Elijah Cruz

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DAT-475

3-1 Project One Submission

A manufacturing company in Tijuana is facing challenges and operational bottlenecks due to quality defects. The team decided to undertake a comprehensive project that leverages data analytics and visualization techniques to identify and address the root causes of these defects. We aim to enhance overall product quality, improve production efficiency, and reduce operational costs by minimizing the occurrence of defects during the manufacturing process. The manufacturing process faces several defects, including solder bridges, missing and lifted components, excessive solder, and damaged components. These issues create challenges during assembly and testing, resulting in costly and time-consuming corrections. Since the IPC-A-610E standards prohibit repairs or modifications to final products, the company must enhance its welding and assembly processes to prevent defects.

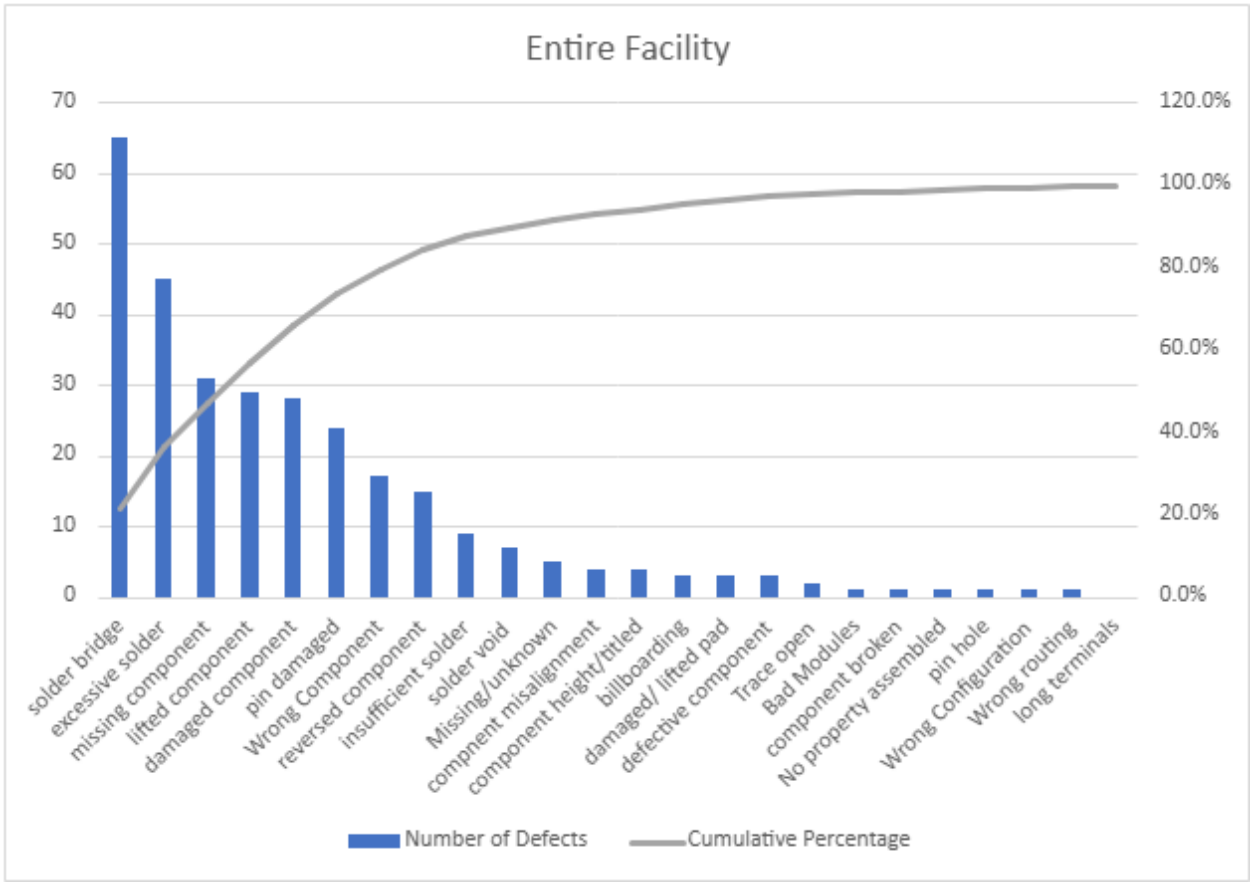
To address this, the company has established two key objectives:

1. Reduce defects in the Manual Finish production area by 20%.
2. Increase production capacity by 20%.

Both goals must be achieved while maintaining compliance with IPC-A-610E quality standards for electronic components. Resolving these issues is crucial for enhancing efficiency, reducing costs, and ensuring long-term success and customer satisfaction.

Entire Facility

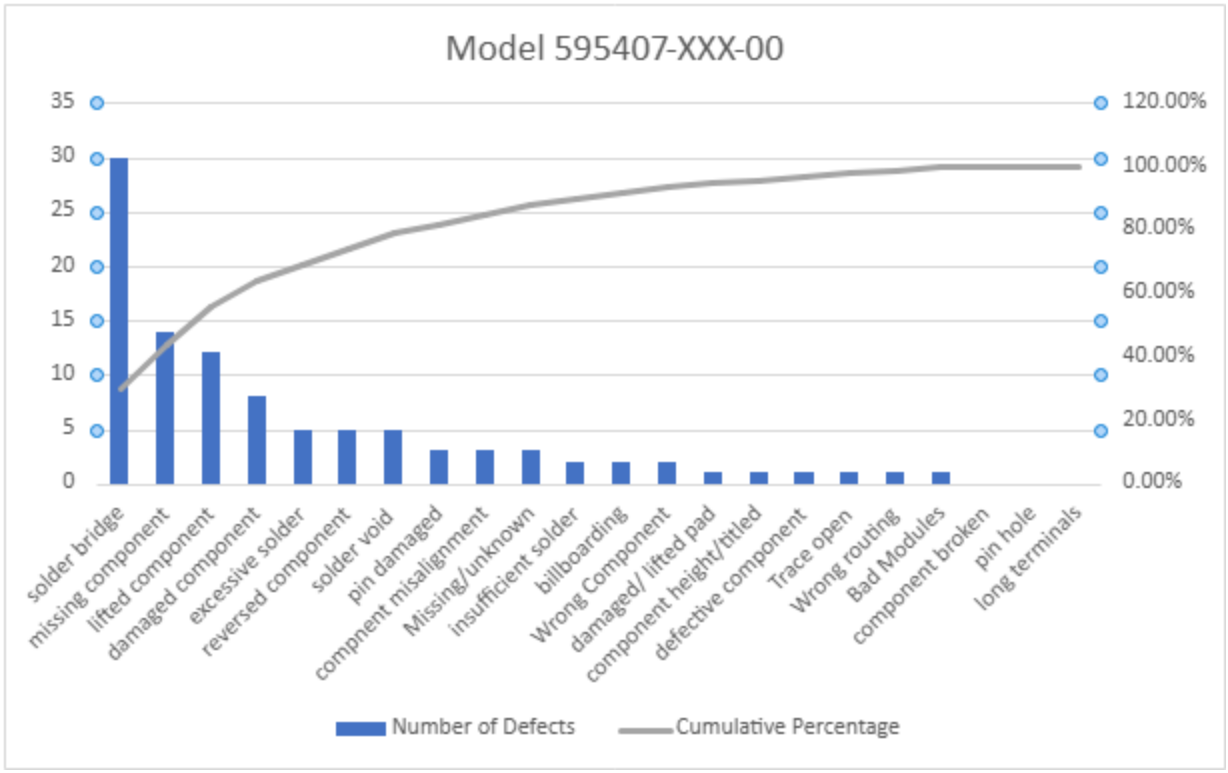
The most common defects across the entire facility include solder bridge, excessive solder, missing components, lifted components, damaged components, pin damage, incorrect components, and reversed components. Additionally, the facility reported zero defects related to long terminals.



The top five defects constitute about 83.3% of the total defects in the facility, making them the top priority for improvement. Addressing these issues with targeted solutions can lead to a 20% overall reduction in defects.

