Solutions Manual

# Chapter 6: Quality Improvement and Control Tools

1.

CAR WON’T START

ELECTRICAL PROBLEM

MECHANICAL PROBLEM

FUEL PROBLEM

OPERATOR ERROR

Battery dead

Lights left on

Starter bad

Out of gas

Fuel pump bad

Car in drive

Cognitive Domain: Application

Difficulty Level: Hard

PLANE DELAYED

SYSTEM ISSUE

MECHANICAL PROBLEM

WEATHER

OPERATOR ERROR

Outbound airport overscheduled

Flight departed late

Engine failure

Ice on runway

Ice on wings

Pilot can’t find Buffalo

2.

Cognitive Domain: Application

Difficulty Level: Hard

3.

LAUNCH DELAYED

PEOPLE

MACHINES

METHODS

MATERIALS

New supplier

Supplier screening lax

Assembly robotic issue

Assembly process

Design process flawed

Bad lot of raw material

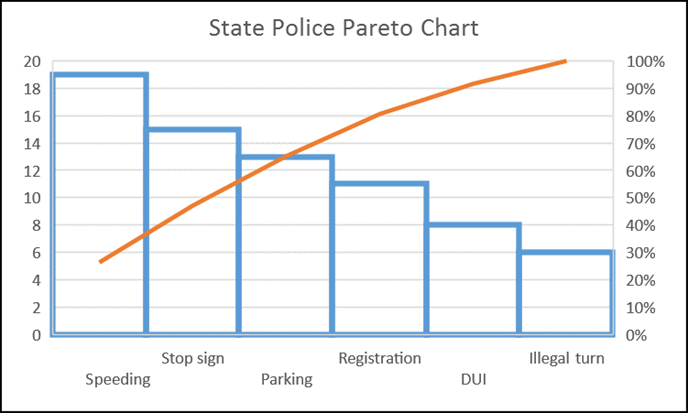
Static discharge

ENVIRONMENT

Cognitive Domain: Application

Difficulty Level: Hard

4.



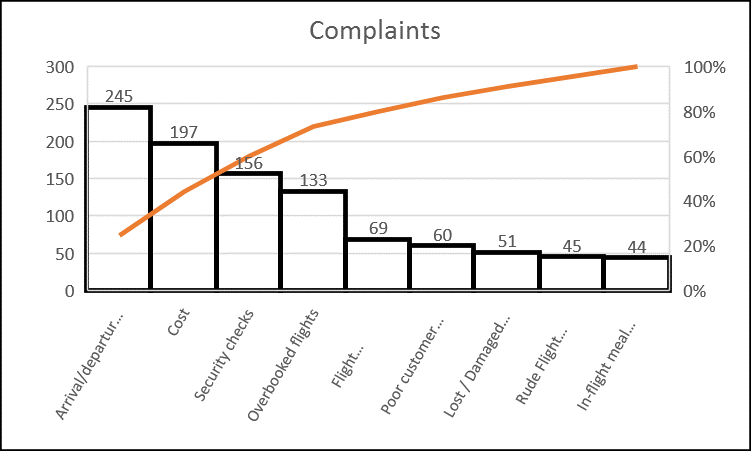
|  |  |
| --- | --- |
| *Check Sheet* | |
| DUI | 8 |
| Speeding | 19 |
| Stop sign | 15 |
| Parking | 13 |
| Registration | 11 |
| Illegal turn | 6 |

Moving violations account for two thirds of all citations.

Cognitive Domain: Comprehension

Difficulty Level: Medium

5a.



5b. The two most common complaints are airport delays and price, so efforts to improve should be focused here.

Cognitive Domain: Comprehension

Difficulty Level: Medium

6a. Differences in the delivery time from the chain to the customer’s door constitutes variation—this appears to be common cause variation.

6b. Three customers received a free pizza, assuming a tie of the 20-minute goal was resolved in favor of the customer.

6c. The accuracy rate is 4/7 = 57.1%.

6d. A Six Sigma operation would be evidenced by 3.4 deliveries per million orders that are late. The percentage delivered on time would be 999,996.6/1,000,000 or 99.9997%.

Cognitive Domain: Comprehension

Difficulty Level: Medium

7.

The process produces within the stated specifications of 2.3 to 2.5 inches.

The chapter does not mention run charts.

