



Achieving Higher Maturity with Centralized Statistical Process Control

Centralized Statistical Process Control



Deviation = 1.0

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Contributors:

- Teresa R. Walker
- Forrest W. Callicutt

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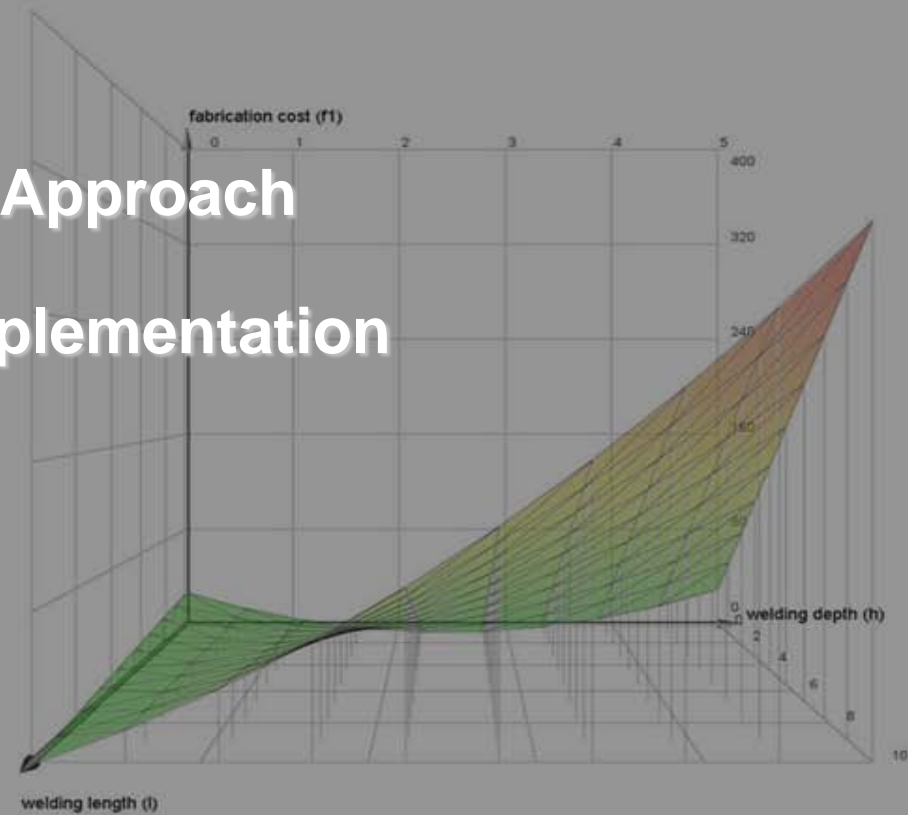
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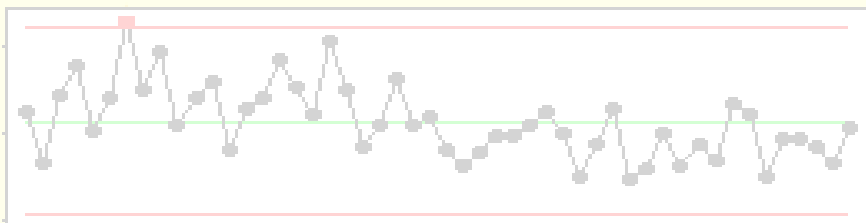
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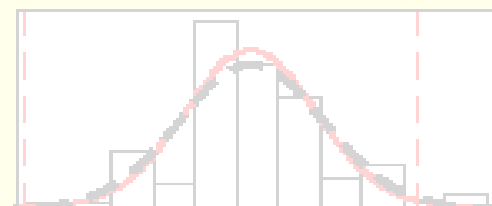


Between/Within Capability Sixpack of CYC TIME

Individuals Chart of Subgroup Means

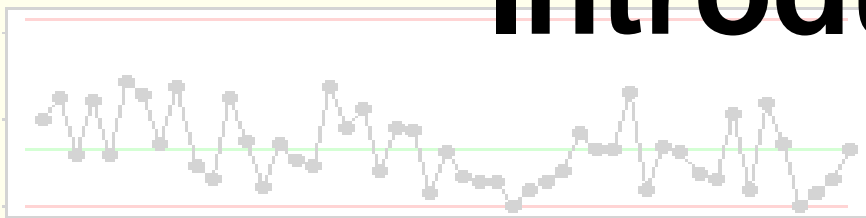


Capability Histogram



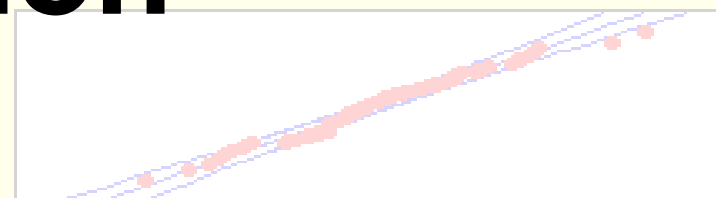
Specifications
LSL 3.5
USL 27.0

Moving Range Chart of Subgroup Ranges



Introduction

Normal Prob Plot
AD: 0.761, P: 0.046



Range Chart of All Data



Capability Plot



~~Dispersed SPC SIVE vs Centralized SPC SIVE~~

USL
UCL
X
LCL
LSL

Introduction

■ Applicability

- CMMI Development Model V1.3 for Systems Engineering, Software, and Hardware
- Large scale appraisals (~3000 people)
- Multi-program, multi-site environments
- Economy of scale