Model 595407-XXX-00

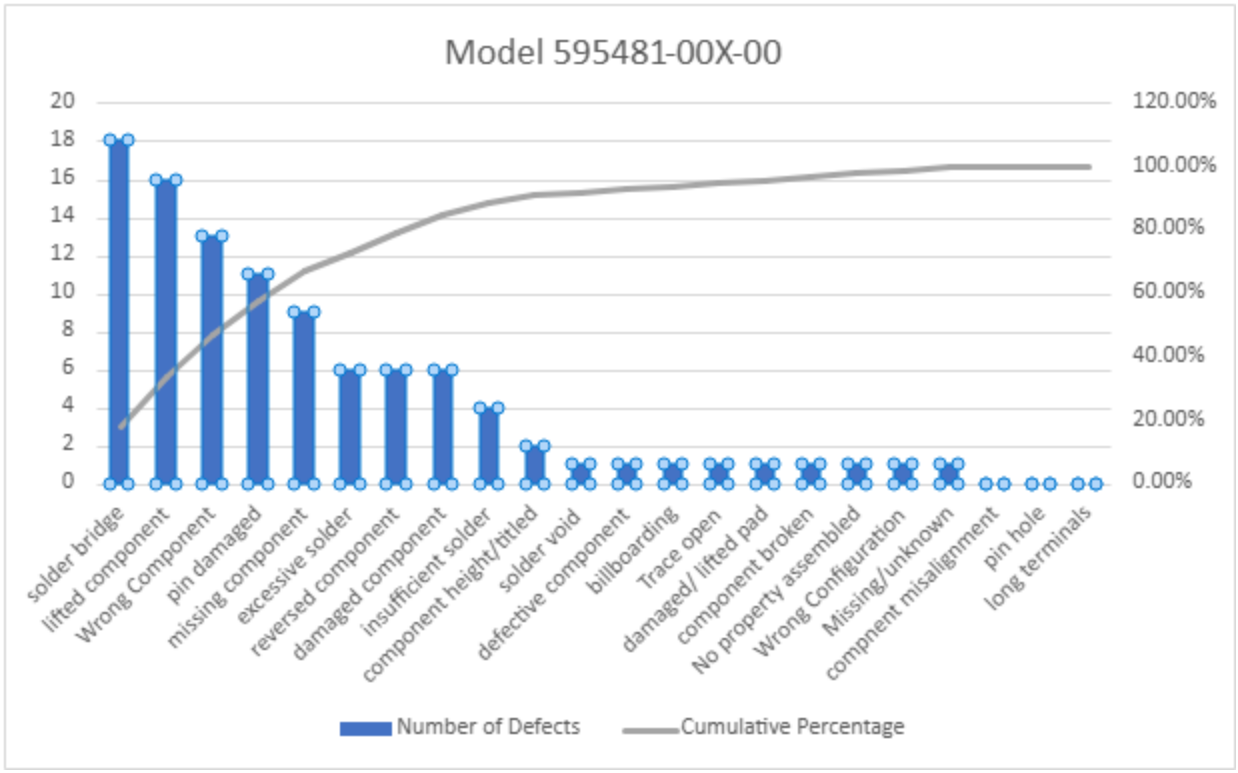
For production line Model 595407-XXX-00, the primary defects include solder bridge, missing components, lifted components, damaged components, excessive solder, reversed components, solder voids, pin damage, component misalignment, missing/unknown components, and insufficient solder.



The top five defects account for approximately 77% of the total defects for this model. Implementing targeted solutions for these key issues will significantly enhance production quality.

Model 595481-00X-00

The top defects for Model 595481-00X-00 include solder bridge, lifted components, pin damage, missing components, excessive solder, reversed components, damaged components, insufficient solder, component height/tilted, and solder voids.

