

Six Sigma Simplified

**Breakthrough
Improvement
Made Easy**

Six Sigma[®] Simplified – A QI Coloring Book[®] 2nd Edition
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Any QI Coloring Book can be customized to reflect a company's improvement process. For information, call, write, or e-mail to the address above.

Also by Jay Arthur:

The Six Sigma Instructor's Guide, Greenbelt Training Made Easy, LifeStar, 2001
Improving Software Quality, John Wiley & Sons, 1993, 287 pages, ISBN 0-471-57804-5

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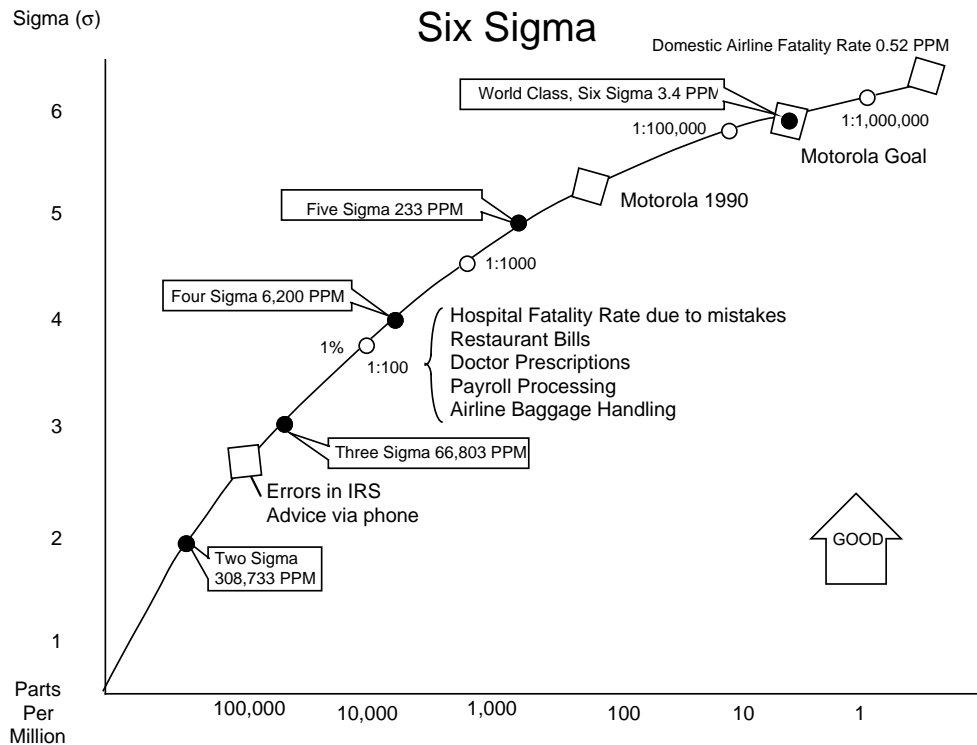
Making Six Sigma Pay Off

Six Sigma Targets

Sigma (σ)	Defects/Million
1	690,000
2	308,733
3	66,803
3.5	Average
4	6,210
5	233
6	3.4

In *Built To Last*, (Collins 1997), the authors mention the need for a BHAG or Big Hairy Audacious Goal. Using Six Sigma as a guide, you can measure your current performance in defects per million and set a BHAG of reaching the next level sigma.

So, if your computer system has 2% downtime, that's 20,000 minutes per million or about 3.5 sigma. Set a goal to reach 5 sigma (1 minute/5,000 minutes available)



What Is Six Sigma?

What is Six Sigma? Six Sigma is a results-oriented, project-focused approach to quality. It's a way of measuring and setting targets for reductions in product or service defects that is directly connected to customer requirements. These reductions in the cost of poor quality translate into cost savings and competitive advantage. Sigma, σ , represents one standard deviation from the average or mean. Most control charts set their range at $\pm 3s$, but Six Sigma extends three more standard deviations. At six sigma, there are only 3.4 parts per million (PPM) defective.

