

Background

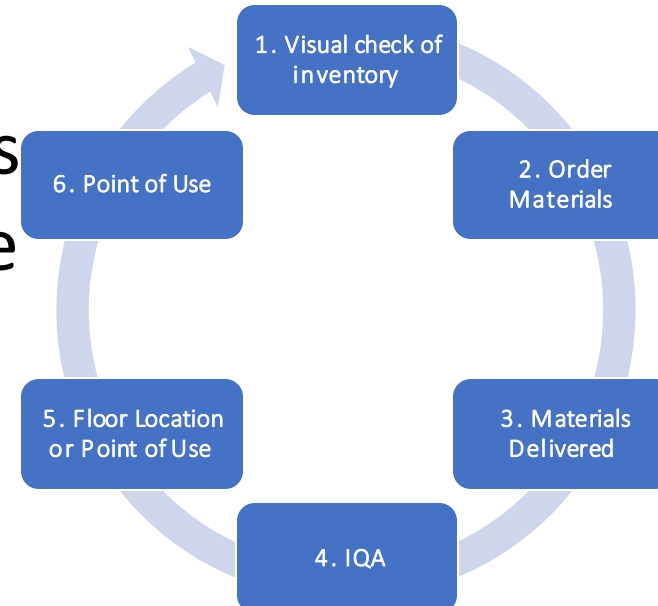
Stryker is one of the world's leading medical technology companies. They offer innovative products and services that help improve patient and hospital outcomes.

Problem Statement

Stryker has packaging footprint of ~500 sq ft. This space is needed for building products, not holding inventory.

State of System

- 5 products w/ unique inventory turns
- 32+ Pallets using valuable floor space
- Signaling system consists of
 - Waterline/Visual approximation
- Refill inventory by carrying back and forth



Constraints/Requirements

Constraints

- 5-foot vertical stacking rule
- Supplier capabilities
- No changes to package design or production schedule

Requirements

- Maintain 100% uptime
- Easy to manage
- Deliver solution by June 2020

Goal Statement

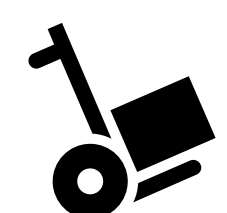
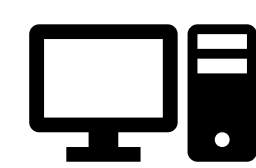
Provide Stryker solutions to reduce packaging footprint by >25% while maintain 100% uptime by June 2020.

Deliverables Include:

Simulation Model – used to define reorder point and quantity

Right Size Inventory Levels – reduce holding costs, must withstand demand shocks and variation to maintain 100% uptime