Between/Within Capability Sixpack of CYC TIME

Subgroup Means

Capability Histogram

Sample Means
1.5
2.0

Normal Prob Plot
AD: 0.261, P: 0.04

Between/Within Capability Sixpack of CYC TIME

Individuals Chart of Subgroup Means



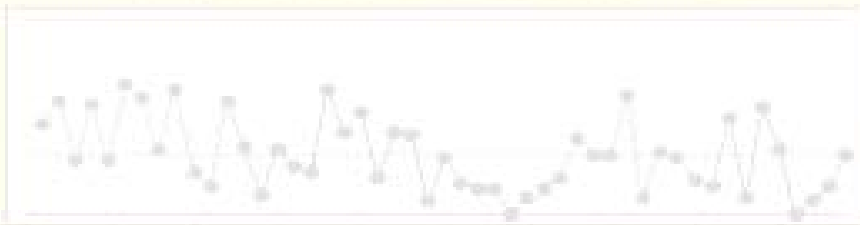
Capability Histogram



Specification Limits
USL 35
LSL 27.0

Overview

Moving Range Chart of Subgroup Means



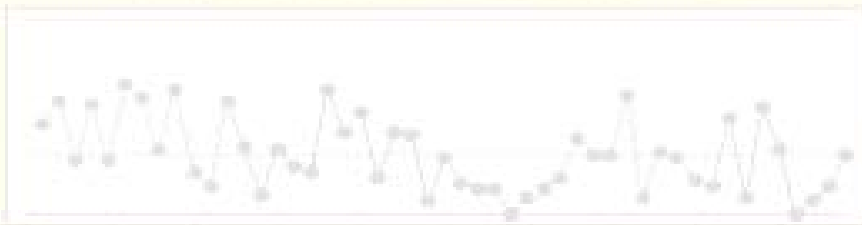
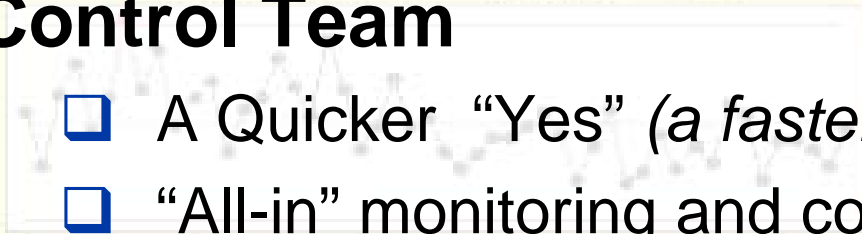
Normal Prob Plot
AD: 0.261, P: 0.04



Overview

■ Benefits of a Centralized Statistical Process Control Team

- A Quicker “Yes” (*a faster buy-in*)
- “All-in” monitoring and control
- “Cheaper, Faster, Better” (*lower base/over head cost*)