Why Six Sigma? Why now? For three years, Jack Welch at GE has been applying Six Sigma to improving GE's performance. GE expects to invest \$450 million to achieve \$2 billion in savings by year end 1998 (Wall Street Journal, April). 1-2% of the employees are full-time "Black Belt" improvement leaders. At GE, 40% of executive bonuses will be based on achieving Six Sigma goals. Respected business leaders embracing the concept will drive the demand for Six Sigma.

Double Your Quality!

Problem Solving

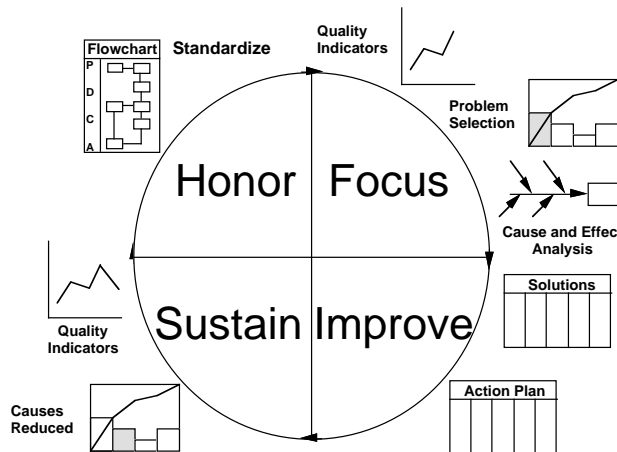
Our problems are man-made, therefore they may be solved by man. No problem of human destiny is beyond human beings.

-John F. Kennedy

Problems are only opportunities in work clothes.

-Henry J. Kaiser

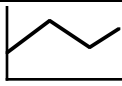
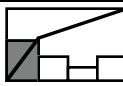
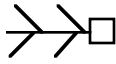
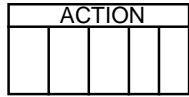
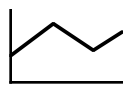
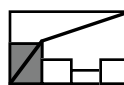

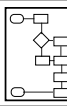
The Six Sigma Problem Solving Process also follows the FISH model—Focus, Improve, Sustain, and Honor. It focuses on identifying problems, determining their root causes, and implementing countermeasures that will reduce or eliminate the waste, rework, and delay caused by these problems.



Process

The problem-solving process follows the FISH cycle to ensure continuous, never-ending improvement:



FISH Step Activity	
Focus	1 Define the problem  
	2 Analyze the problem 
Improve	3 Prevent the problem 
	  
Sustain	4 Sustain the improvement 
Honor	5 Recognize, review, and refocus your efforts

For more information, check out the Six Sigma Wizard at www.qimacros.com/qiwizard.html

Six Sigma Improvement

Step 1 - Define The Problem

Purpose

Define a specific problem area and set a target for improvement

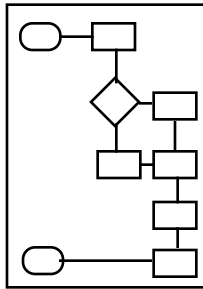
Problems are only opportunities in work clothes.

-Henry J. Kaiser

There are two ways of looking at problems:

Increase (want more of a "good" thing)

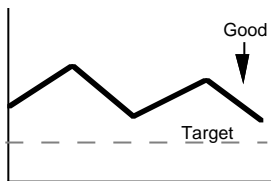
Decrease (want less of a "bad" thing)



These are often two sides of the same coin:

an increase in ...	is equal to a decrease in . . .
quality	number or percent defective
speed	cycle time—to deliver a product or service idle time—people, materials, machines
profitability	cost of waste and rework