Inventory Cart – Decrease handling time, move inventory faster and ergonomically



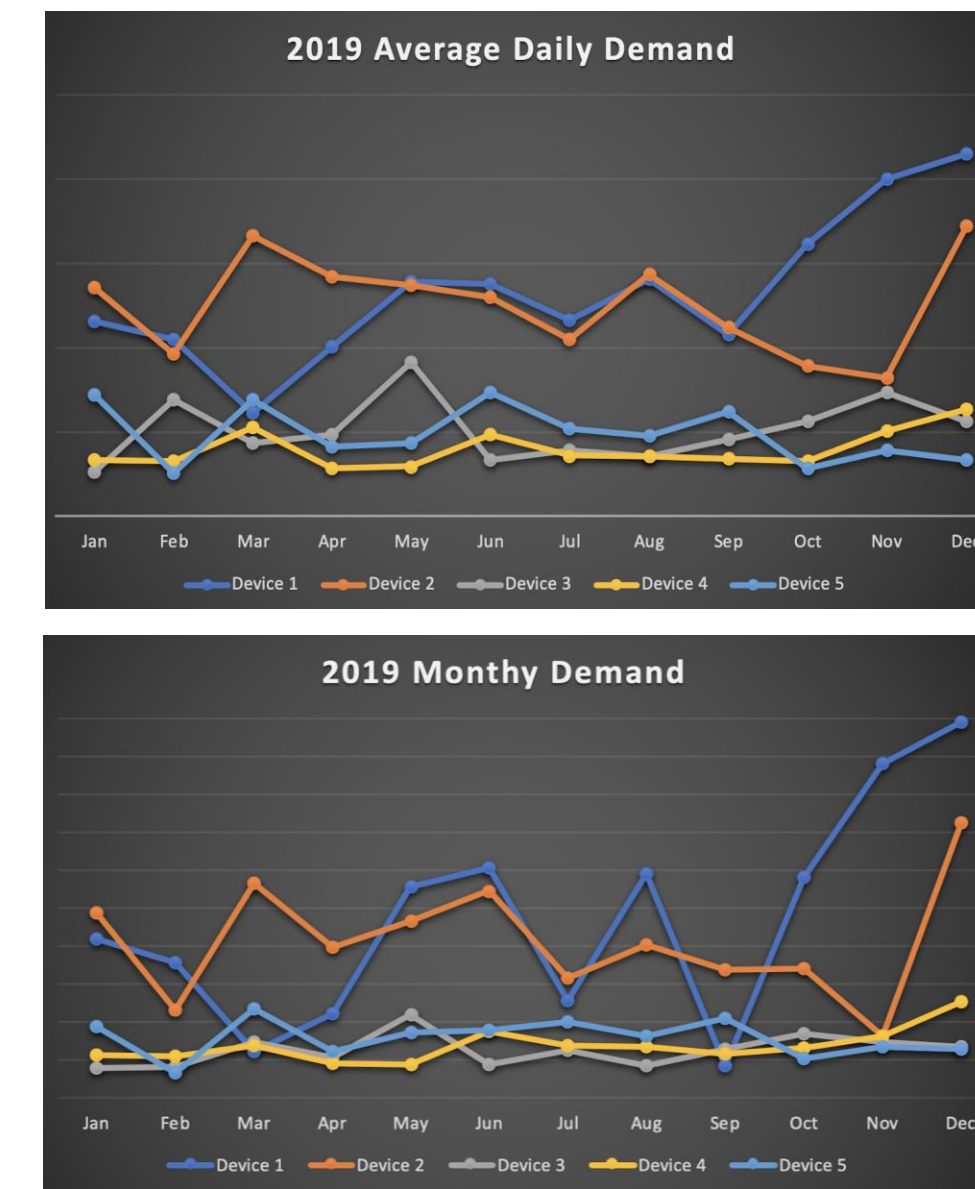
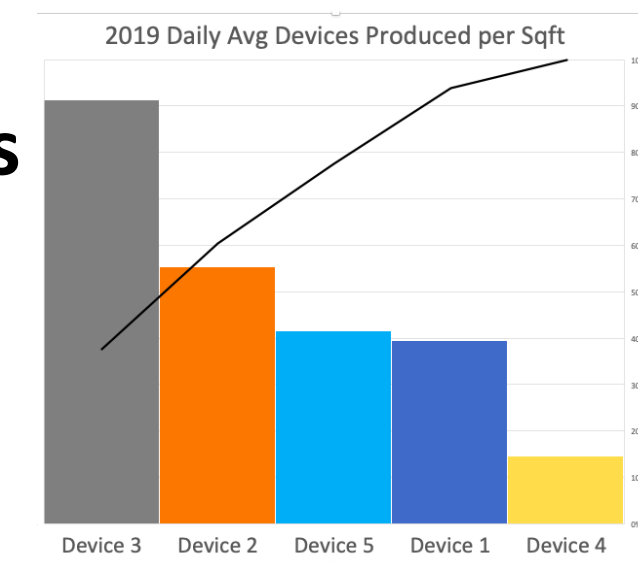
Initial Observations

Demand has a high variance

- Number of devices produced changes day to day for each device
- Demand spikes at the end of each quarter (seasonality)

