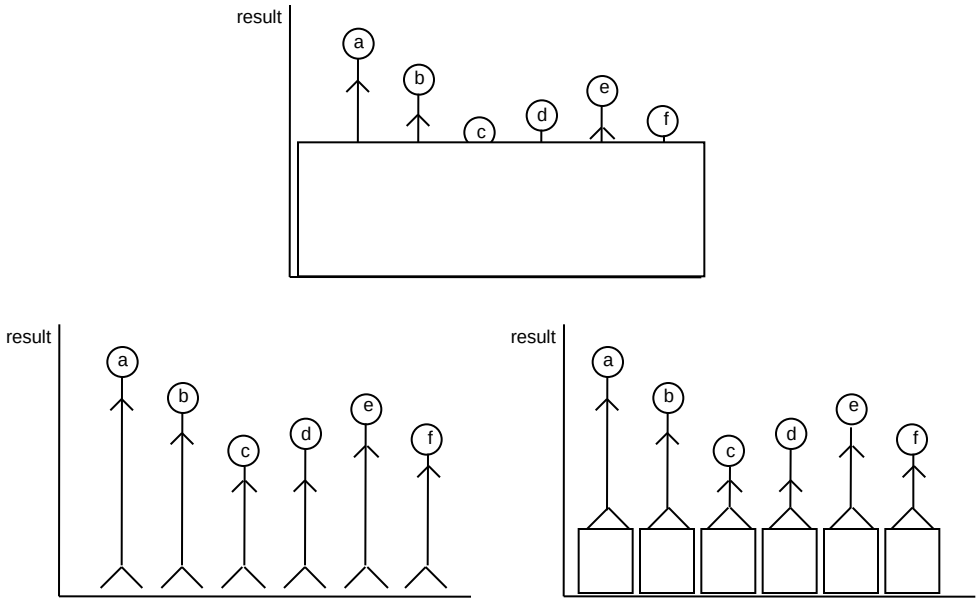


x + (yx) = 8

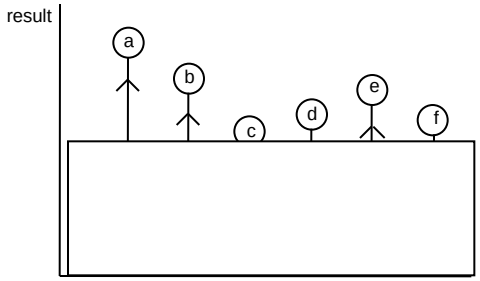


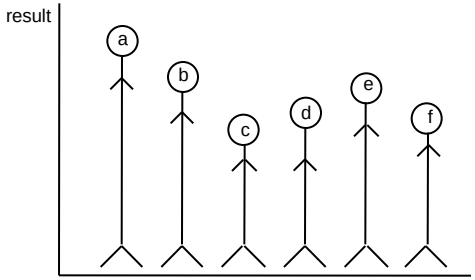


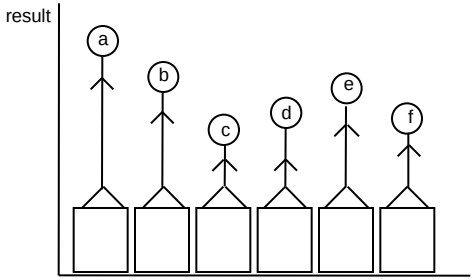
$x + (yx) = 8$

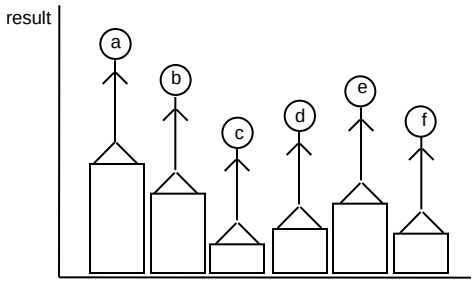


$x + (yx) = 8$

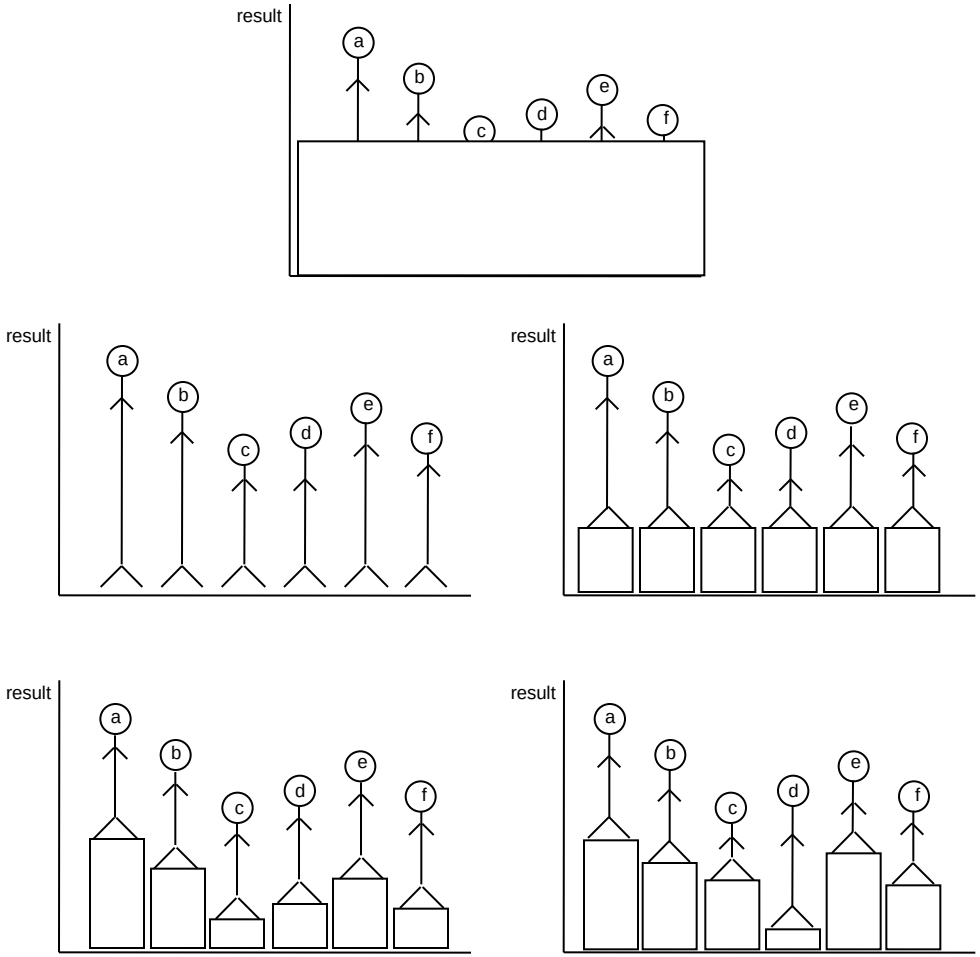








$x + (yx) = 8$


result
a
b
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e
