

**Using Six Sigma to
Reduce Excess Service
Parts Inventory While
Maintaining Service
Levels**

DMAIC Application

Agilent World-wide Customer
Service and Support

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Statistician & Supply Chain Analyst
March 9, 2010

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Agilent Technologies Fast Facts

- Net Revenue FY'09 U.S. \$4.5 billion
- Number of Employees 17,000
- President & CEO William P. (Bill) Sullivan
- Headquarters Santa Clara, CA

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Agilent Operates Two Primary Businesses



Electronic Measurement



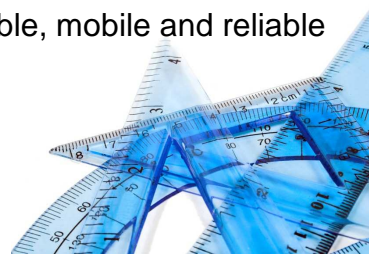
Bio-Analytic Measurement



Supported by Agilent Laboratories, our technology research group.

With a singular focus on measurement, Agilent helps:

- test more than half of the worlds 1.3 billion cell phones
- equip more than 200 communications service providers
- analyze the causes and cures for disease
- advance next-generation integrated voice, video and data
- enable the military to be more flexible, mobile and reliable



Learning Objectives

1. DMAIC applied to service parts management
2. Two risks inherent to the life time buy decision
3. Statistical theory applied to inventory stocking

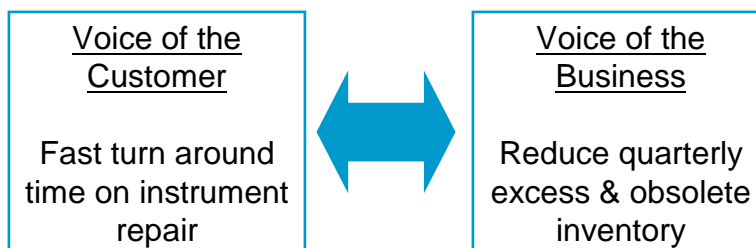


World-wide Customer Service and Support

DEFINE

Provide calibration and repair services for over 7,000 products with deployment lives of 12+ years and requiring over 30,000 service parts.