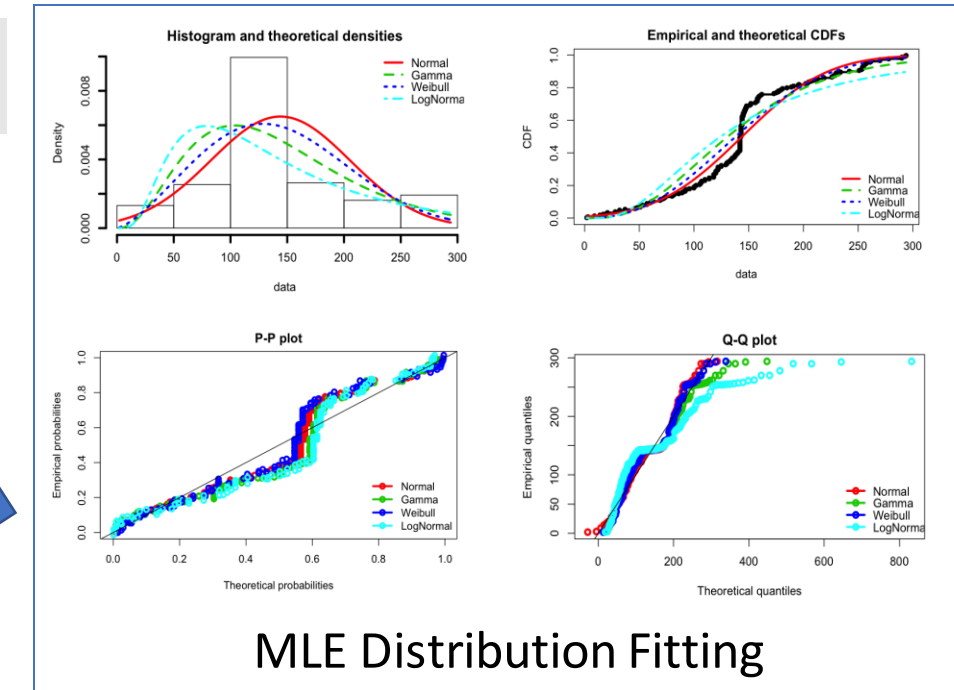
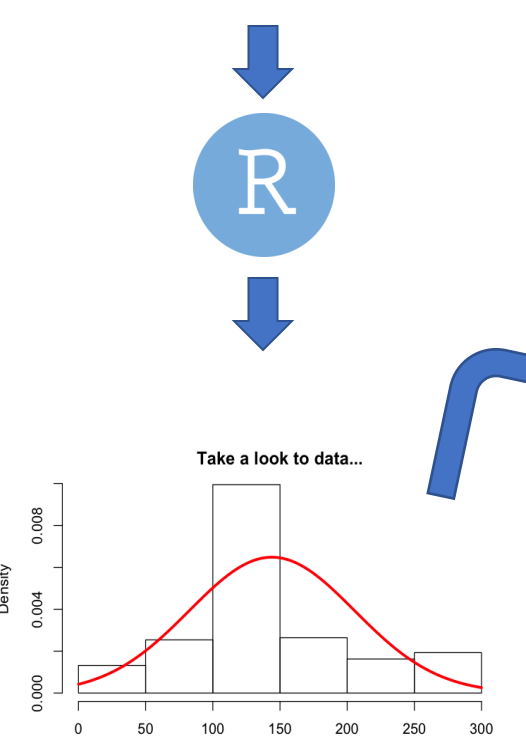
Variance between devices

