

# Lean Six Sigma Green Belt Certification Course

DIGITAL  
OPERATIONS





## Measure Phase: Project (Contd.)



# Case Study

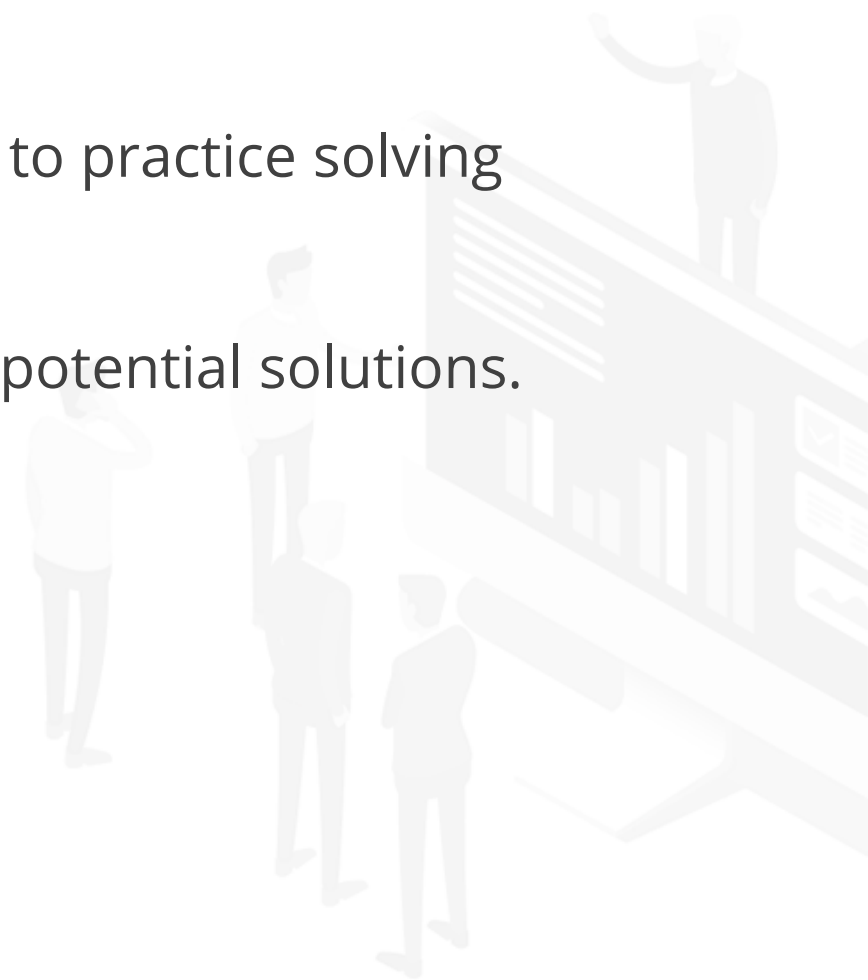
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This case study is a project simulation. As we complete each Phase of the DMAIC (Define, Measure, Analyze, Improve, and Control) process, different aspects of the case study will be presented to you. You will be given background information, instructions, data sets, project updates, and all necessary information to work through each step of the project and answer questions.

**Note:**

You will be using only some of the DMAIC tools and techniques in the case study to practice solving a single problem.

The provided solutions are not the “perfect” answers; they are only one of many potential solutions.