Objective: Timely calibration and repair of customer instruments



Project Charter

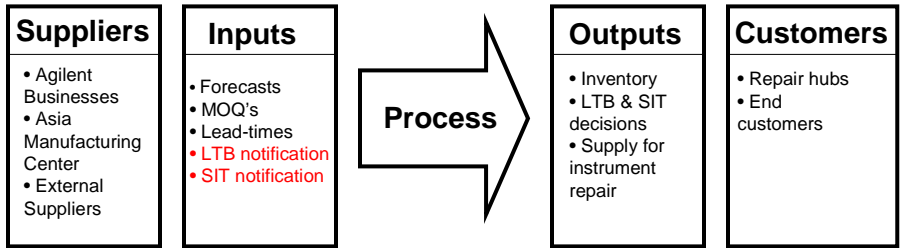


<p>Business Case</p> <p>Improving the inventory planning process leads directly to greater parts availability and reductions in excess write-offs while increasing operating profit.</p>	<p>Opportunity Statement</p> <p>The drive to meet customer TAT expectations in the face of demand uncertainty has historically resulted in quarterly write-offs in excess and obsolete inventory.</p>																																										
<p>Goal Statement</p> <p>Improve the end-to-end inventory planning process, improving inventory utilization and reducing E&O. Measure/Goal: Reduce long term inventory commitments and, hence, E&O by 20%</p>	<p>Project Scope</p> <p>Start: Part demand planning (both in production and in support) Stop: Part End of Support Life Out of Scope: "Best Effort" support post EOS.</p>																																										
<p>Project Plan</p> <table border="1"> <thead> <tr> <th>Phase</th> <th>Oct</th> <th>Nov</th> <th>Dec</th> <th>Jan</th> <th>Feb</th> <th>Mar</th> </tr> </thead> <tbody> <tr> <td>Define</td> <td>█</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Measure</td> <td></td> <td>█</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Analyze</td> <td></td> <td></td> <td>█</td> <td>█</td> <td></td> <td></td> </tr> <tr> <td>Improve</td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> <td></td> </tr> <tr> <td>Control</td> <td></td> <td></td> <td></td> <td></td> <td>█</td> <td>█</td> </tr> </tbody> </table>	Phase	Oct	Nov	Dec	Jan	Feb	Mar	Define	█						Measure		█					Analyze			█	█			Improve				█	█		Control					█	█	<p>Team Selection</p> <ul style="list-style-type: none"> • Three demand planners • One purchasing representative • Planning Systems Specialist • Six Sigma Black Belt • Champion: Planning Manager • Sponsor: Service Parts Organization Manager
Phase	Oct	Nov	Dec	Jan	Feb	Mar																																					
Define	█																																										
Measure		█																																									
Analyze			█	█																																							
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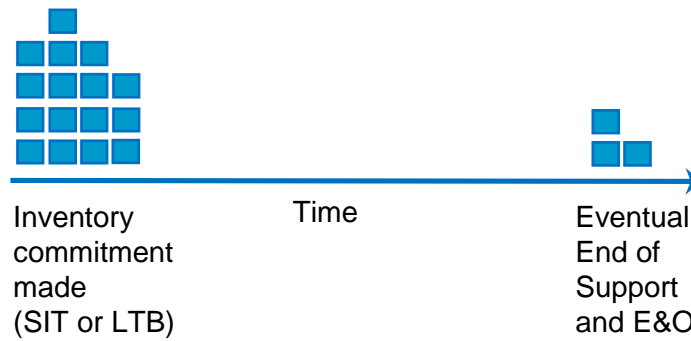


End to End Parts Planning and Supply Process



Support Inventory Transfers (SIT) and Life Time Buys (LTB) Drive Excess and Obsolete Inventory

DEFINE



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Performance Measures

MEASURE

Y_1 = Quarterly E&O Inventory Write-Off

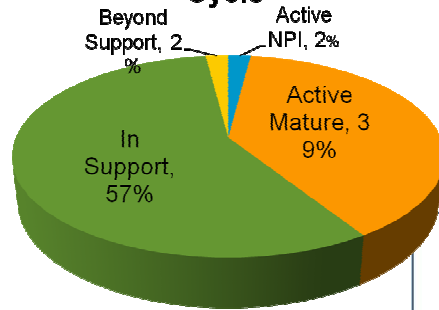
Y_2 = Potential Excess

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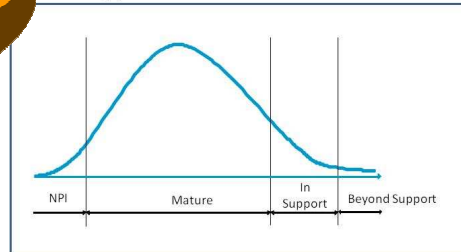
Measure Current State

MEASURE

Support Inventory by Life Cycle



Support Part Demand Profile

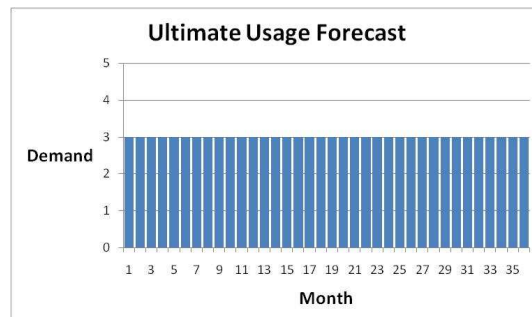


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Traditional Method for Determining Ultimate Usage Quantity

ANALYZE

UU Qty = Greater of the 12 or 24 month average demand times number of months to EOS date.



