

Metrics Portal™

# **MEASURING YOUR BUSINESS OPERATION – VIRTUAL INSTRUMENTATION FOR THE EXECUTIVE**

*From the Lab to the Executive Suite*

**David Koenig, Brookline Technology LLC**

**August 8, 2007**

# Introduction

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***Decision-makers have access to more data than ever before, yet the problem of turning it into meaningful information still remains. With non-stop streaming of operational data from independent and unrelated sources, managers are finding it difficult to get a holistic view of their operation, never mind being able to make control decisions in real-time.***

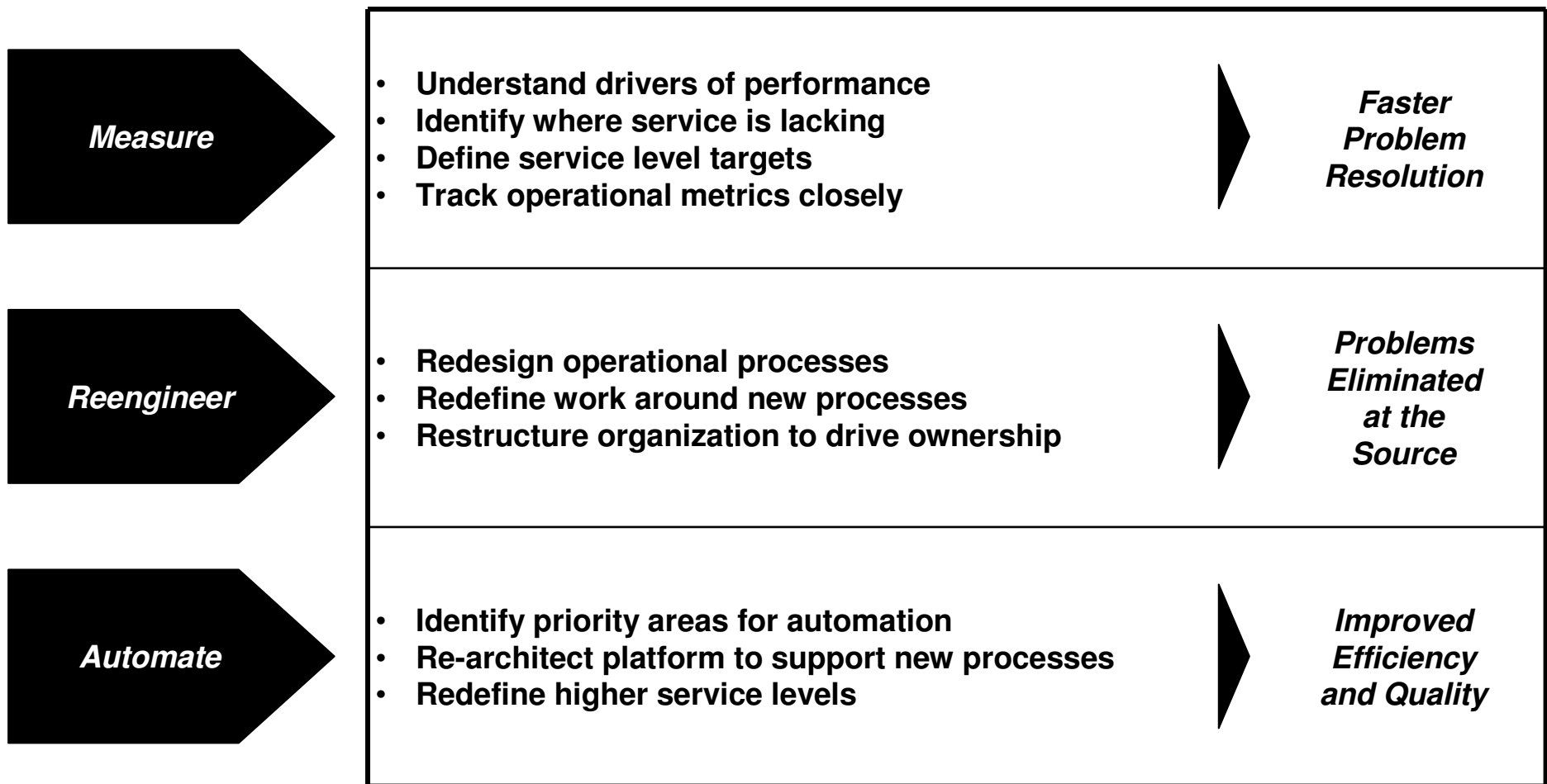
***Concepts that drove the creation of LabVIEW—acquisition, analysis, and presentation of data from disparate sources via a virtual instrument—are directly relevant to solving some of the more pressing issues facing business managers today. Look beyond Test and Measurement in its traditional sense, and there is a vast untapped landscape that could benefit from adopting the LabVIEW way:***

- ***Better visibility into the business operation***
- ***Closing the decision-making loop***
- ***Delivering information to a broad set of users***

***This presentation discusses how measurement and automation tools like LabVIEW can be used to augment operational monitoring and business intelligence tools to create virtual instrumentation for the executive. We will also discuss examples where LabVIEW has been used to build dashboards for measuring operations at several service organizations.***