Measurement

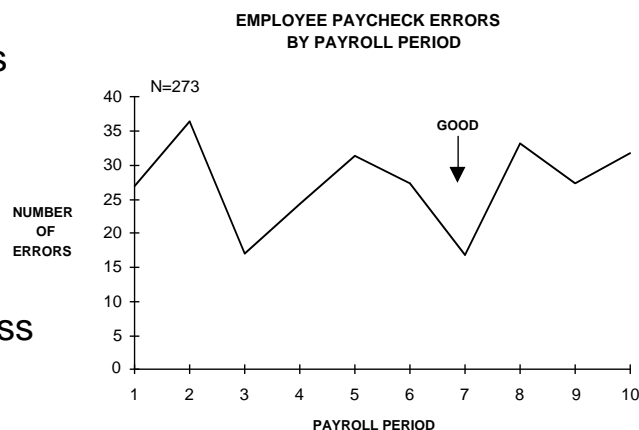


Solving problems is usually easiest when you focus on decreasing the "bad" rather than increasing the "good." Most problems can be easily expressed as a line graph showing the current trend and desired reduction in either cycle time, defects, or cost:

Example:

Reduce defects in employee paychecks

Target: 15 or less

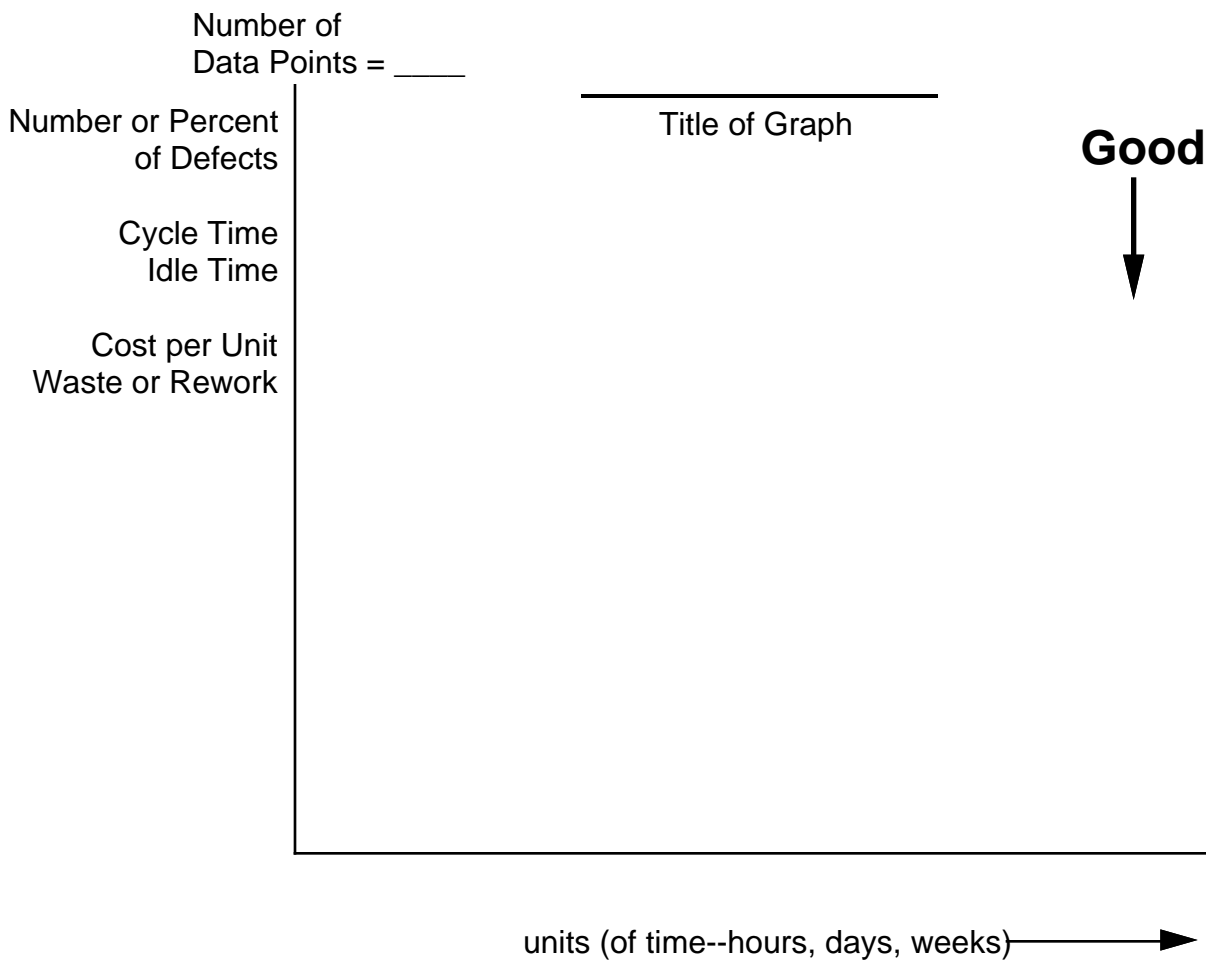


Six Sigma Improvement

Step 1 - Define The Problem

(circle one)

Problem: Reduce Defects in _____
 Time to deliver _____
 Cost to deliver _____ (product or service)



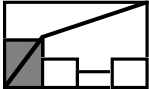
Who collected the data?
 When was data collected?
 Where?
 What formula was used?

To automate all of your graphs, charts, and diagrams using Microsoft® Excel, get the *QI Macros For Excel*.
 Download a Risk-FREE limited demo from www.quantum-i.com

Six Sigma Improvement

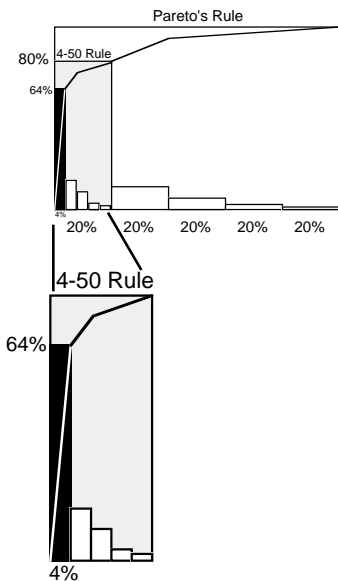
Step 1 - Define The Problem

Pareto Chart



We only admit to minor faults to persuade ourselves that we have no major ones.