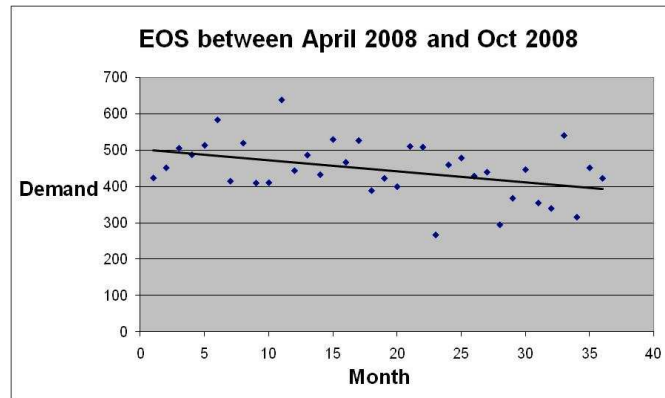
3 per month times 36 months = 108

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Root Causes Identified

ANALYZE

1. Demand Decays with Time



N = 732 parts, slope = -0.6% per month

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Root Causes Identified

ANALYZE

2. Failure to Account for Return Unused

Customer
Service
Engineer



“Hmmm...I will err on the side of making sure I have all the replacement parts I need when I order from the warehouse.”

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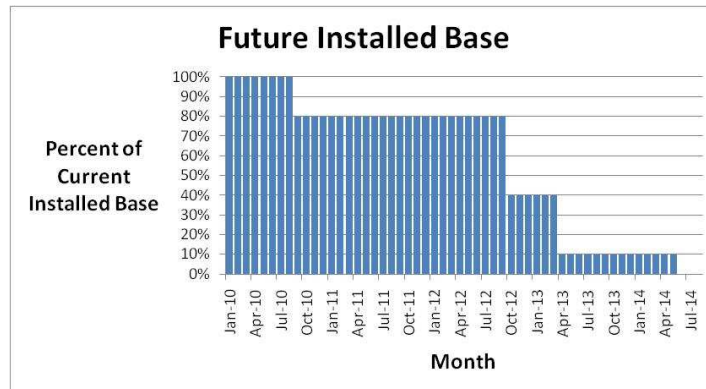
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Root Causes Identified

ANALYZE

3. Ignoring Changing Installed Base



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Need for a Statistical Ultimate Usage Tool

IMPROVE

Containing Stock Out Risk Containing E&O Risk



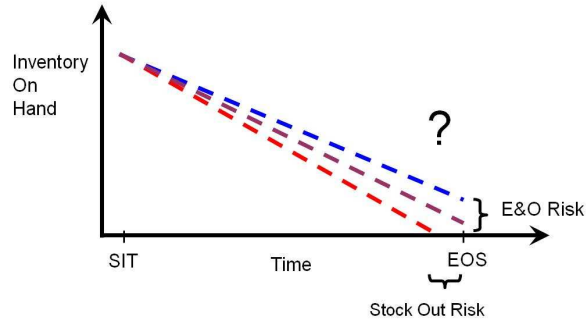
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Statistical Ultimate Usage Tool

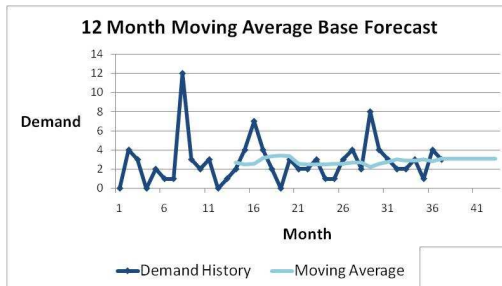
IMPROVE

Provide a statistical means of estimating inventory requirements to achieve a targeted service level over the life of a part and forecast potential excess.