# Better Operations Start with Measurement

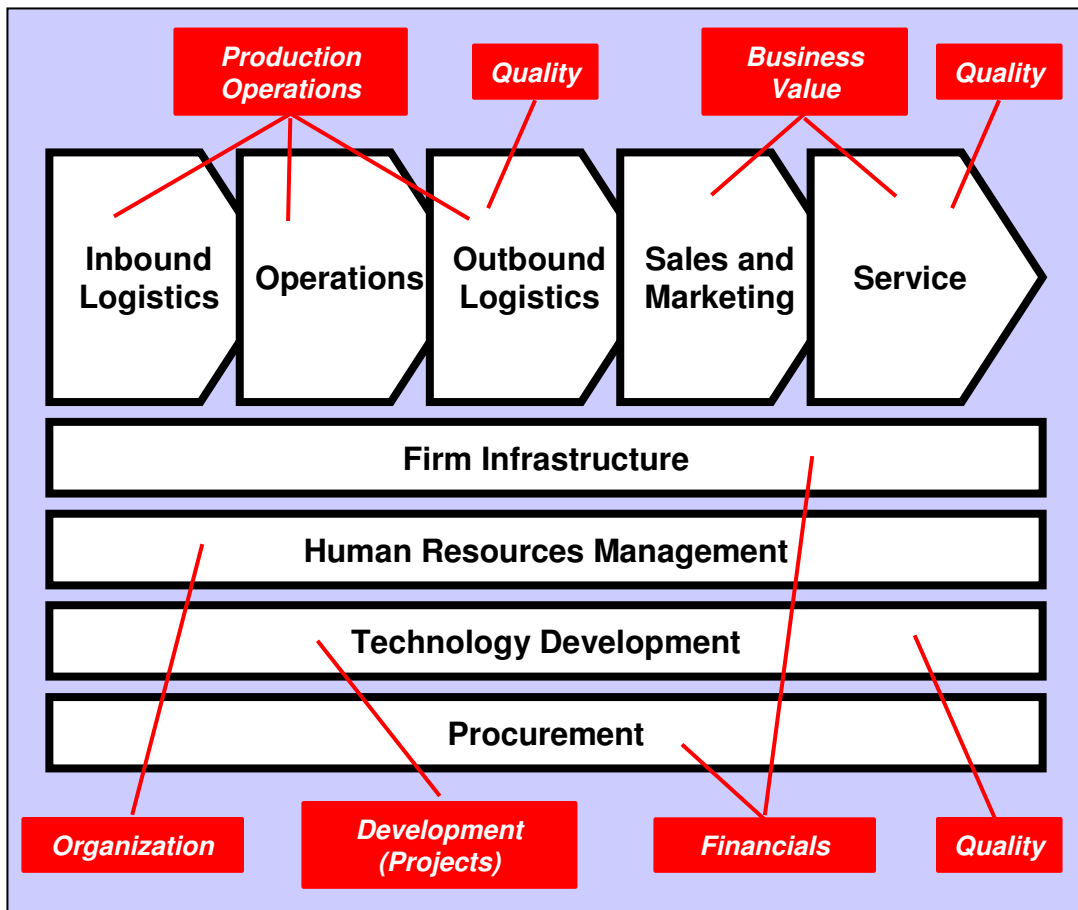
Operational improvement efforts too often fail because large-scale development projects are started before basic fixes have been identified and realized. Managers must first measure and understand their operations before trying to reengineer or automate them.



# Business Operations is a Measurable System

Many managers complain that they don't get enough information on how their operation is working. Why is that? Business operations is a measurable system like anything else. What is so obvious to the engineer or scientist just hasn't taken root in the same way for the operations manager.

*Value Chain of Business Operations*



*Measurement is a Core Requirement*

*“The central problem in management and in leadership is failure to understand the information in variation...Sound understanding of statistical control is essential to management, engineering, manufacturing, and...service.”*  
 – Deming, Out of the Crisis

*“In order to discover the root causes of inconsistencies, people need to know what kind of information to gather and how to analyze it.”*  
 – Welch, Winning

*“When numbers acquire the significance of language, they acquire the power to do all of the things which language can do: To become fiction and drama and poetry.”*  
 – Lewis, Moneyball