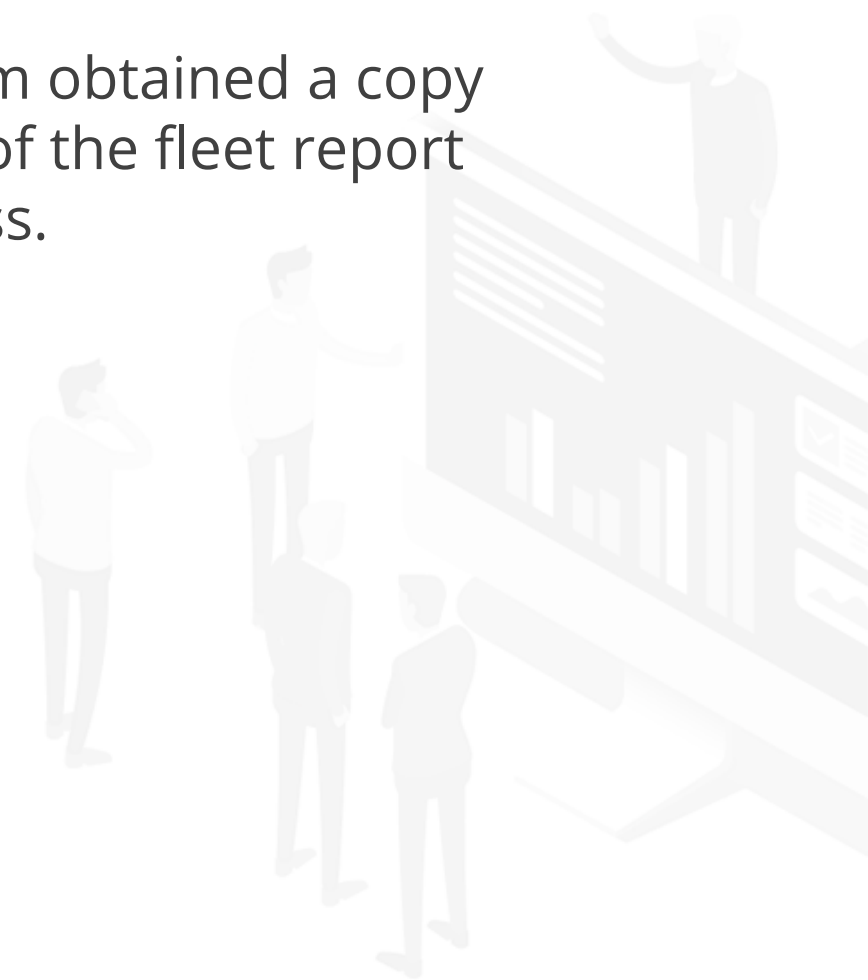
# DMAIC Phase 2: Measure

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## Project Update: Collecting Data

Your team has completed the Define phase. A SIPOC map was created to show high level process flow. Critical Quality Characteristics (CTQs) were identified, and an operational definition of billing defects was created."

To help them understand how the current forklift billing process works, your team obtained a copy of every invoice from all the vendors for a month from E/P. They also got a copy of the fleet report from MO for the same month. The team must now investigate the current process.



# DMAIC Phase 2: Measure

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## Project Update: Baseline Performance

Your team has collected 5,026 invoices for the selected month. Each invoice represents one month's lease agreement and service contract for an individual forklift. They compared the invoices to the fleet report to identify discrepancies and decided to look at all invoices for the month instead of a sample.

After collecting the data and compiling the results, your team identified 2,412 defects.





# DMAIC Phase 2: Measure

## Project Update: Defect Frequency

Your team matched all forklift invoices to the fleet report to determine the defects and their frequency. They assigned a letter code for each defect as a quick identifier. The letter codes are presented in the table below along with the defect frequency.