- Amount of floor space occupied by material not proportional to demand



Demand Probability Distribution Fitting

Historical Data

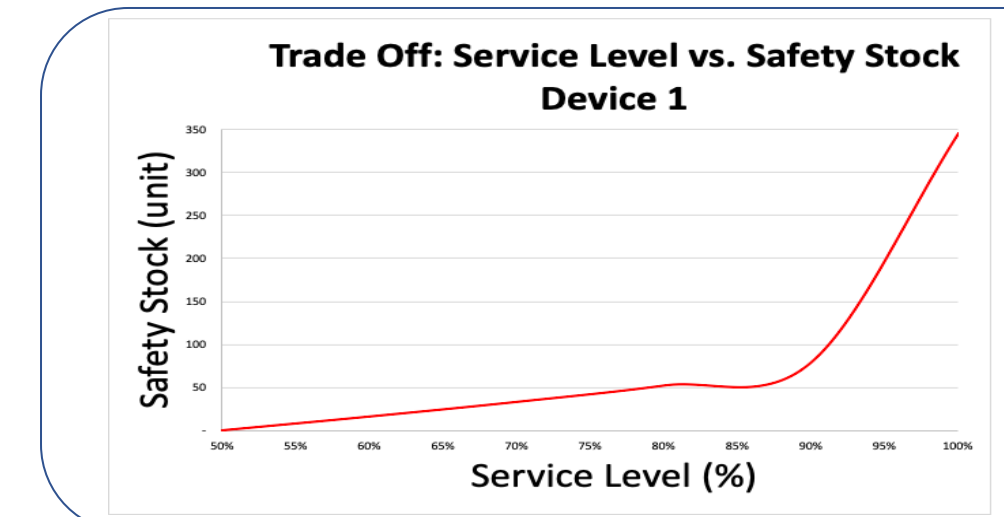


MLE Fitting
Device 1's demand follows Normal Distribution (μ, σ)

(Q,r) Model

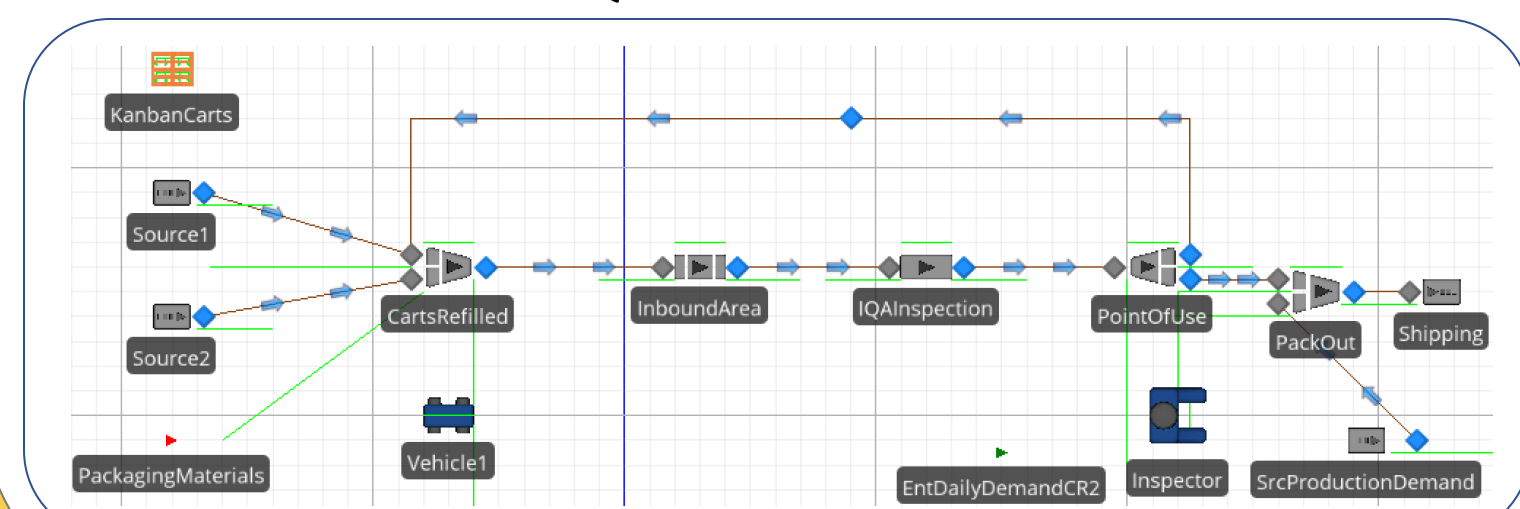
Why (Q,r) Model?