# From the Lab to the Executive Suite

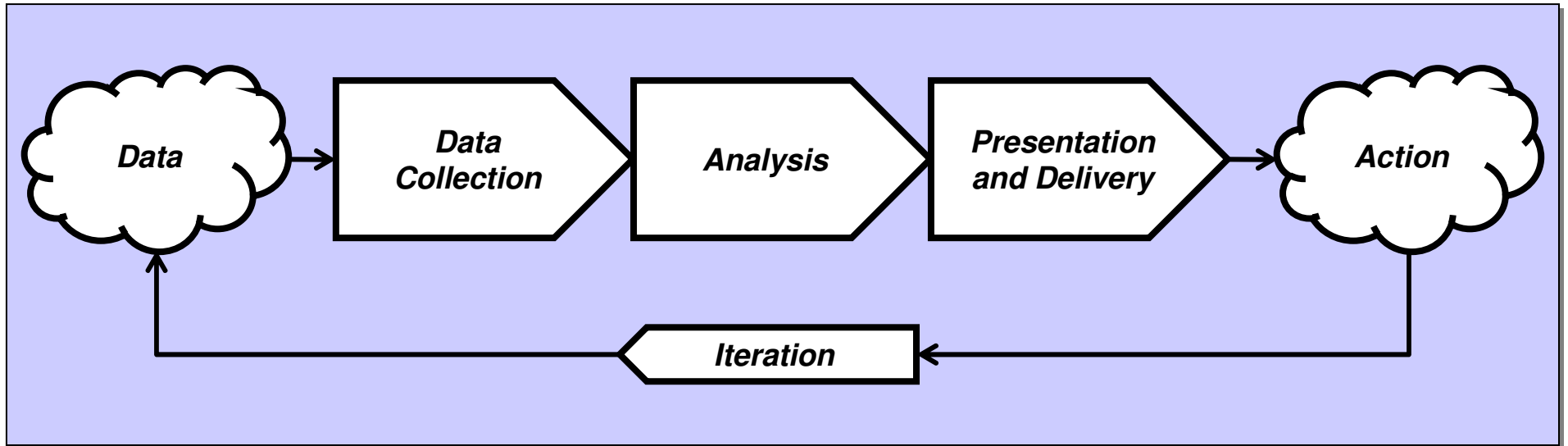
Concepts that drove the creation of LabVIEW—*acquisition, analysis, and presentation* of data via a *virtual instrument*—are directly relevant to solving some of the more pressing issues facing business managers today.

<i>Leveraging VI Concepts...</i>
• “The Software is the Instrument”
• Acquire, Analyze, Present
• Design, Prototype, Deploy
• Virtual Instrument
• Instrument
• Sensor
• Data Logger
• DAQ (Measurement Hardware)
• Instrument Driver
• GPIB (Instrumentation Bus)
• G, NI-VISA, NI-488, NI-DAQ
• Desktop-centric
• Test and Measurement, Process Control



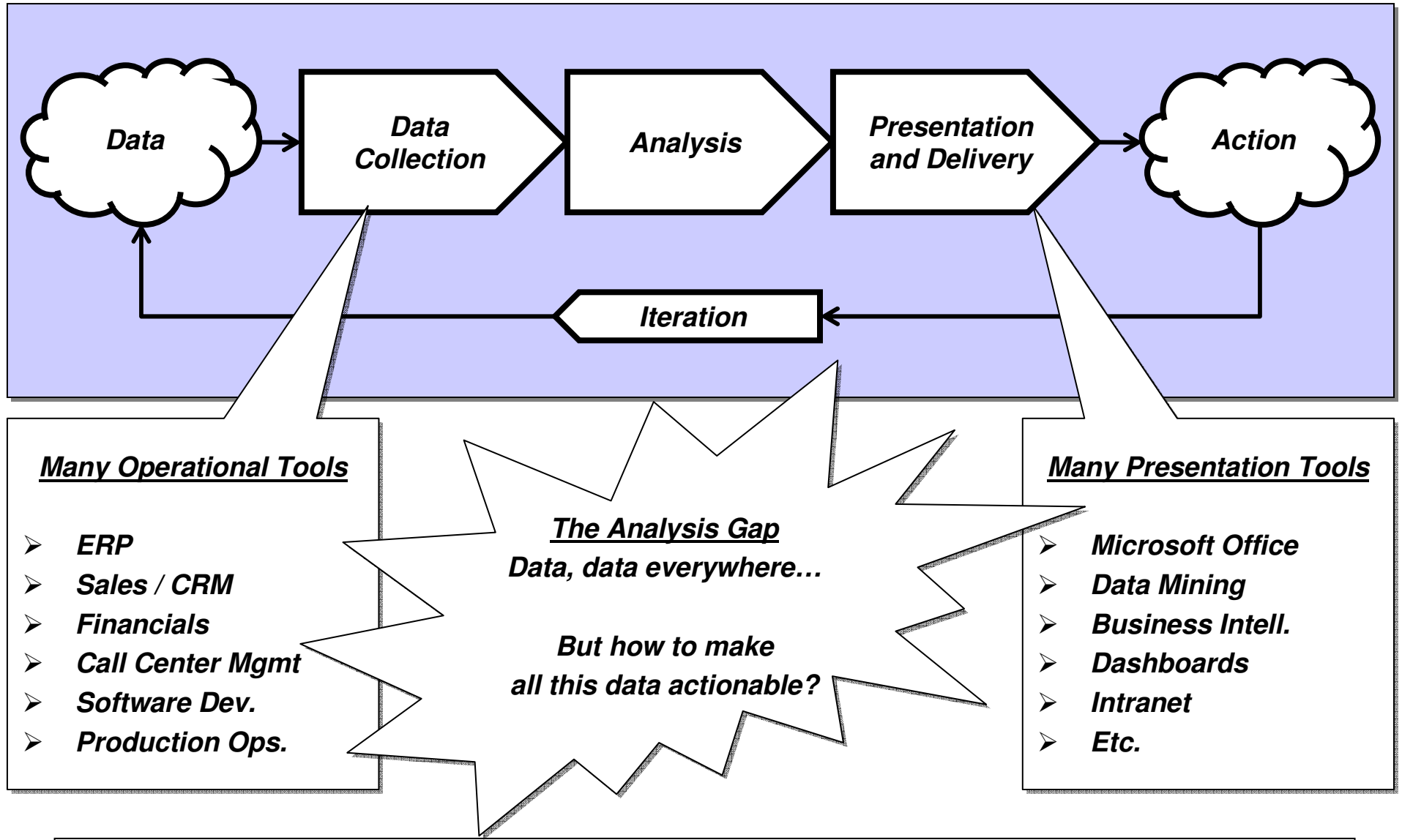
<i>... To Improve Business Operations</i>
• “The System is the Instrument”
• Collect, Analyze, Distribute
• Measure, Reengineer, Automate
• Executive Dashboard
• Operational System (e.g., ERP, Workflow, CRM)
• Application Trace
• Application Logs
• Monitoring Software
• APIs, Data Feeds, ETL
• IP, HTTP, XML, MQ
• Java, SQL, VB, C++
• Server-centric
• Business Management and Control