Our

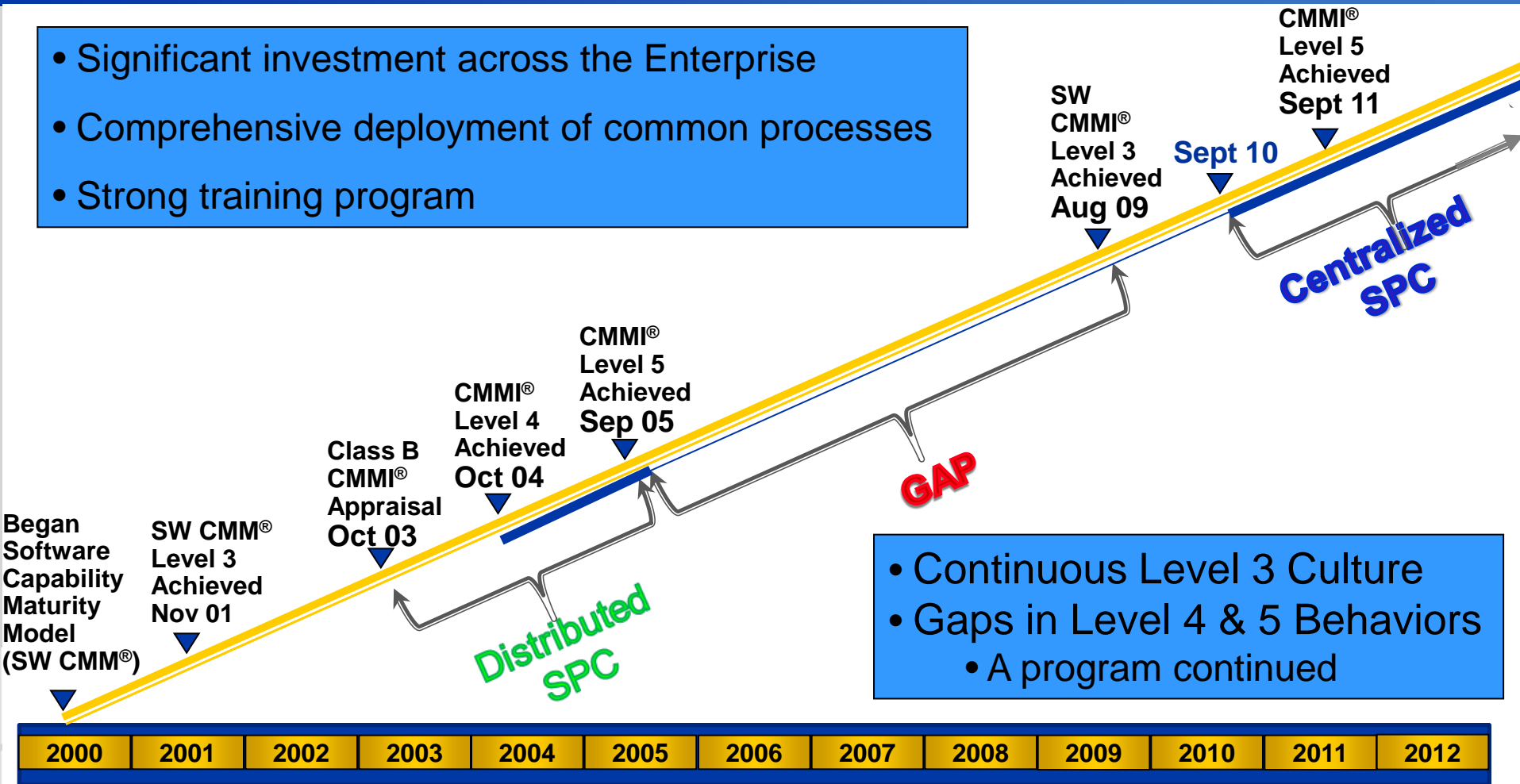


HISTORY

with Distributed Approach

Evolution of Level 5 Capability

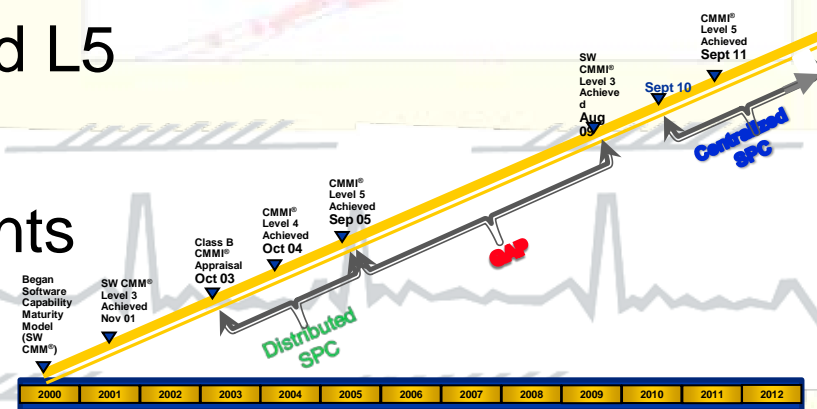
- Significant investment across the Enterprise
- Comprehensive deployment of common processes
- Strong training program