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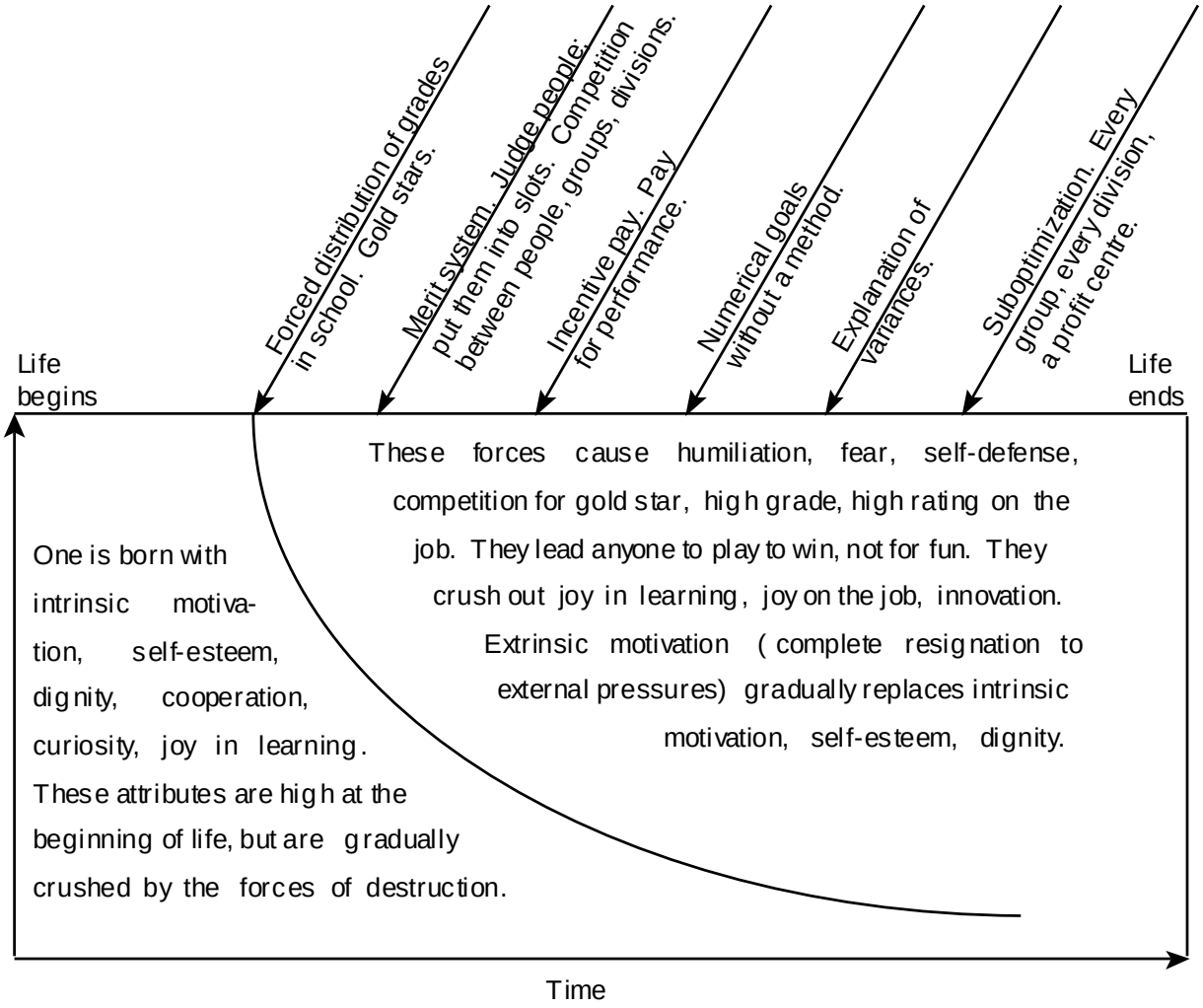
Forces of Destruction



The New Economics, 2nd Ed., p. 122.

Intrinsic and Extrinsic Motivation

Edward L. Deci 1971

“Intrinsic motivation involves people freely engaging in activities that they find interesting, that provide novelty and optimal challenge.”

Intrinsic motivation is undermined by extrinsic rewards.

Herzberg on Motivation

Possible interpretation of Herzberg's HBR article title – "One More Time, How Do You Motivate Employees?":

What methods should you use to manipulate the behavior of employees to match what you want?

KITA

To get a dog to do what you want, you can either give him a treat or kick him. In neither case is the dog motivated – you are.