## Measuring Business Operations – Three Steps



- **Data Collection** alone will do little to help managers make sense of their operation. Few organizations are lacking sufficient data; in fact, most are drowning in too much.
- **Analysis** alone won't encourage managers to change their behaviors. Without meaningful presentation and delivery, even the best insights will go unheeded if people don't know about or understand them.
- **Presentation and Delivery** alone will simply make oceans of data more available, but will do little to help managers make sense of what's going on. There are too many other activities diverting attention away from finding the insights buried in raw data.

# What's Missing? The Analysis Gap...

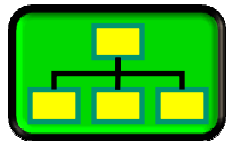
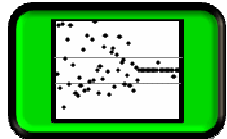
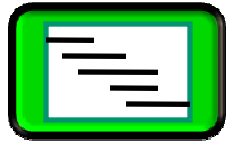
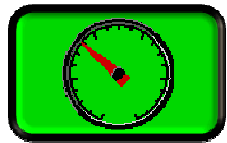


**Virtual Instrumentation concepts can help managers to better understand their operations**

# **A MEASUREMENT PLATFORM FOR BUSINESS OPERATIONS**

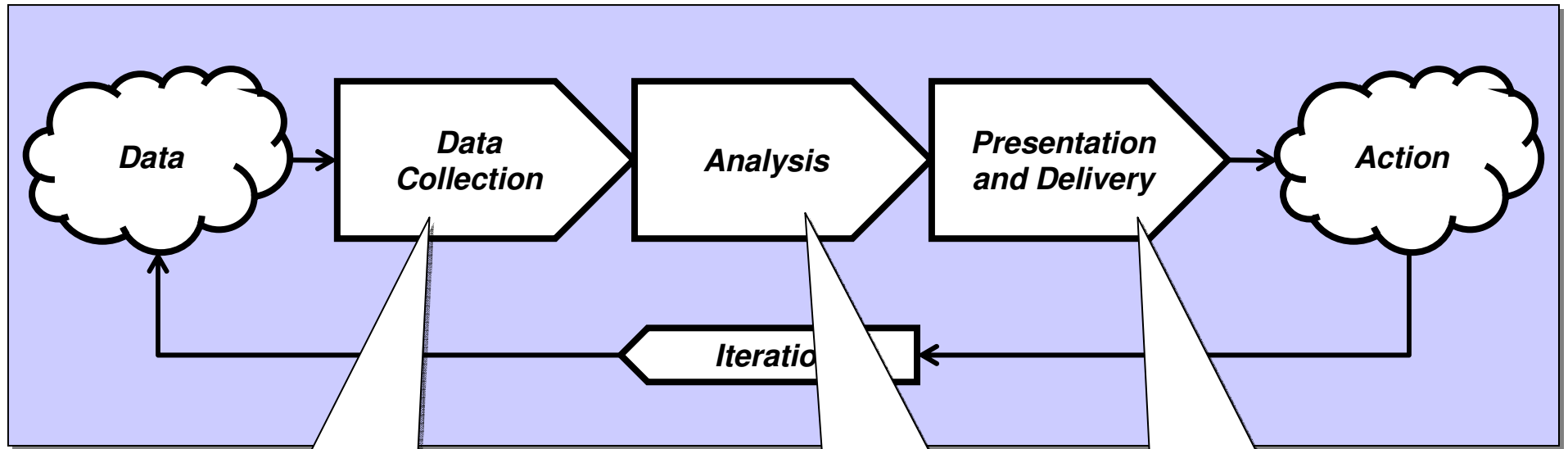
# Six Metrics for Business Operations

Operational systems (e.g., ERP, CRM, SDLC) offer a treasure trove of information on how the business operation is doing. Business managers can bring better visibility to their organization by mining this data and delivering six sets of metrics.