Cognitive Domain: Comprehension

Difficulty Level: Medium

8.

Cognitive Domain: Knowledge

Difficulty Level: Easy

9.

Cheating or plagiarism suspected

Professor communicates “no action required”

Professor decides whether violation occurred

Professor meets with student

Professor checks records for priors

Professor communicates with academic integrity board

Priors exist?

Professor requests approval from dept chair for penalty

Hearing held

Professor communicates with student penalty imposed

Student accepts penalty?

Case closed

Yes

No

Student appeals

Yes

No

Cognitive Domain: Comprehension

Difficulty Level: Medium

10.

Customer complaints high

PEOPLE

MANAGEMENT

METHODS

MATERIALS

Workers untrained

Trainer unmotivated

Staffing levels low

Cleaning problems

Check-in process slow

Linens need replacement

Diwali noise

ENVIRONMENT

Cognitive Domain: Comprehension

Difficulty Level: Medium

11a.



11b. The process is out of control for Sample 5.

Cognitive Domain: Analysis

Difficulty Level: Medium

12a.





Both charts are in control.

Cognitive Domain: Analysis

Difficulty Level: Medium

13a.



13b. The process was not in control throughout May. The sample mean of 164 violates the upper control limit of the mean chart.

13c. A larger sample size would result in tighter control limits, so the mean chart would still show an out-of-control situation in May.

Cognitive Domain: Analysis

Difficulty Level: Medium

14a.

14b.



The process is not in control.

Cognitive Domain: Analysis

Difficulty Level: Medium

15ab. A c-chart is appropriate because the defects are being counted over a consistent window of opportunity.



15c. The last 20 points are the data for the following week. The process is in control but is close to violating the rule about eight successive points on one side of the center line. There appears to be a lower defect rate after process improvements were made.

Cognitive Domain: Analysis

Difficulty Level: Medium

16a. A c-chart is appropriate because the defects are being counted over a consistent window of opportunity.

16b.

UCL = 5.23 + 3 x = 12.10

LCL = 5.23 – 3 x √5.23 = 1.66

16c. The process is in control.

Cognitive Domain: Analysis

Difficulty Level: Medium

17.



Cognitive Domain: Analysis

Difficulty Level: Medium

18.



The chart is in control.

Cognitive Domain: Analysis

Difficulty Level: Medium

19ab. A p-chart is appropriate because the data are binomial and have a variable sample size.



Since the sample size is variable, the average sample size of 56.875 was used in the standard deviation formula to determine the standard deviation of 0.0496.

19c. The process is not in control, as Week 12’s proportion of C-sections is 0.3, which is higher than the UCL of 0.267.

Cognitive Domain: Analysis

Difficulty Level: Medium

20.



The process is in control.

Cognitive Domain: Analysis

Difficulty Level: Medium

21.



The process is assumed to be centered, so CPK and CP are identical. Process capability is low.

Cognitive Domain: Analysis

Difficulty Level: Medium

22.



The process is assumed to be centered, so CPK and CP are identical. Process capability is OK.

Cognitive Domain: Analysis

Difficulty Level: Medium

23.



We are not furnished cost information, so we cannot calculate the value for *k* or for average loss. The high-standard deviation contributes more to the loss parameter of 86.69, about 83% of that value, so the delivery service should strive for greater consistency first.

Cognitive Domain: Analysis

Difficulty Level: Medium

24a.



PTC is not achieving Six Sigma levels of quality.

24b. They must improve their consistency (reduce the standard deviation of their times).

Cognitive Domain: Analysis

Difficulty Level: Medium

25a.



25b. They can achieve this rating in some cases, but they are far from being able to consistently hit this level of performance.

Cognitive Domain: Analysis

Difficulty Level: Medium

26.



Cognitive Domain: Analysis

Difficulty Level: Medium

27.



The process is out of control.

Cognitive Domain: Analysis

Difficulty Level: Medium

28a. A c-chart should be used. The data are binomial, and we are counting the defects on sheets of glass. Knowing the number of defects doesn’t inform our knowledge of nondefects.

28b.



28c.

The process is out of control.

Cognitive Domain: Analysis

Difficulty Level: Medium

29a.



29b. The last four samples show a process that is out of control.

Cognitive Domain: Analysis

Difficulty Level: Medium

30. 

Cognitive Domain: Analysis

Difficulty Level: Medium