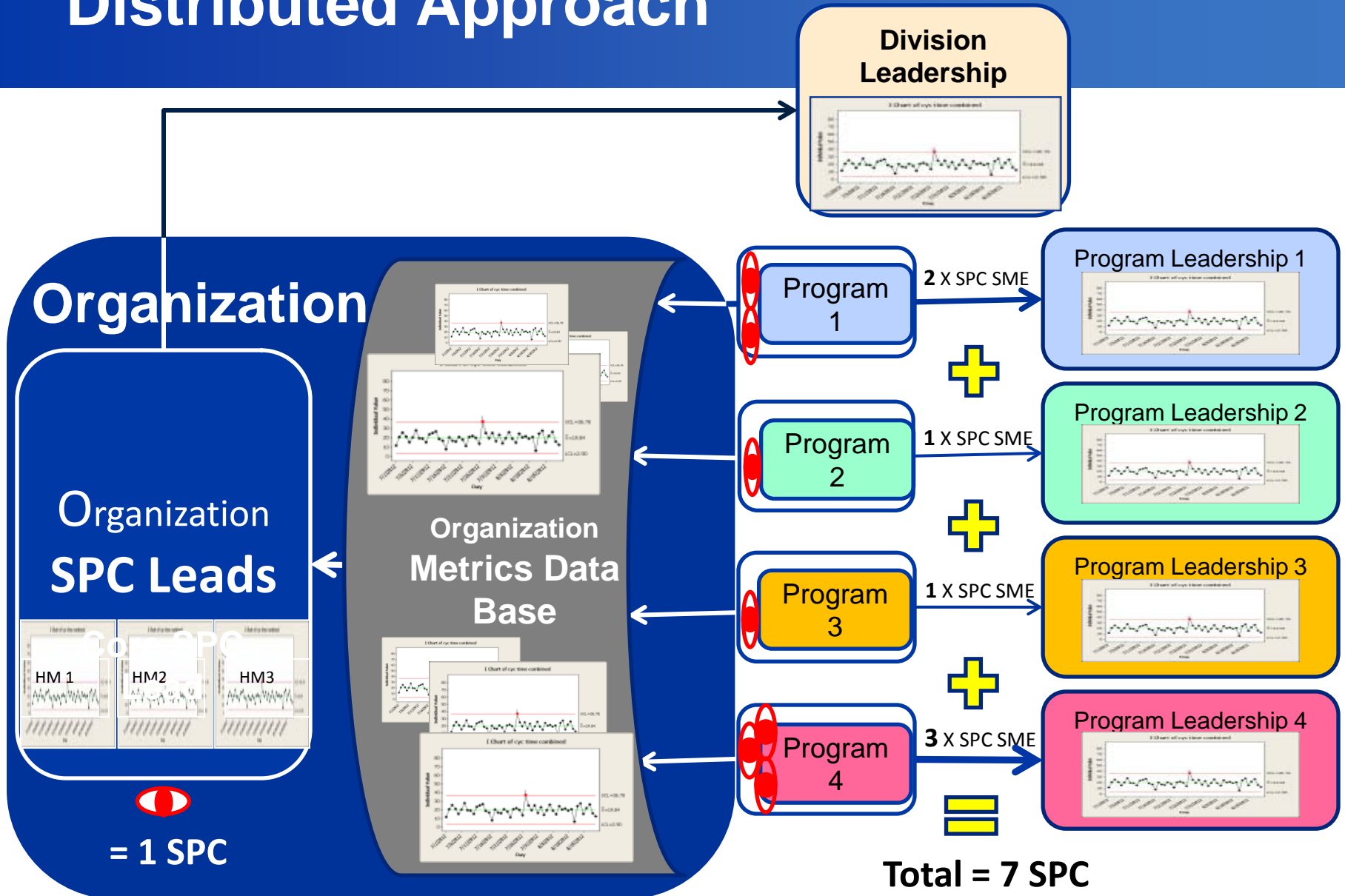
Challenges with Distributed SPC Approach

■ Post 2005 to 2010

- Distributed approach made commonality difficult for items such as metric formats, definitions, and scoring criteria.
- Rollup of data and analysis at organizational level was inefficient
- Process organization had no authority to influence high maturity metrics
- Organizational Leadership viewed L5 as too expensive
- Inconsistent customer requirements
- Unable to sustain L5 culture

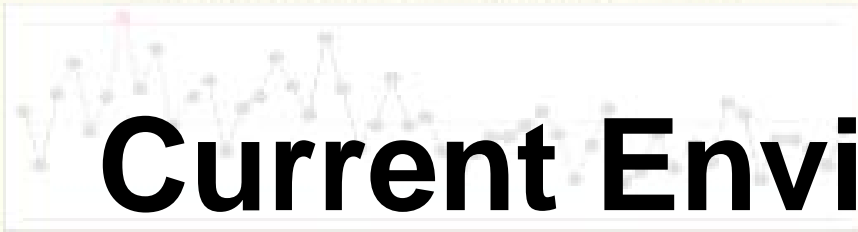


Distributed Approach



Between/Within Capability Sixpack of CYC TIME

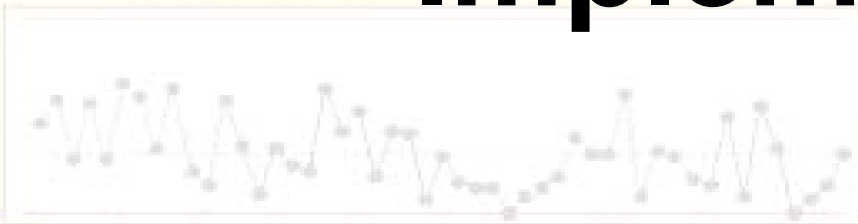
Individuals Chart of Subgroup Means



Capability Histogram



Moving Range Chart



Normal Prob Plot



Current Environment and Implementation

Centralized Approach

Organization

Program 1

Program 2

Program 3

Program 4



Organization SPC Leads

2 X SPC = 2 SPC



Transition to a L4/5 Centralized SPC Group

Evolution to Centralized SPC group

- Division and program level commitment to centralization
- Core process group given Responsibility, Accountability and Authority (RAA) for L5 process
- Key SPC subject matter expertise assigned to core process group
- Established common L5 process, metrics, and analysis tools