	<i>Objectives</i>	<i>Example Metrics</i>
<i>Production Operations</i>	<ul style="list-style-type: none"> <li>• Reliability</li> <li>• Efficiency</li> <li>• Scalability</li> </ul>	<ul style="list-style-type: none"> <li>• Manufacturing Operations</li> <li>• Call Center Operations</li> <li>• Back Office</li> <li>• Data Center / IT Production</li> </ul>
<i>Development</i>	<ul style="list-style-type: none"> <li>• On-schedule</li> <li>• On-scope</li> <li>• On-budget</li> </ul>	<ul style="list-style-type: none"> <li>• Product Development</li> <li>• Software Development</li> <li>• Construction</li> </ul>
<i>Quality</i>	<ul style="list-style-type: none"> <li>• More testing</li> <li>• Fewer defects</li> <li>• Better design</li> </ul>	<ul style="list-style-type: none"> <li>• Errors and Rework</li> <li>• Product Returns</li> <li>• Software Defects</li> <li>• Complaints</li> </ul>
<i>Organization</i>	<ul style="list-style-type: none"> <li>• Staff development</li> <li>• Turnover</li> <li>• Differentiation</li> </ul>	<ul style="list-style-type: none"> <li>• Staffing (Hires and Terms)</li> <li>• Performance Feedback</li> <li>• Training</li> <li>• Salary and Bonus Distribution</li> </ul>
<i>Business Value</i>	<ul style="list-style-type: none"> <li>• Lower cost per unit</li> <li>• Time-to-delivery</li> <li>• Better service</li> </ul>	<ul style="list-style-type: none"> <li>• Product Time to Market</li> <li>• Customer Satisfaction</li> <li>• Marketing Effectiveness</li> <li>• Scale Economies (e.g., Units per FTE)</li> </ul>
<i>Financials</i>	<ul style="list-style-type: none"> <li>• Top line growth</li> <li>• Controlled spending</li> <li>• Lower “lights on” costs</li> <li>• Transparency</li> </ul>	<ul style="list-style-type: none"> <li>• Sales Pipeline vs. Targets</li> <li>• Budget vs. Actual Spending</li> <li>• Profitability</li> <li>• Fixed Cost Reductions</li> </ul>

# Metrics Planning Process



**Sourcing**

- Source system
- Data elements
- New data?

**Access**

- Method of access
- Frequency
- Destination for data

**Assignment**

- Categorize and clean-up
- Meta-definitions

**Baseline**

- Analysis to be done
- Baseline current performance

**Trending**

- Trends to track
- Set targets for each metric

**Format**

- How to present data (e.g., graphs, tables, screens)

**Drill-Down**

- Layers of output, from high level to most detailed

**Delivery**

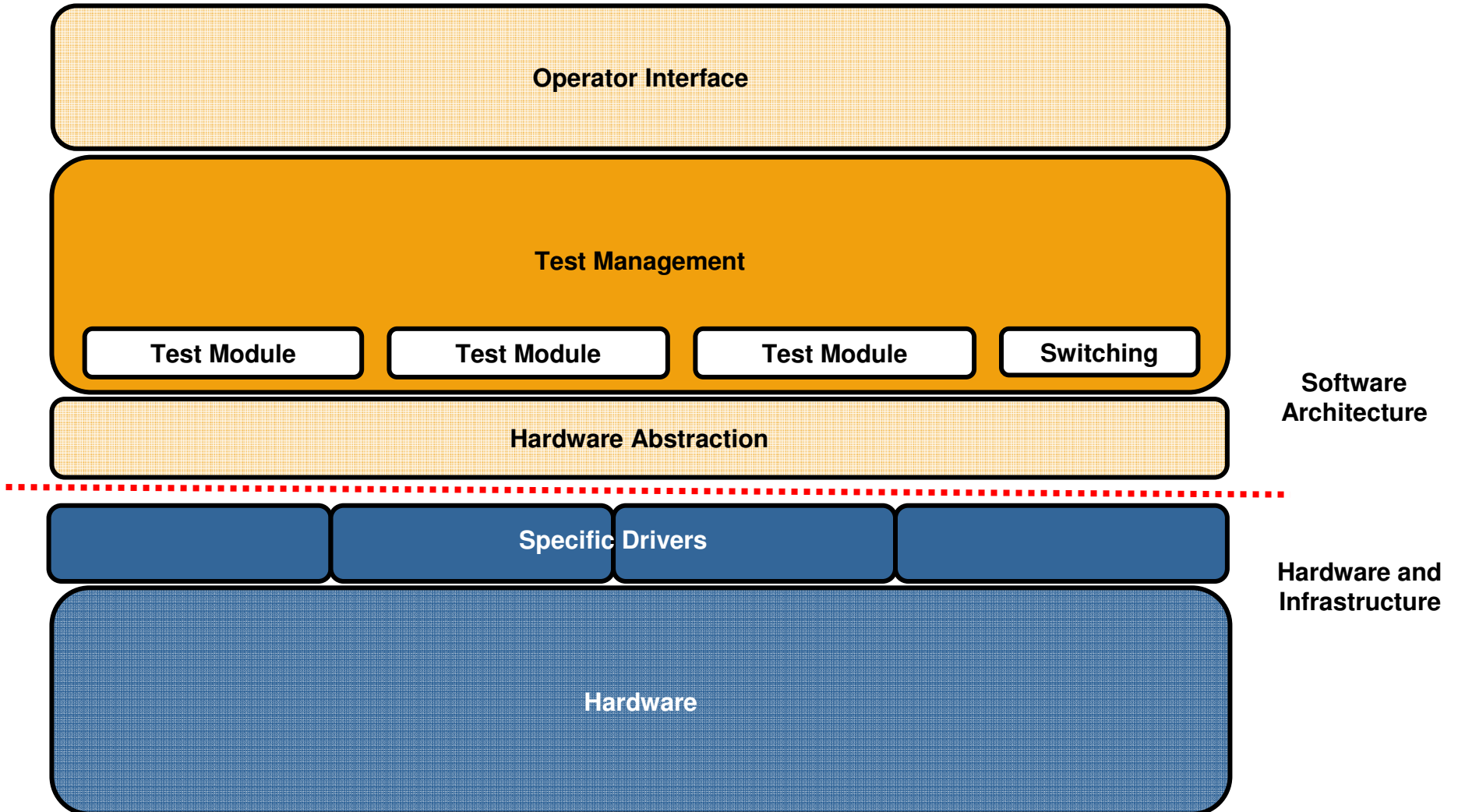
- How will each user receive its data
- How will data be used