Work Motivation

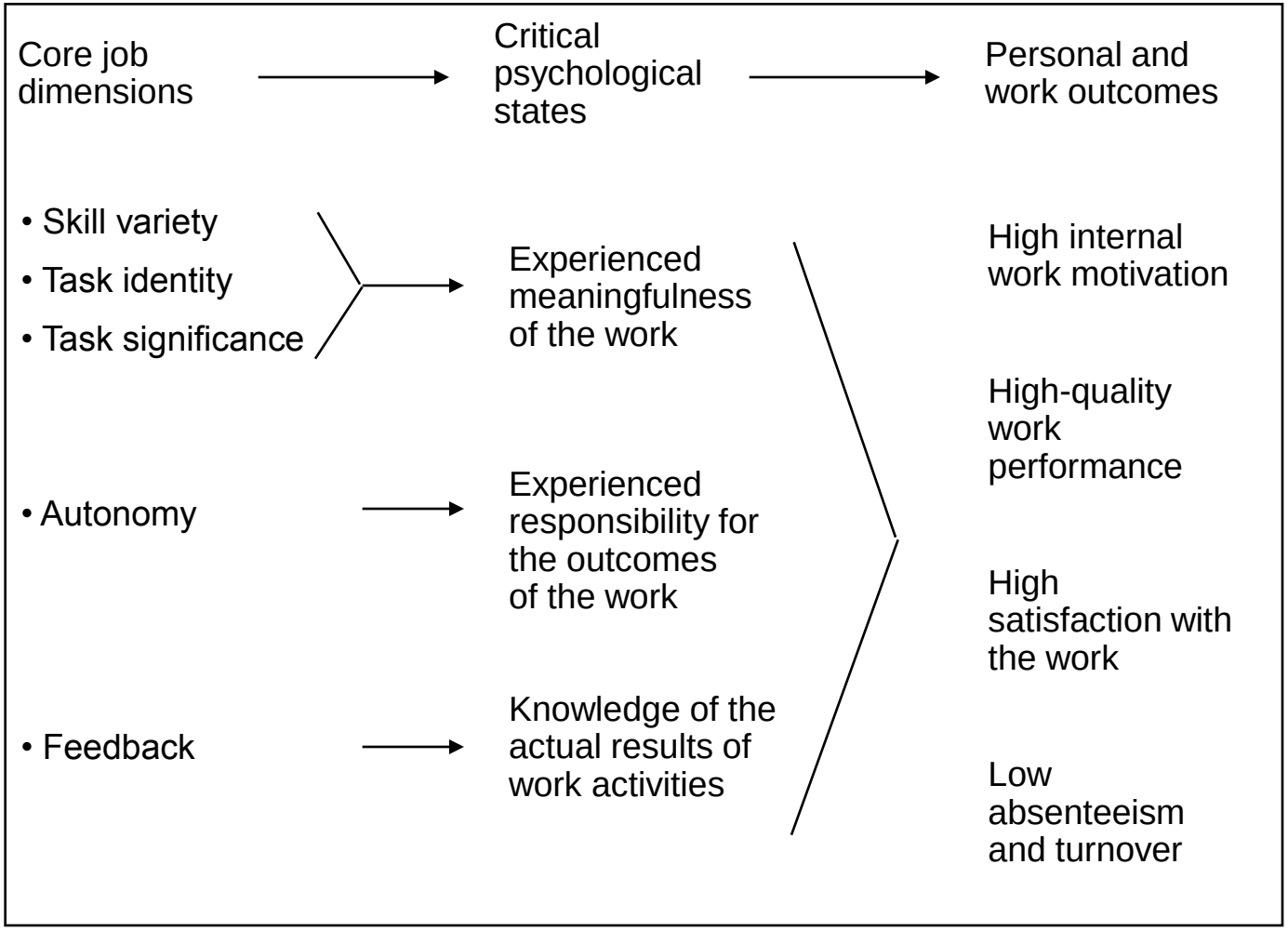
The “rabble hypothesis”– T.W. Harrell

Erroneous assumption that money is the only important incentive

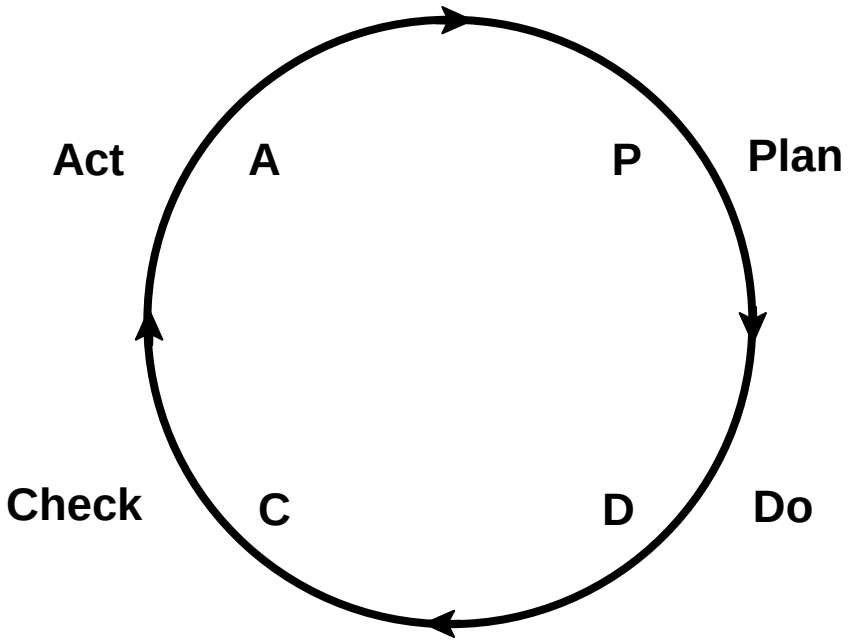
Workers treated as a group of unorganized rabble insensitive to the social motives of approval and self-respect

Work Motivation

Job Characteristics Model – Richard Hackman and Greg Oldham



Work Motivation



Role of a Manager of People

Seeking to understand people and help them develop

12. He listens and learns without passing judgment ...

13. He will hold an informal, unhurried conversation with every one of his people at least once a year, not for judgment, merely to listen. The purpose would be development of understanding of his people, their aims, hopes, and fears…

5. He is coach and counsel, not a judge.

The New Economics, 2nd Ed.

Toyota

"Manager-teachers—the internal motto is *Good Thinking, Good Products*. How do they achieve this "good thinking" which forms the foundation of their success? It is through a **culture of mentoring**.

Managers are expected to be hands-on masters of their domain of work …, ***are expected to spend time teaching and coaching others***."

Source: Larman and Vodde, *Lean Primer*

Role of a Manager of People

Trust

10. He creates trust. He creates an environment that encourages freedom and innovation.

The New Economics, 2nd Ed.

The Psychological Contract

Argyris (1960)

Unwritten expectations between an employee and the employing organization

Employee's expectations include:

- sense of dignity
- sense of worth
- fair treatment
- opportunities to learn and grow

Employer's expectations of the employee include:

- loyalty
- commitment

Trust

Trust is evolutionary

conditional ⟶ unconditional

Unconditional trust fundamentally changes the quality of the exchange relationship

Jones, G. and George, J. (1998), “The Experience and Evolution of Trust: Implications for Cooperation and Teamwork,” *The Academy of Management Review*, 23(3), 531-546.

Trust

Effects of Unconditional Trust on Interpersonal Cooperation and Teamwork

- willingness to go beyond job description
- high confidence in others
- people want to help each other
- willing to seek help
- free exchange of knowledge and information
- subjugation of personal needs and ego for the greater common good
- high involvement

Adapted from: Jones and George (1998).

Role of a Manager of People

Joy in work.

3. A manager of people understands that people are different from each other. He tries to create for everybody interest and challenge, and joy in work. ....

The New Economics, 2nd Ed.