Between/Within Capability Sixpack of CYC TIME

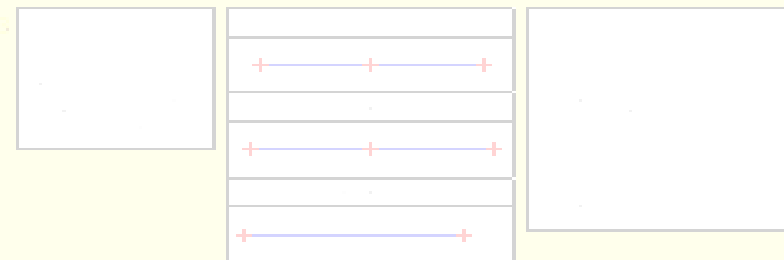
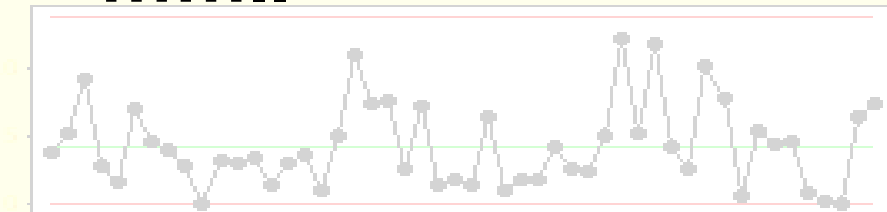
Process Capability Histogram