- La Rochefoucauld

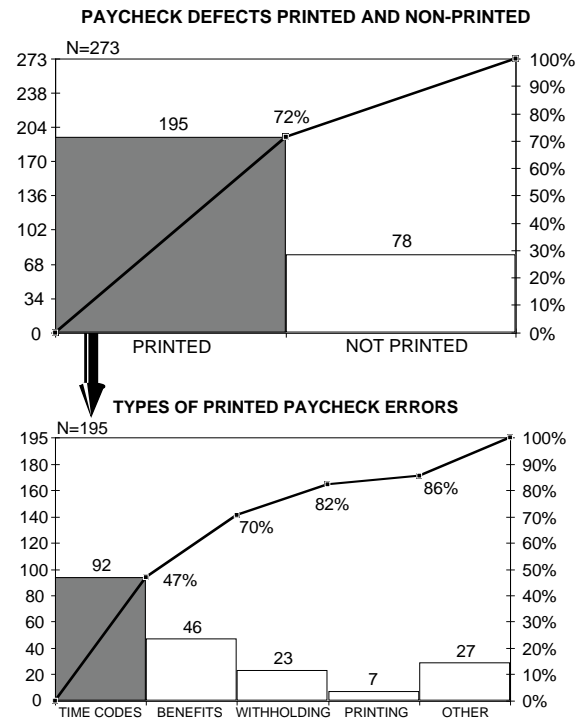


Problem *areas* are usually too big and complex to be solved with one effort, but when we whittle it down into small enough pieces, we can fix each one easily and effectively.

This step uses the Pareto chart (a bar chart and a *cumulative* line graph) to identify the most important problem to improve first.

Often, two or more pareto charts are needed to get to a problem specific enough to analyze easily. The left axis shows the number of occurrences for each bar. The right axis shows the cumulative percentage for the line graph.

Begin by identifying the components of the problem:



Indicator

Pareto Components

Defects
Time
Cost

- types of defects
- steps or delays in a process
- types of costs—rework, waste

A problem well stated is a problem half solved.

Once we have whittled the problem down to a small enough piece, we can then write a problem statement about the major contributor. This will serve as the basis for identifying root causes. We also need to set a target for improvement.