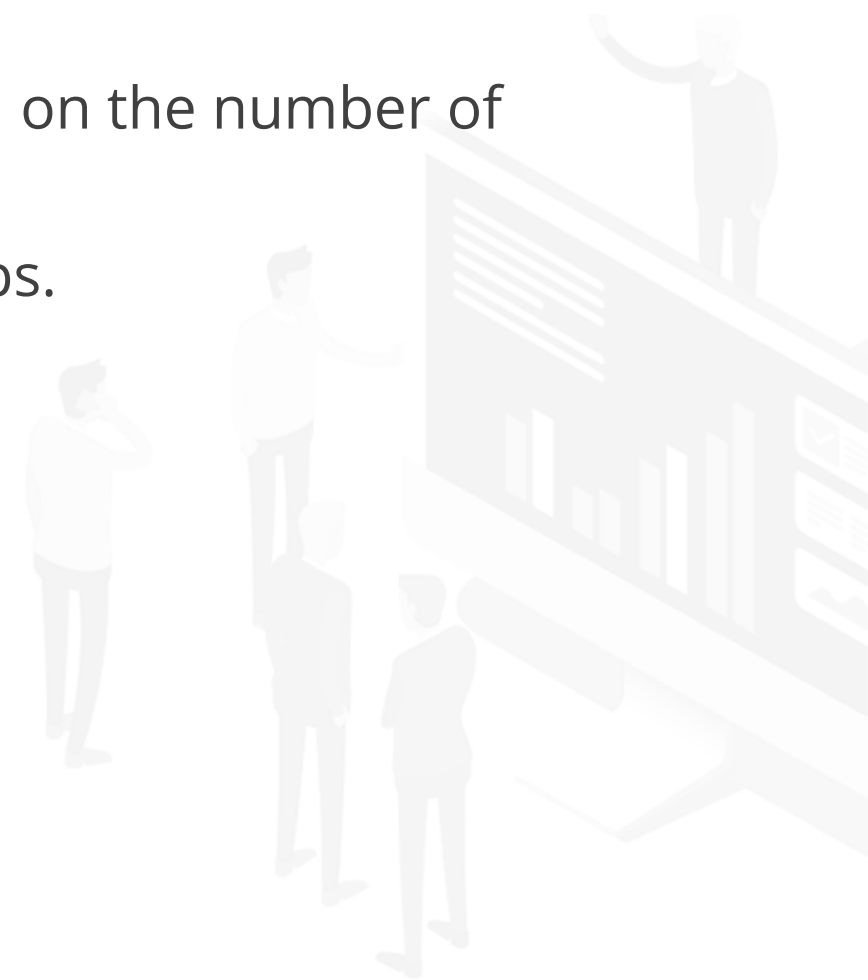
Code	Defect Type	Frequency
A	Invoice is for incorrect amount	68
B	Invoice sent to wrong location	75
C	Invoice serial number is incorrect	54
D	Invoice is late	134
E	Fleet report amount differs from invoice	202
F	Fleet report has incorrect location	296
G	Fleet report is missing description	280
H	Fleet report serial number doesn't match invoice serial number	1303

# DMAIC Phase 2: Measure

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## Measure Phase Questions

1. What is the goal or objective of the Measure Phase?
2. Based on the definition of defect(s) identified in the Define Phase, what are the defect opportunities for each forklift charge/invoice?
3. Calculate the current process Sigma Level for the forklift billing process based on the number of identified defect opportunities.
4. After creating a Pareto Chart, identify the primary defect(s) and your next steps.



# DMAIC Phase 2: Measure

## Measure Phase Answers

- 1. The purpose of the Measure phase is to gather as much data about the process as possible to better understand the current situation.
- 2. Defect opportunities include location, accurate charges, and serial number agreement.
- 3. Based on the opportunities listed, here is the calculation for the process Sigma Level:

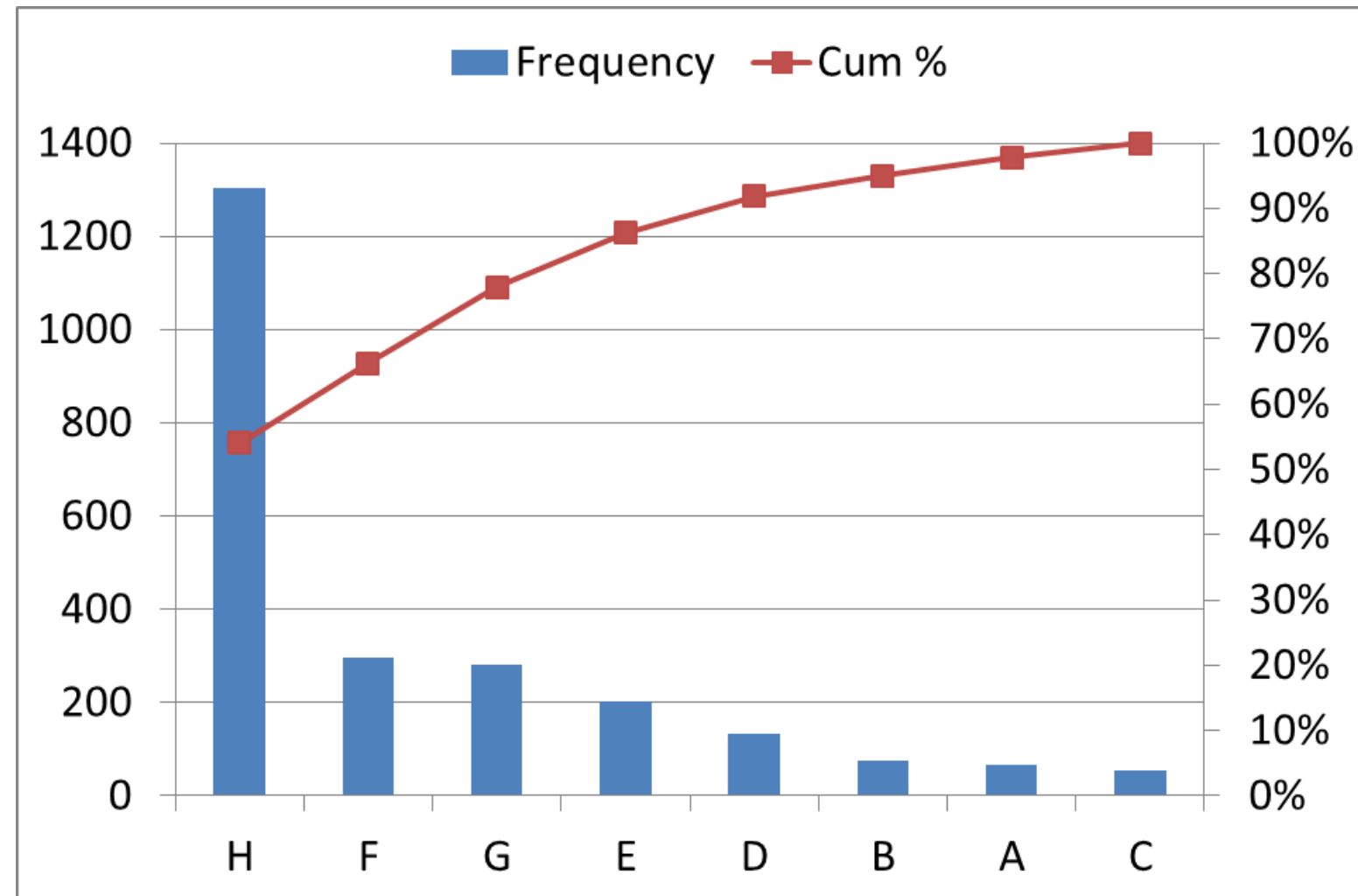
Step	Equation	Result
Determine number of defect opportunities per unit	O=	3
Determine number of units processed	N=	5026
Determine total number of defects made	D=	2412
Calculate defects per opportunity	$DPO = D / (N \times O) =$	0.1599682
Calculate yield	$Yield = (1 - DPO) \times 100$	84.00
Sigma Level from Sigma conversion table	process sigma =	2.495



# DMAIC Phase 2: Measure

## Measure Phase Answers

- The primary defect code is H which indicates the number of times the fleet report and invoice serial numbers do not match (code H), as shown in the Pareto Chart. The team should use the information to focus the scope of the project on minimizing this defect type.