# Metrics Planning Framework

	Data Collection		Analysis			Presentation		
	Sourcing	Access	Assignment	Baseline	Trending	Format	Drill-Down	Delivery
Production Operations	Production Systems	Real-Time APIs	SBU Application Function Component	Outages CPU util Latency	Improve uptime to >99.9%			
Development	Pjt. Mgmt			Change Late pjts Glide plane	Projects >90% on- time			<a href="http://project website">http://project website</a>
Quality	Quality and Defects	Daily Feeds	Incident User Base Root Cause	Tests run Pass rate Defects Backlog	Reduce backlog by 50%			<a href="http://metrics portal">http://metrics portal</a>
Organization	HR/Staff	Weekly Extracts	Project Release Phase	Staff util Hire/term Span of ctl Grade dist	Span of control 7 to 12			<a href="http://HR admin-site">http://HR admin-site</a>
Business Value	Bus. Ops	Monthly Extracts	Department Manager Team Individual	Outage Cycle time Unit cost	Increase units per FTE by 20%			
Financials	Financials		Asset Class Budget Code Spend Type	Bud v Act Maint % Cntr rates	Reduce contractor rate by 20%			

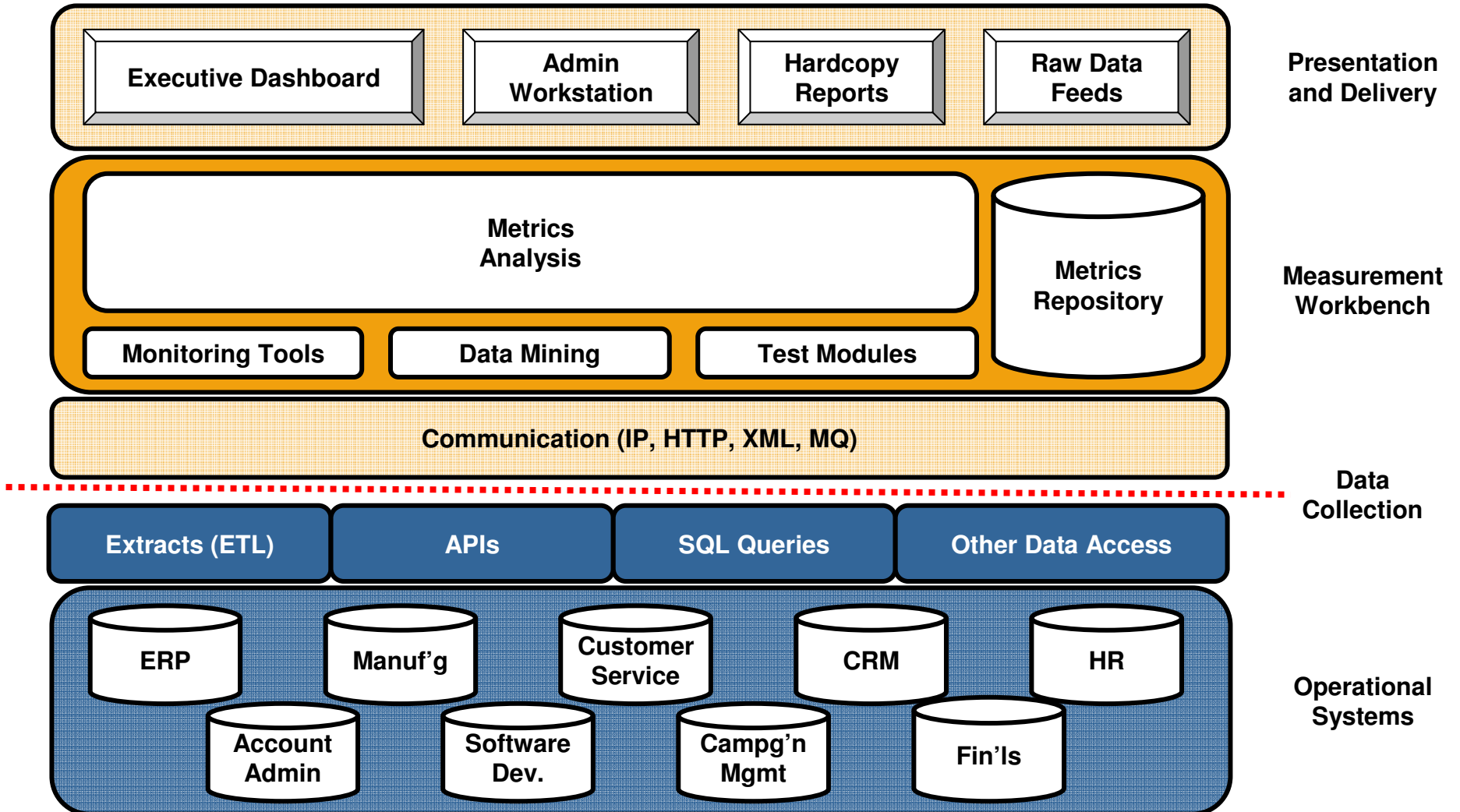
# ATE System Design Architecture

NI defines a five-tier architecture for designing automated test systems, with the objective of abstracting the *test management* and *interface* layers from the details of specific acquisition and control hardware being used.



# Executive Dashboard Design Architecture

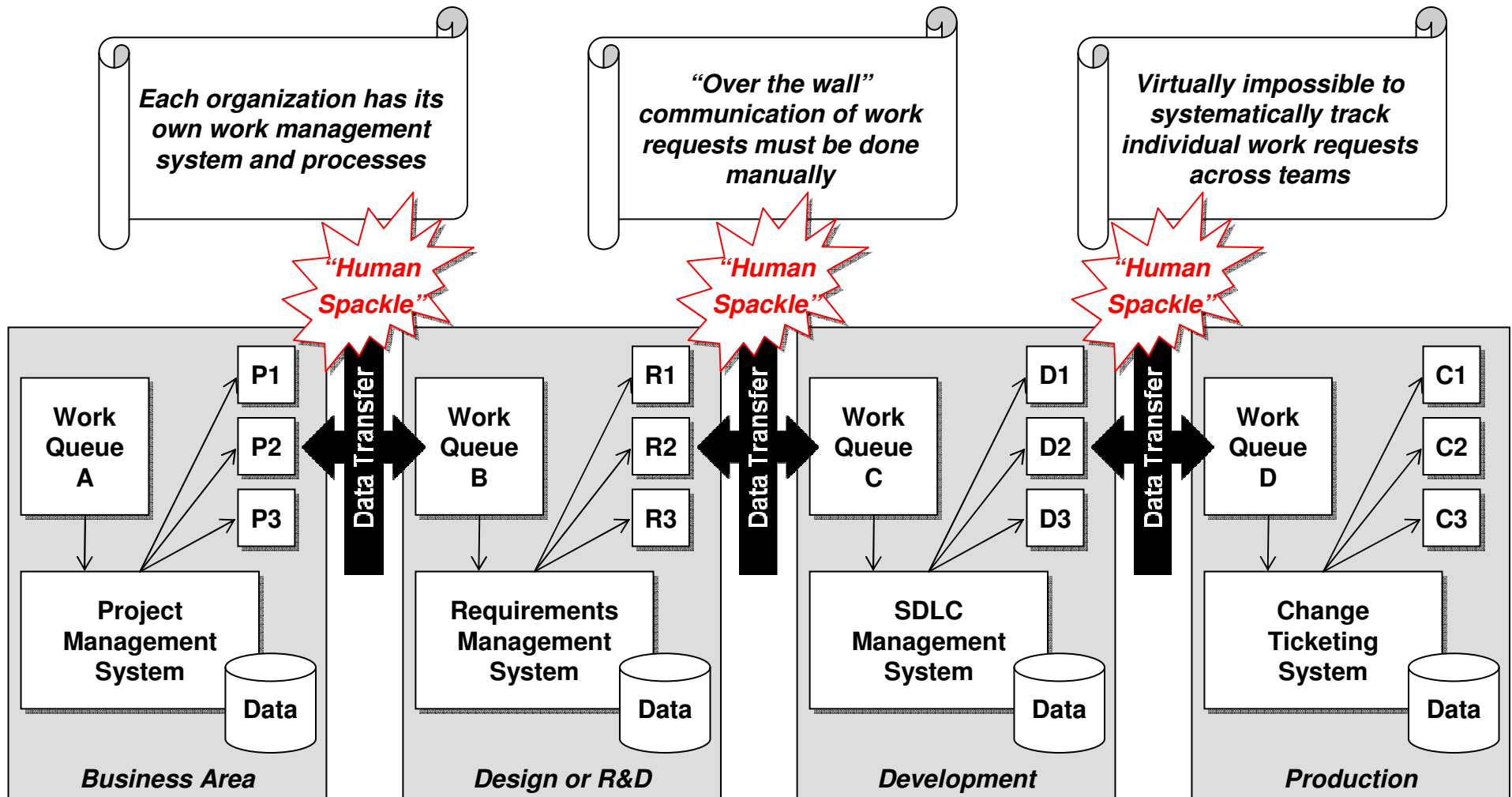
This same architecture can be used for designing measurement systems for the business operation.