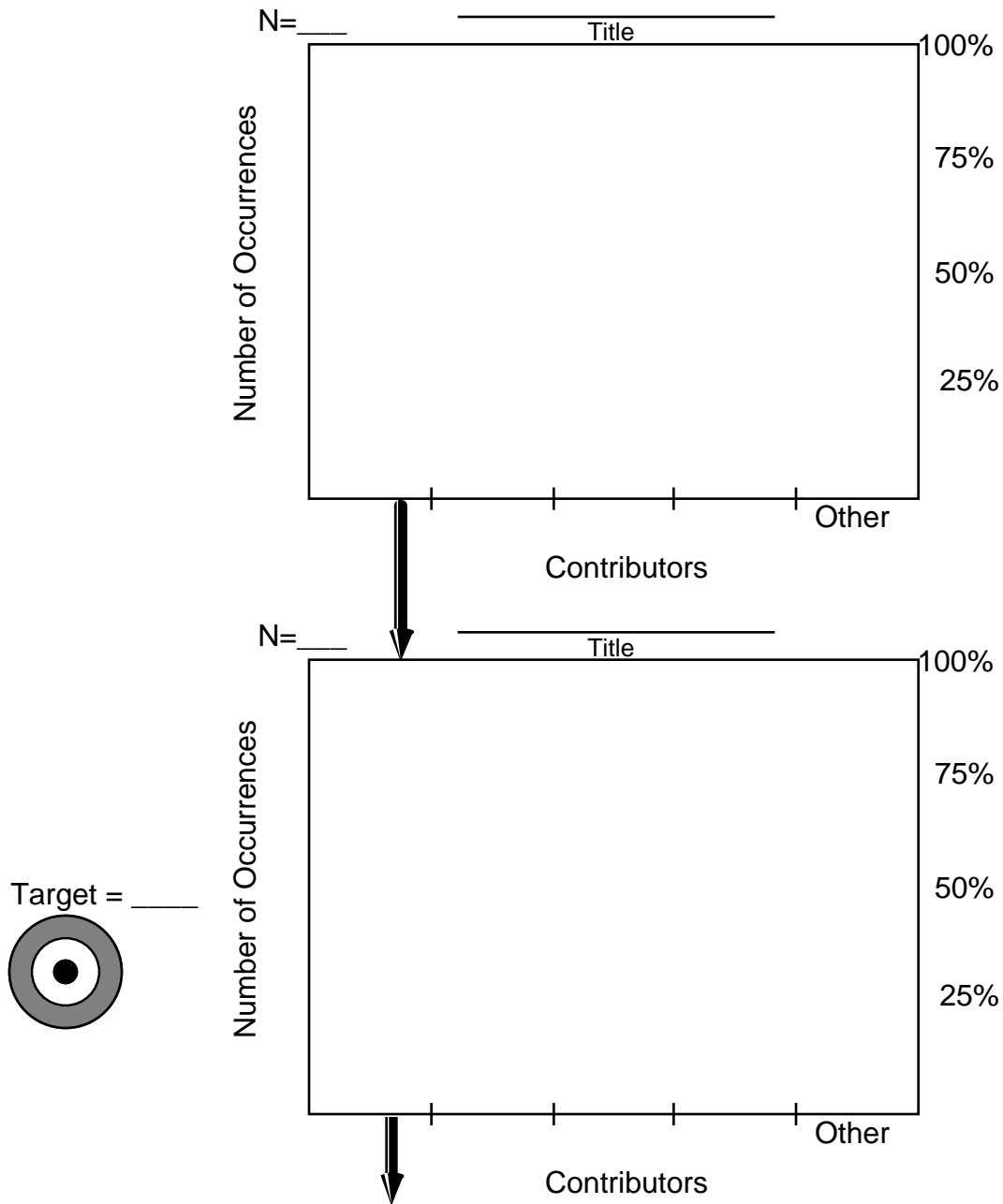
Problem Statement

Problem Statement: During the first five months of the year, time code errors accounted for 47% of all incorrect paychecks, which was 2X higher than the next highest contributor and resulted in 78 employee complaints.