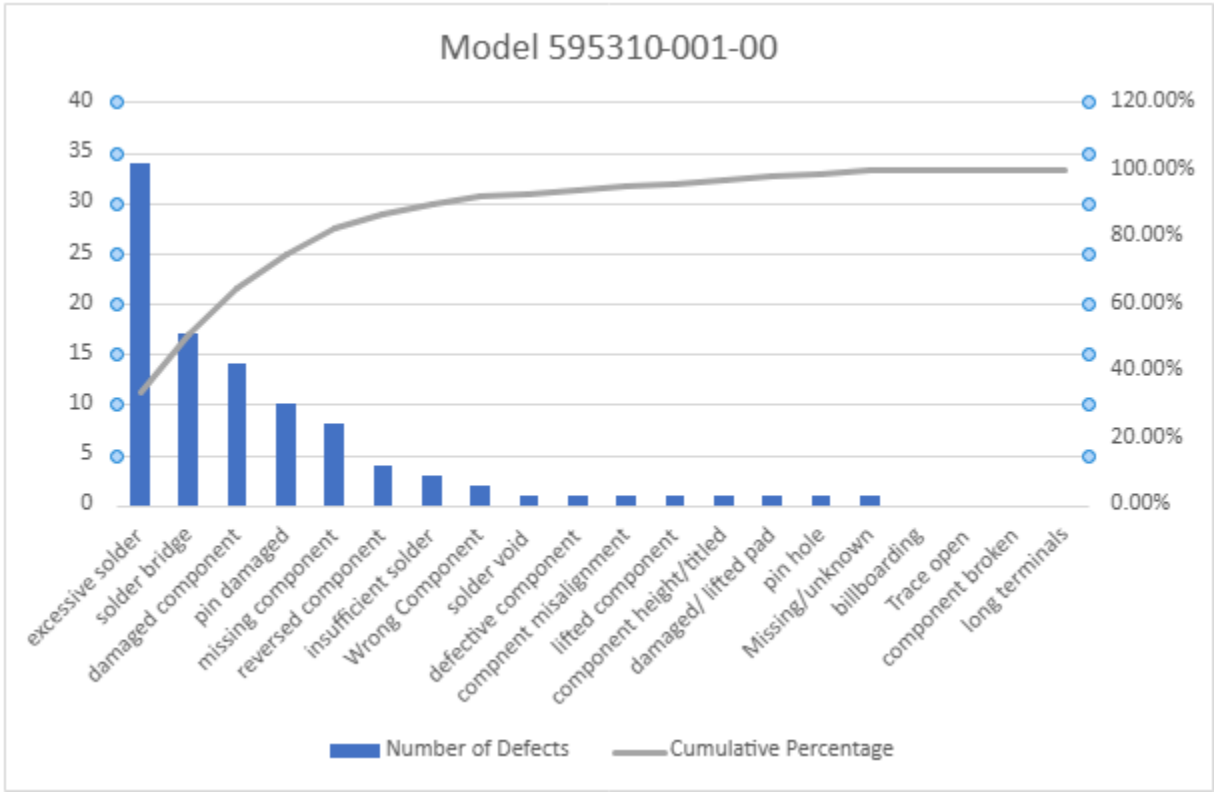


These four defects comprise approximately 90% of the total defects for this model.

Addressing these issues will yield the most significant improvements.

Model 595310-001-00

For production line Model 595310-001-00, the leading defects include excessive solder, solder bridge, damaged components, pin damage, missing components, reversed components, insufficient solder, and solder voids.