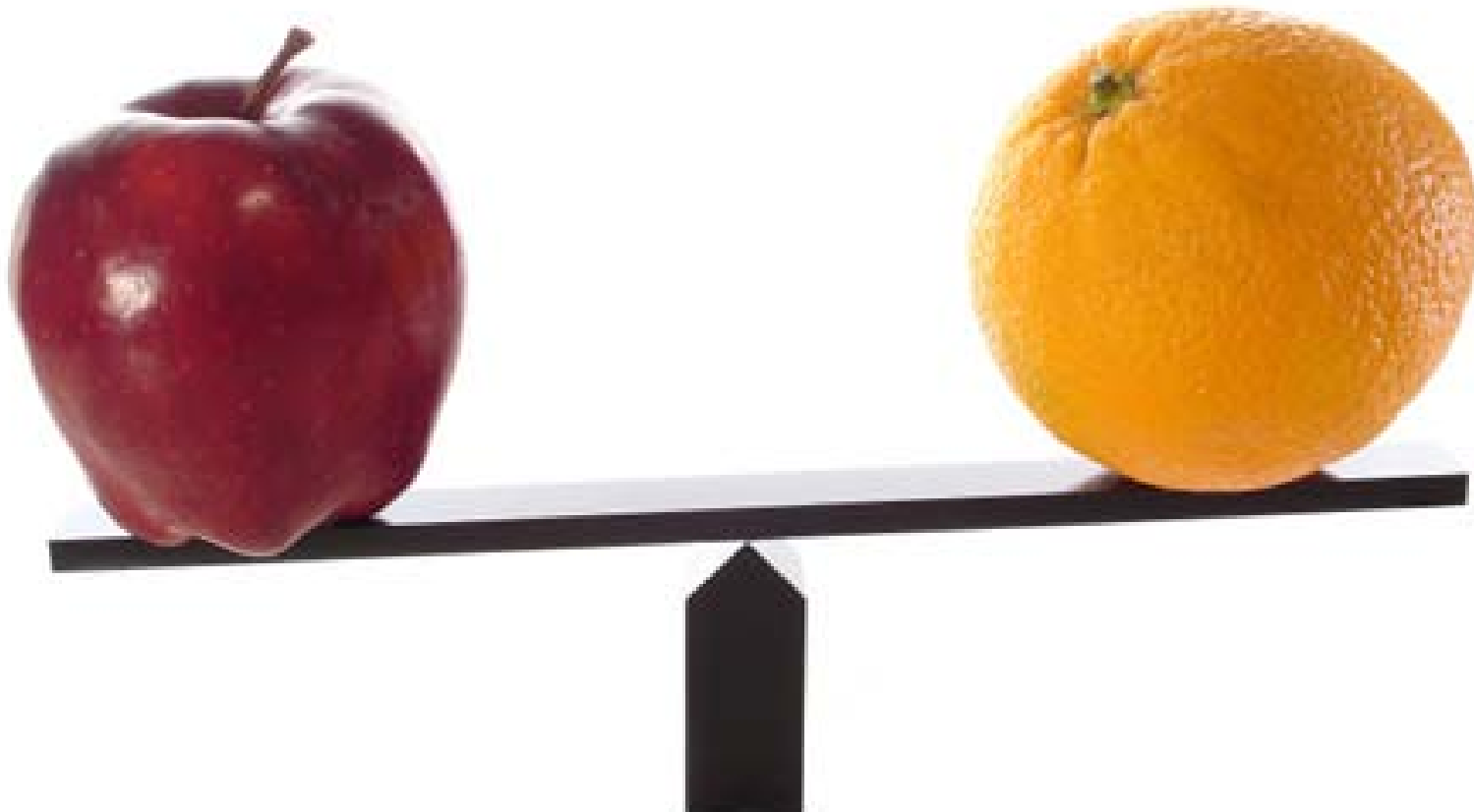
Specifications	
USL	3.5
USL	27.0

Process Capability Histogram

Range Chart of All Data

Capability Plot





Comparison of Approaches

Distributed versus Centralized

Distributed	Centralized
<ul style="list-style-type: none"> • Part time Core SPC expert(s) 	<ul style="list-style-type: none"> • Full time SPC expert(s)
<ul style="list-style-type: none"> • Reliance on programs to provide SPC skills 	<ul style="list-style-type: none"> • Availability not impacted by program priorities
<ul style="list-style-type: none"> • Lengthy Level 5 instantiation 	<ul style="list-style-type: none"> • Faster L5 capability
<ul style="list-style-type: none"> • Limited insight into program L5 metrics 	<ul style="list-style-type: none"> • Full insight into all program L5 metrics
<ul style="list-style-type: none"> • Wide variation in skills, training, and effectiveness. 	<ul style="list-style-type: none"> • Known skill sets, common training, and effectiveness
<ul style="list-style-type: none"> • Different metric definitions and measurements 	<ul style="list-style-type: none"> • Common metric definitions and measurements
<ul style="list-style-type: none"> • Inconsistent reporting to leadership 	<ul style="list-style-type: none"> • Consistent reporting to leadership
<ul style="list-style-type: none"> • Program-specific view on key processes 	<ul style="list-style-type: none"> • Ensured focus on key performance processes

RESULTS



Results and Benefits

- Reduce appraisal planning and execution costs
- Higher number of Level 4 and 5 projects across functions and programs
- Continued centralized approach maintains ongoing high maturity focus with committed resources
- Centralized approach resulted in finding additional program Level 4 and 5 candidates
- Centralized SPC resulted in a support system that programs relied on to strengthen and improve existing skill sets.

Lessons Learned



Lessons Learned

- Centralized SPC SME does not replace program responsibility

- Root Cause and Corrective Action
- Analysis of Outliers
- Process improvement pilots
- Using SPC as a decision tool

- Centralized SPC SME must communicate analysis results early to programs.

- Visibility into multiple programs has improved response to RFP's and “what if” scenarios.

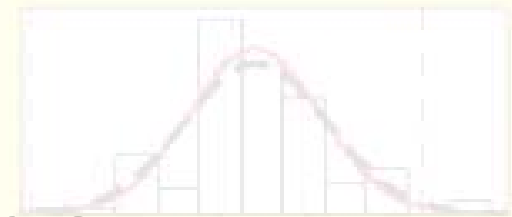
- With an overall view of all programs, we have a higher confidence in proposal inputs.