- Stochastic demand \sim ND
 - Stochastic lead time
 - Continuous Review
- Finding order quantity Q, and reorder point R for each product



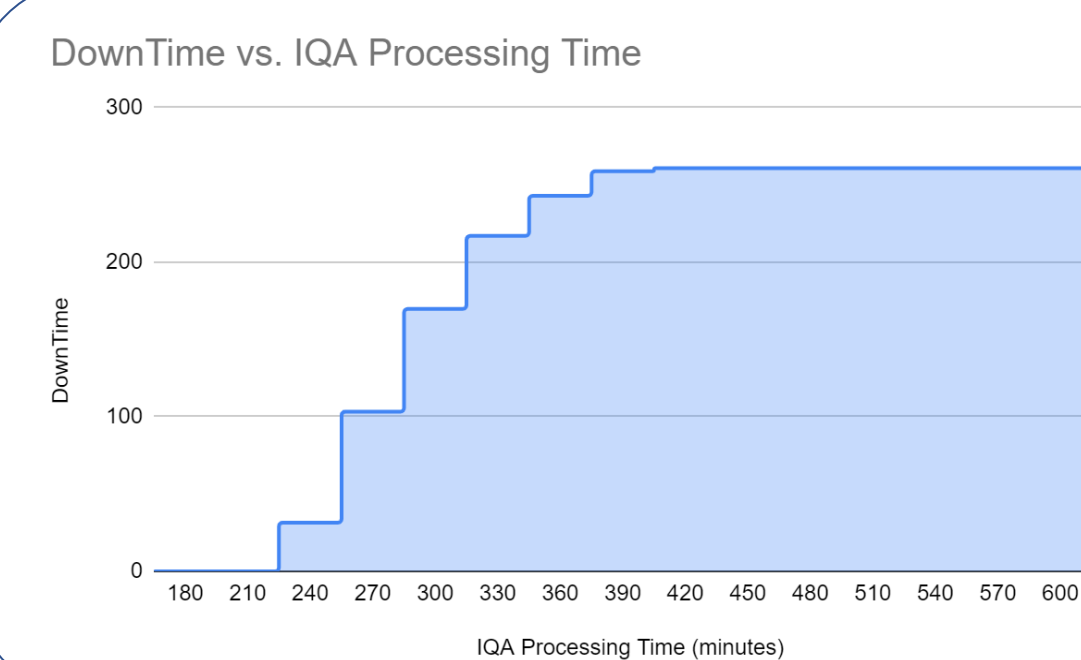
Simulation Model

- Tracks inventory and service levels over time to determine amount of carts needed in Kanban system
- OptQuest to test different reorder points and validate QR model



Sensitivity Analysis

- Sensitivity Analysis on simulation model to find where the system is most vulnerable to failures



COVID-19 Changes

- Overall direction and goals remain the same
- Adapted to accomplishing goals remotely
- Shifted to modeling approach

Cart Design

- Solidworks to design
- Red zone is Kanban signal
- Casters for easy transportation
- High durability
- Easy to assemble



Physical Cart Prototype

- Created physical cart prototype for 1 lines of devices
- To validate design
- Used PVC pipes and Stryker packaging materials



Accomplishments

- Projected floor space reduction** - by 50%
- Reduction of Operating Costs** –approx. \$50,000/year
- QR and Simio Models** – quantity & number of carts
- Create SolidWorks models** - for all devices
- Reduce Muda** - Remove the use of pallets to reduce transportation by material handlers

ISE Methodologies

Define Measure Analyze Improve Control



Acknowledgements

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