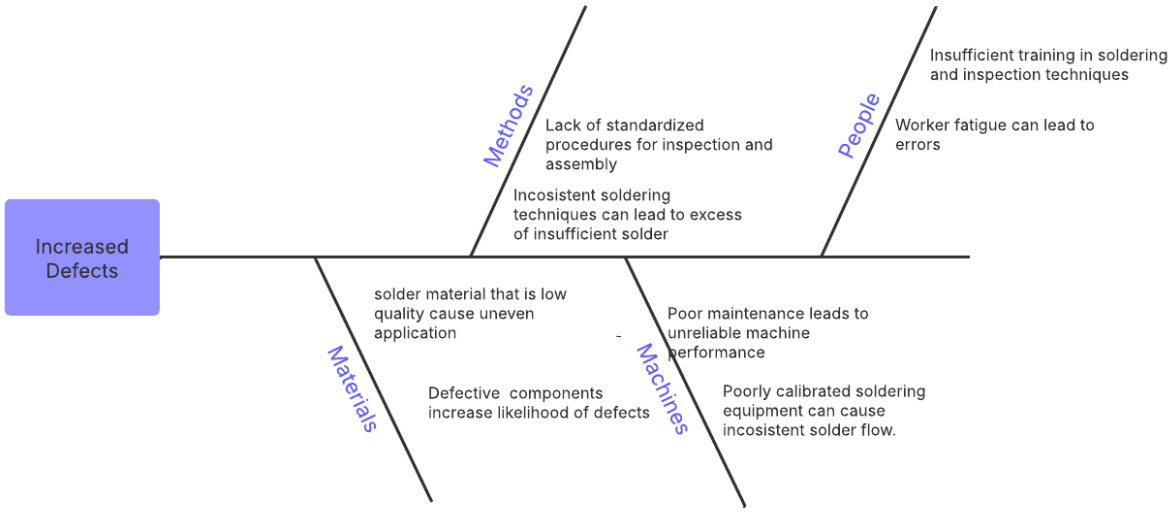
Together, these defects make up approximately 90% of all issues observed in this model. Addressing these areas will yield the most significant improvements.

Root Cause Analysis

Root cause analysis is a structured approach used to investigate issues, identify multiple contributing factors, prioritize them, and determine potential solutions. In this analysis, Pareto

charts were utilized to identify the most critical defects requiring attention in the manufacturing process.

Pareto charts operate on the "80/20" rule, which suggests that 80% of problems stem from 20% of the causes. The goal is to focus on the most impactful issues while deprioritizing minor ones. However, in this analysis, the defect distribution for the entire facility and the three models deviated from the traditional "80/20" principle. Instead, approximately 45.45% of defects were responsible for 90% of manufacturing process issues. Addressing these defects could significantly improve overall production quality.



Increased defects in the manufacturing process can be attributed to several key factors across methods, people, materials, and machines. Inconsistent soldering techniques often result in excessive or insufficient solder, while a lack of standardized procedures for inspection and assembly further exacerbates defect rates. Additionally, insufficient training in soldering and

inspection techniques, coupled with worker fatigue, increases the likelihood of errors. Material quality also plays a crucial role, as low-quality solder can lead to uneven application, and defective components further raise the risk of defects. Machine-related issues, such as poor maintenance and improper calibration of soldering equipment, contribute to unreliable performance and inconsistent solder flow, ultimately impacting overall product quality. Addressing these challenges through improved training, standardization, material selection, and equipment maintenance will be essential in reducing defect rates.

Reducing solder bridges, excessive solder, missing components, lifted components, and damaged components will significantly enhance production efficiency and lower defect rates. By addressing these key issues, the company can achieve its objectives of reducing defects by 20% and increasing production capacity by 20%. These improvements will also result in higher product quality, greater cost efficiency, and adherence to IPC-A-610E standards. Implementing recommended solutions—such as enhanced training, superior materials, optimized machine maintenance, and standardized processes—will contribute to a more efficient production system. Additionally, mitigating worker fatigue and ensuring an ergonomic work environment will boost productivity and minimize errors, supporting the company’s long-term success and customer satisfaction.

Resources:

Tardi, C. (2023, December 19). *The 80-20 Rule (aka Pareto Principle): What It Is, How It Works*. Investopedia. https://www.investopedia.com/terms/1/80-20-rule.asp

Realyvásquez-Vargas, A., Arredondo-Soto, K. C., Carrillo-Gutiérrez, T., & Ravelo, G. (2018). Applying the Plan-Do-Check-Act (PDCA) cycle to reduce the defects in the manufacturing industry: a case study. MDPI. https://learn.snhu.edu/content/enforced/1860641-DAT-475-11796.202516-1/course_documents/DAT%20475%20Project%20Case%20Study.pdf?ou=1860641