Between/Within Capability Sixpack of CYC TIME

Individuals Chart of Subgroup Means

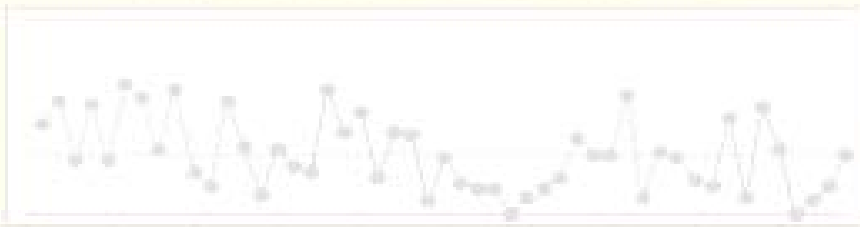


Capability Histogram



Specifications
USL 35
LSL 27.0

Moving Range Chart of Subgroup Means



Normal Prob Plot
AD: 0.261, P: 0.04



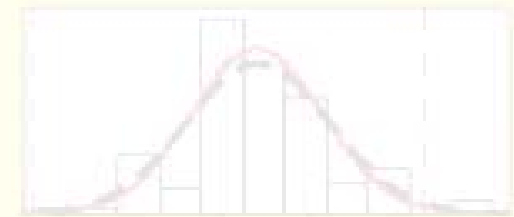
Questions

Between/Within Capability Sixpack of CYC TIME

Individuals Chart of Subgroup Means

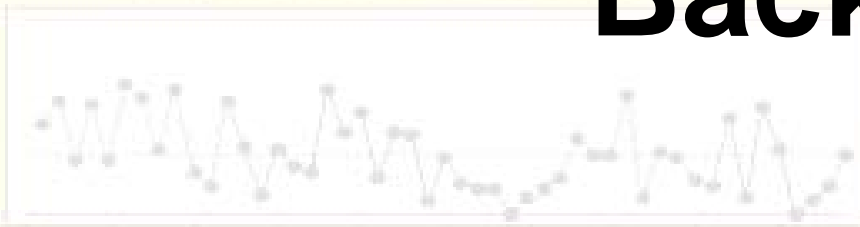


Capability Histogram



Specification	27.0
USL	35
LSL	27.0

Moving Range Chart of Subgroup Ranges



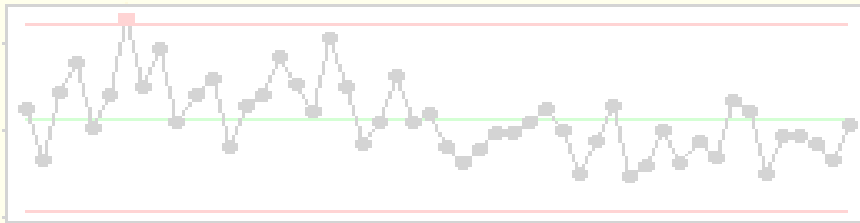
Normal Prob Plot
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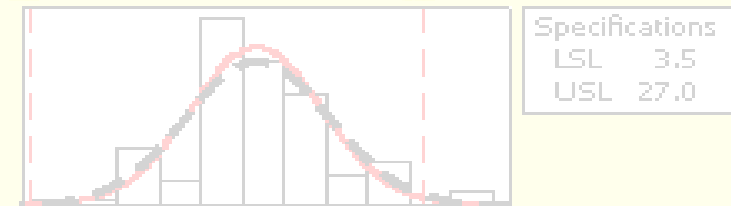
Back-up

Between/Within Capability Sixpack of CYC TIME

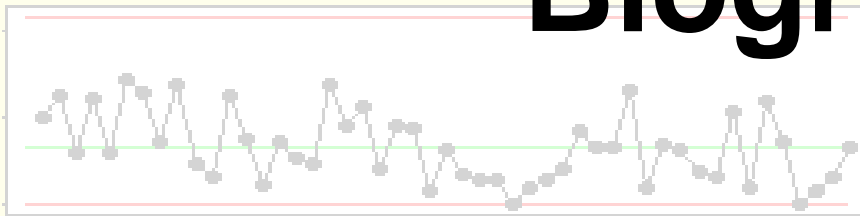
Individuals Chart of Subgroup Means



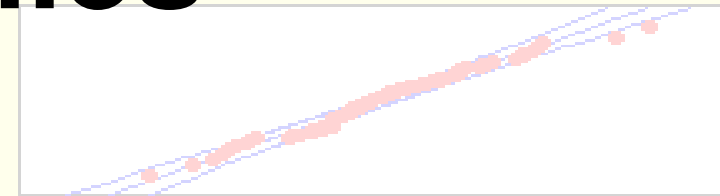
Capability Histogram



Moving Range Chart of Subgroup Ranges

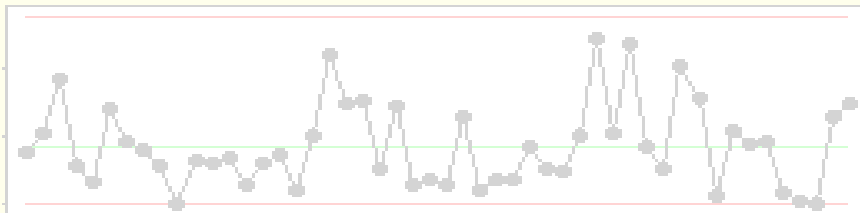


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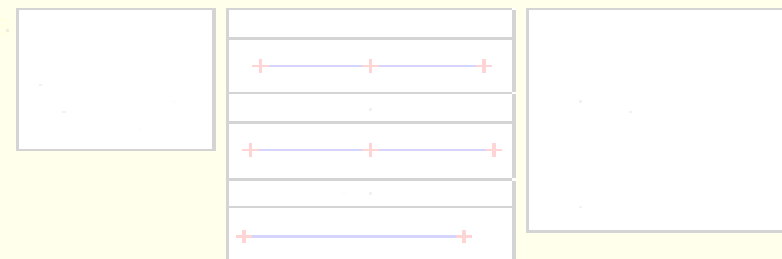