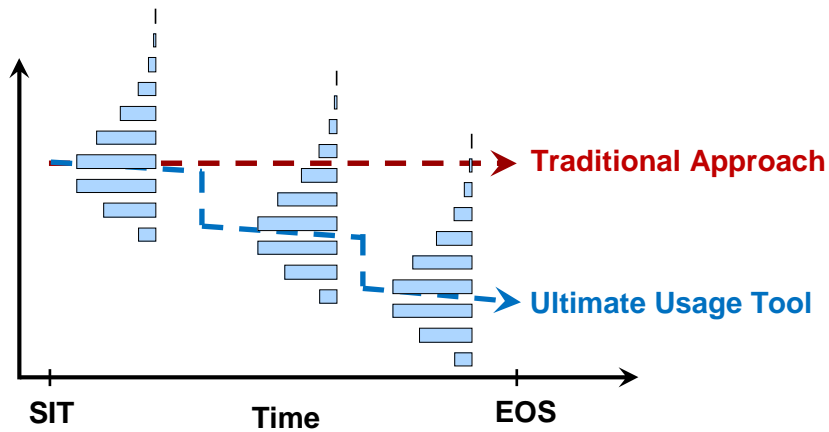
Generate Baseline Forecast

IMPROVE



Dynamic Poisson Due to Decay Over Time and Changing Installed Base

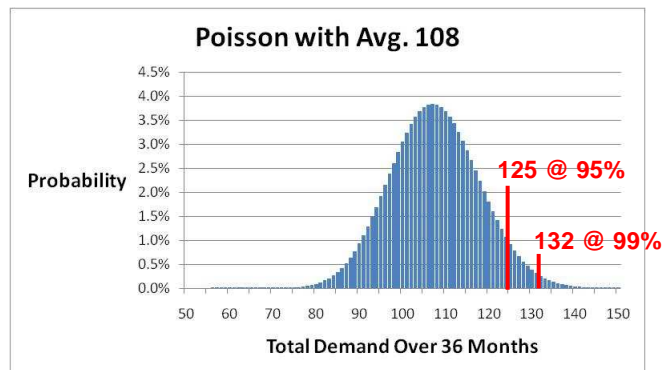
IMPROVE



The Statistical Ultimate Usage Quantity

IMPROVE

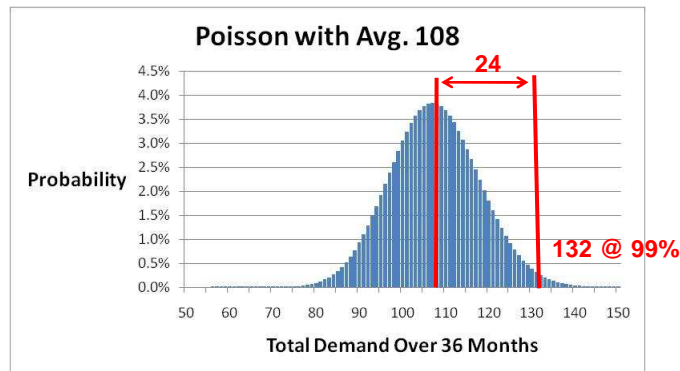
As it turns out, the sum of independent Poisson distributions with separate means is itself Poisson.



Forecasting Eventual Excess

IMPROVE

Forecast Excess = Quantity at service level selected minus most likely quantity.



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Choosing a Service Level

CONTROL

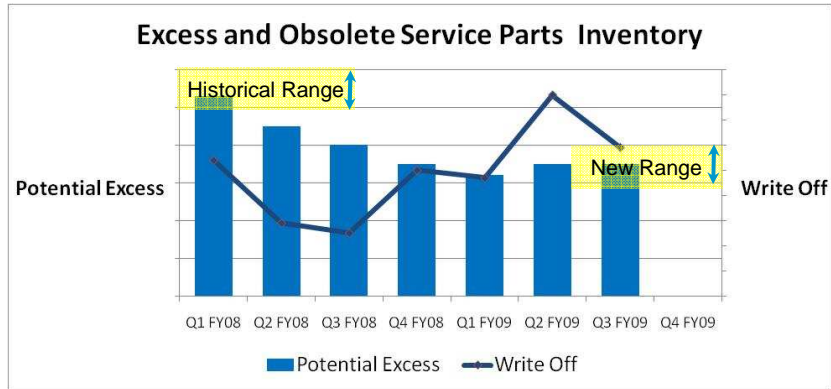
1. UU Quantity by Traditional Methods > UU Tool Quantity @ 99% Service Level
2. No known incidents of SIT/LTB stock outs.