Target: 50% reduction in time code errors

Six Sigma Improvement

Step 1 - Define The Problem



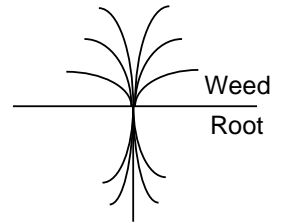
Problem Statement

During _____, _____, _____ accounted for ____% of _____,
 (Months) (Year) (Main Contributor) (time, defects, cost)

which was _____ higher than desired and resulted in _____.
 (Gap) (Pain)

Six Sigma Improvement

Step 2 - Analyze The Problem



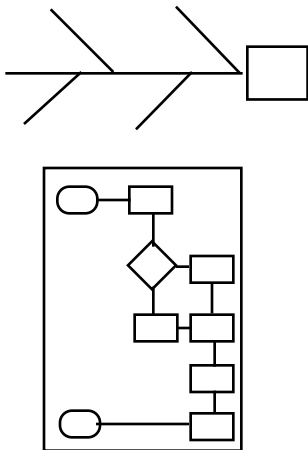
Purpose

For every thousand hacking at the leaves of evil, there is one striking at the root.
-Thoreau

Identify and verify the root causes of the problem

Like weeds, all problems have various root causes. Remove the roots and, like magic, the weeds disappear.

Cause-Effect Analysis



1. To identify root causes, use the fishbone or Ishikawa diagram. Put the problem statement from step 1 in the head of the fish and the major causes at the end of the major bones. Major causes include:

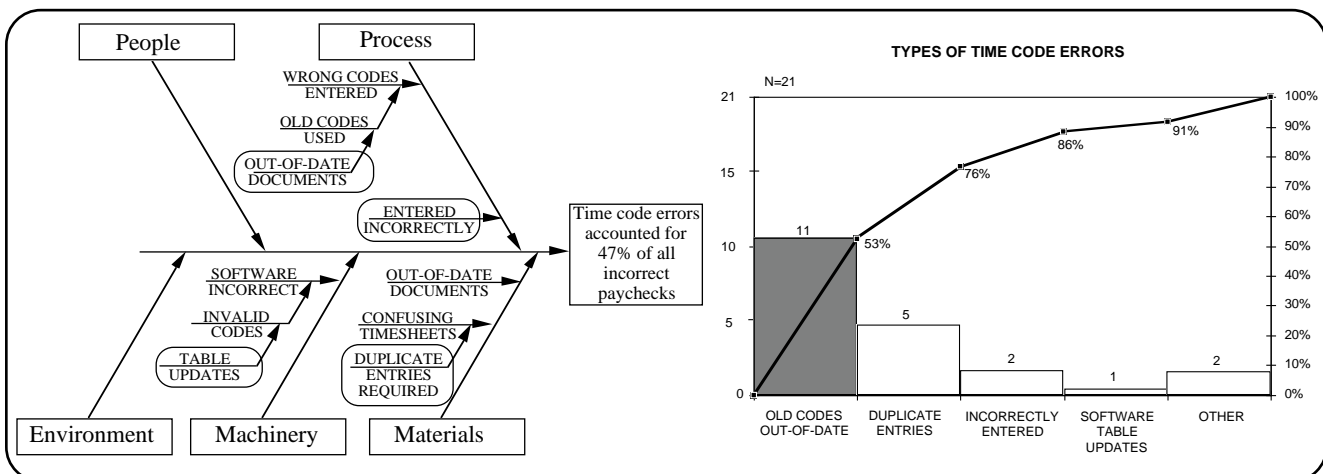
- Processes, machines, materials, measurement, people, environment
- Steps of a process (step1, step2, etc.)
- Whatever makes sense

2. Begin with the most likely main cause.

3. For each cause, ask "Why?" up to five times.

4. Circle one-to-five root causes (end of "why" chain)

5. Verify the root causes with data (Pareto, Scatter)



Six Sigma Improvement

Step 2 - Analyze The Problem