Biographies

Range Chart of All Data



Capability Plot



High Maturity Authors

- **Primary Author**

- Raymond A. Daves

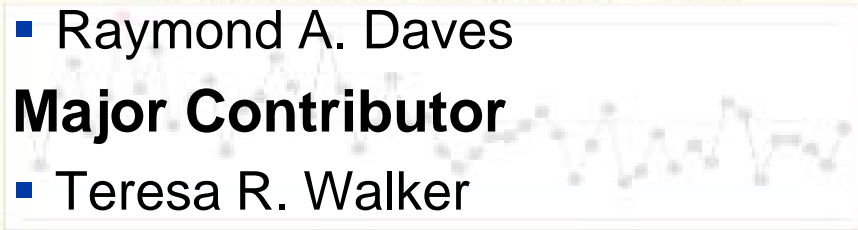
- **Major Contributor**

- Teresa R. Walker

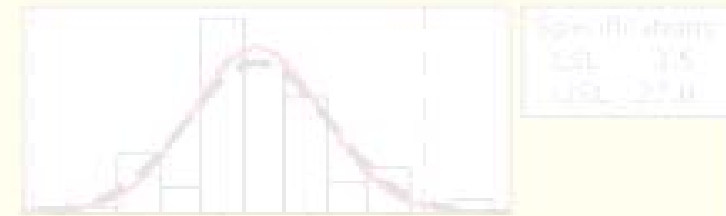
- Forrest W. Callicutt

Between/Within Capability Sixpack of CYC TIME

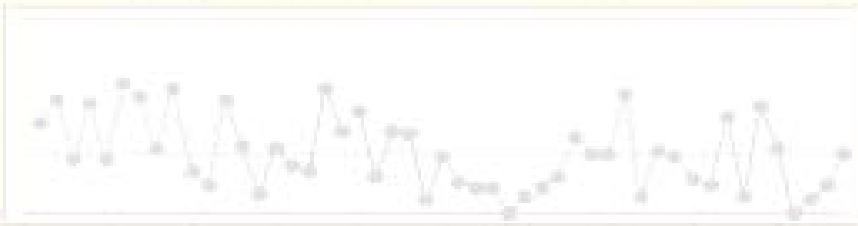
Individual Chart of Subgroup Means



Capability Histogram



Moving Range Chart of Subgroup Means



Normal Prob Plot
AD: 0.261, P: 0.04



Raymond A Daves, Sr

- **Mr. Raymond A. Daves, Sr. is a Senior Level Systems Engineer for Boeing Strategic Missile and Defense Systems, Huntsville, Alabama. In this position, Ray's responsibilities include driving Quantitative Project Management understanding and development of meaningful metrics using statistical process control and other statistical techniques as appropriate. He is a part of the successful CMMI High Maturity acquisition and sustainment team. Previously in Boeing Ray has held the positions of Senior Level Quality Engineer on the GMD program creating, evolving and overseeing the Senior Corrective Action Board process, authoring program directives and Joint Program Directives as well as training in RCCA and other quality venues. He worked as a Quality Engineer for Tooling and CAPA processes on the ARES program and the Quality and Variation Reduction Engineer position for the Delta Program (Decatur Plant).**
- **Prior to Boeing, Ray Daves has held multiple positions in three of the top 10 Fortune 500 Companies. He held positions with General Electric as Senior Advanced Manufacturing Engineer, Senior Advanced Quality Engineer, Six Sigma Black Belt, Fabrication, Finishing and Manufacturing Business Team Leaders, and Fabrication Quality Business Team Leader. With Eaton he held a position as Staff Quality Manager.**
- **Ray began his career in the Automotive Industry in 1987 with the United Technologies Motor Systems as a Supervisor over the armature department for the Auto shift on the fly 4 wheel drive DC motor and window lift motors. Other positions: Product Reliability Engineer, Senior Quality Assurance Engineer working on solving manufacturing, shipping and supplier induced defects. Daves also held leadership positions in Eaton and AB Electrolux.**
- **Ray received his Bachelor of Science degrees in Biological Engineering from the Mississippi State University and Biology/Mathematics from Livingston University (University of West Alabama).**
- **Ray has worked multiple projects as a GE Six Sigma Black Belt that produced huge savings. Prior to leaving GE, He was nominated and awarded the honor of GE Global Technical Expert in Manufacturing and Quality.**

Forrest W Callicutt

- Mr. Forrest Callicutt is a Software Engineering Functional Staff Engineer at the Boeing Huntsville site. In this role he defines and maintains the software processes and infrastructure for managing and producing software work-products; coordinates institutionalization of the software processes by projects; manages standard tool usage and software specific skills training; and is involved with metrics management including process and performance improvement activities. He has served as a SCAMPI Assessor Team member for over half-dozen appraisals at multiple Boeing sites. He has 34 years software engineering experience; 26 years with The Boeing Company including software engineering roles on missile defense and space programs. He has a M.S. in Mathematics from the University of Tennessee Space Institute.

Teresa R. Walker

- **Ms. Teresa R. Walker is a senior manager at the Boeing Huntsville site responsible for process management and performance on missile defense programs. She is a recognized CMMI subject matter expert within Boeing, leading 2 large scale CMMI Level 5 appraisals. As the SM&DS IPG lead, she is responsible for the deployment and execution of engineering processes across Huntsville hosted missile defense and NASA programs. Ms. Walker has 24 years with The Boeing Company working in systems engineering, process management, and program management roles. She has a B.S. in MIS from Judson College.**