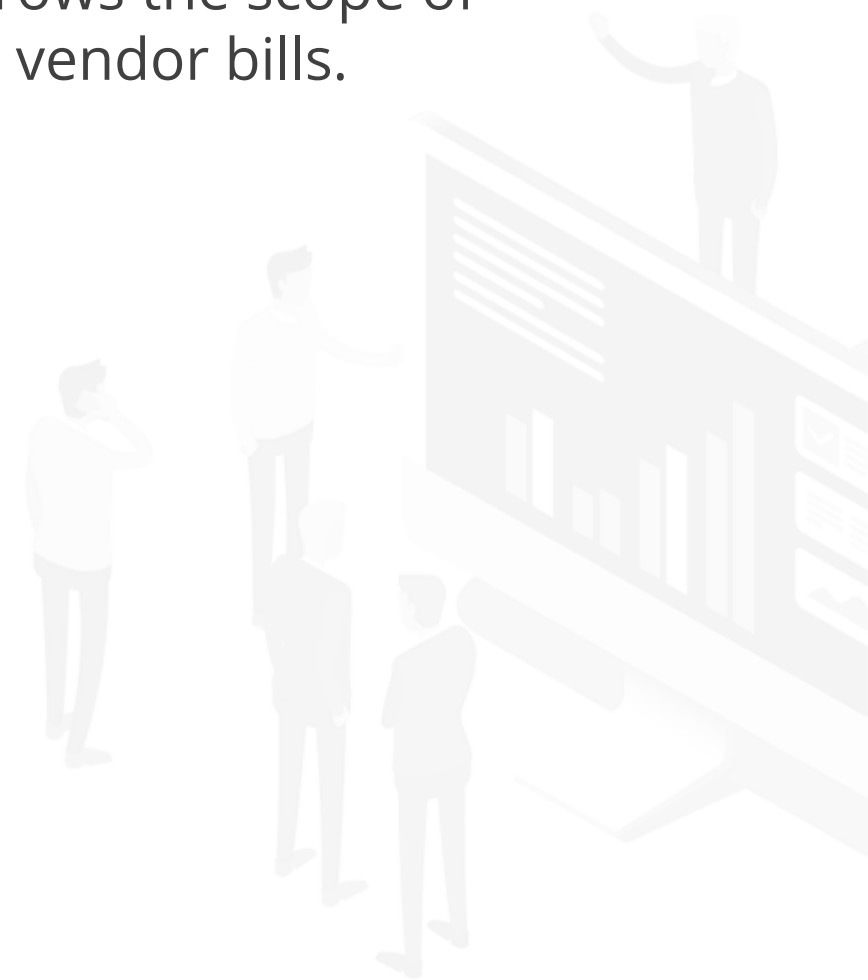


# DMAIC Phase 2: Measure

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## Project Update: Redefining Project Scope

You arrange to meet your Champion to present your team's findings so far. From the Pareto charts, you conclude the primary defect is the mismatch of the fleet report serial number with the invoice serial number. Because of the high occurrence of this defect, your Champion narrows the scope of the project to improve the match of the serial numbers in the fleet records to the vendor bills.



# DMAIC Phase 2: Measure

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## Measure Phase Questions

5. Based on the new scope, how will you describe the defect and how many defect opportunities exist per charge?
6. Recalculate process Sigma Level from the new defect definition. This value will be your process baseline to measure the improvements in performance.



# DMAIC Phase 2: Measure

## Measure Phase Answers

- 7. The new defect definition is any invoice serial number that does not match the company and vendor records. This is now one defect opportunity per unit.
- 8. Based on the change in scope, the new project Sigma Level is calculated as shown here:

Step	Equation	Result
Determine number of defect opportunities per unit	O=	1
Determine number of units processed	N=	5026
Determine total number of defects made	D=	1303
Calculate defects per opportunity	$DPO = D / (N \times O) =$	0.25925189
Calculate yield	$Yield = (1 - DPO) \times 100$	74.07
Sigma Level from Sigma conversion table	Process sigma =	2.146

In the Measure Tollgate, your Champion sets a goal for the project team of 3.0 Sigma Level based on your updated baseline calculation.