➡ These two observations lead to using a 99% or lower service level.

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Validating Improvement

CONTROL

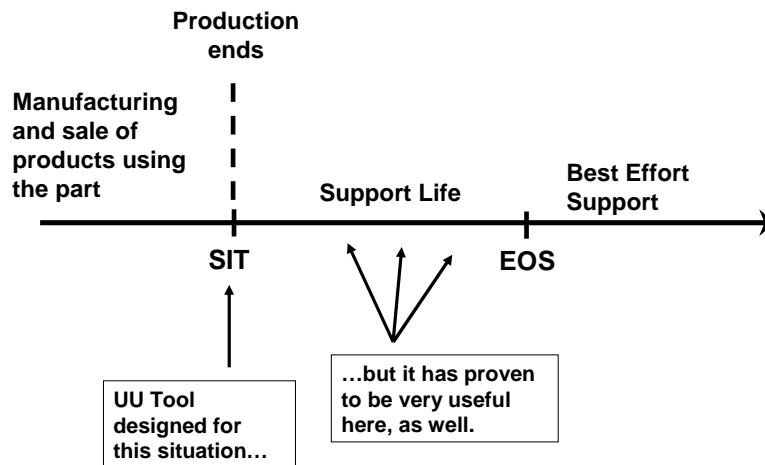


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UU Tool Application

CONTROL



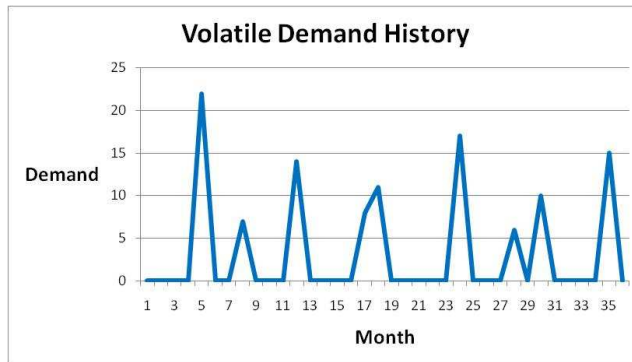
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Next Generation “Volatile Demand” Model

CONTROL

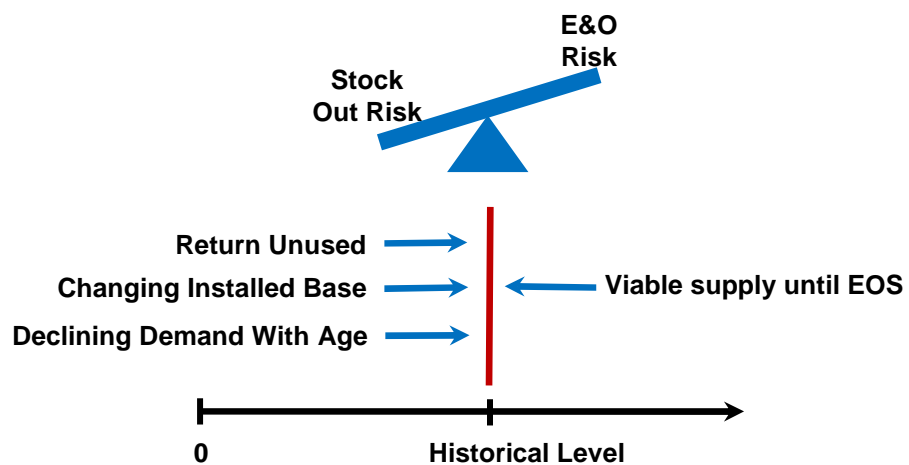
- Probability of demand modeled as Binomial(p).
- Demand when it does occur modeled as Poisson(λ)



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Summary: Forces Keeping E&O at Historical Levels



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Summary: Analytic Model Provides Balance



Q&A