## **EXAMPLE – CHANGE CONTROL**

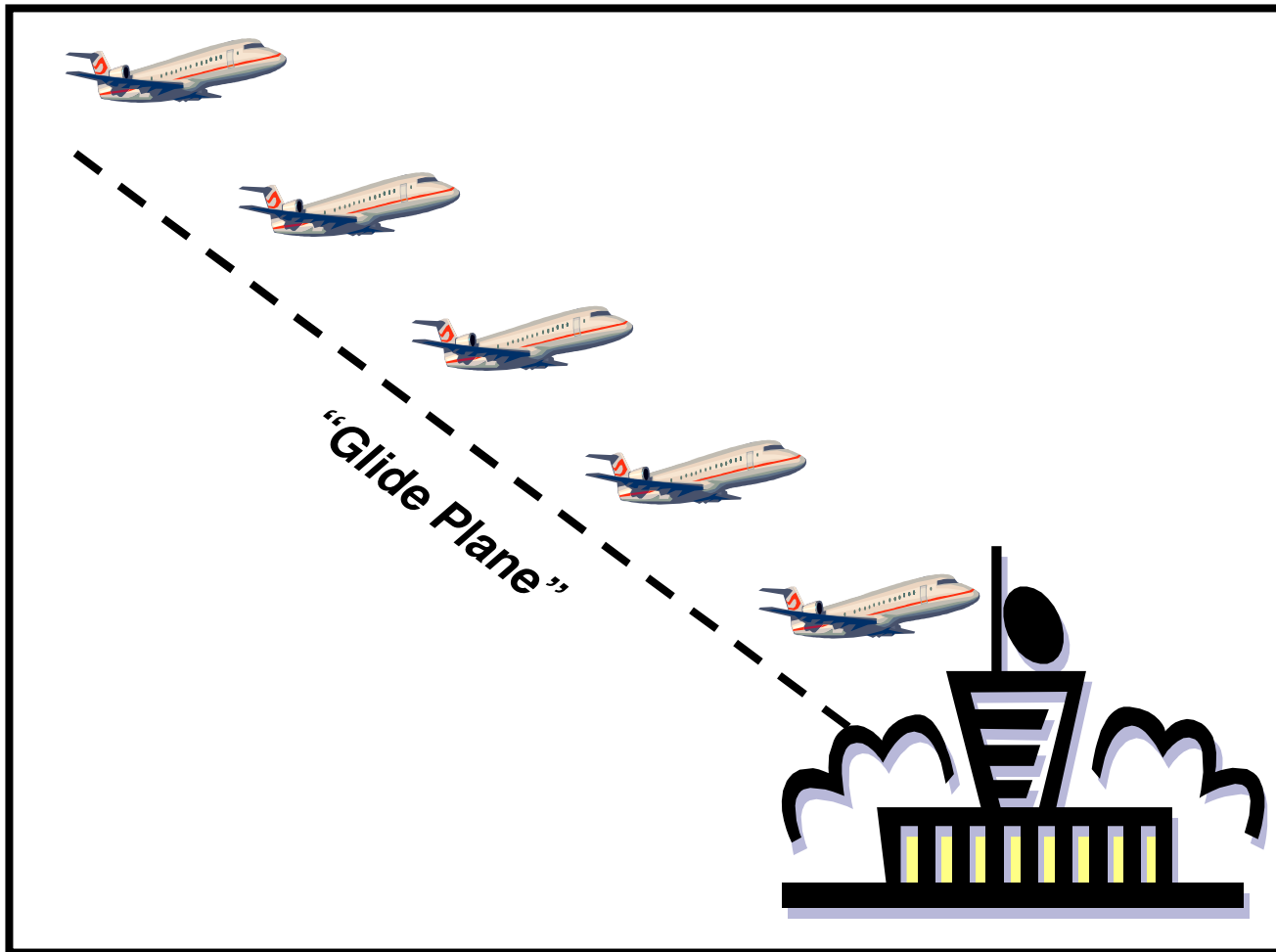
# Managing Change Across Organizational Silos

Change control is the bane of many a project manager. Apart from external events or infrastructure issues, most operational problems can be traced to changes that had unintended consequences. Companies struggle to facilitate the work of dozens of individuals from different organizations, each with their own systems, priorities and incentives.



# Better Change Control – The “Glide Plane”

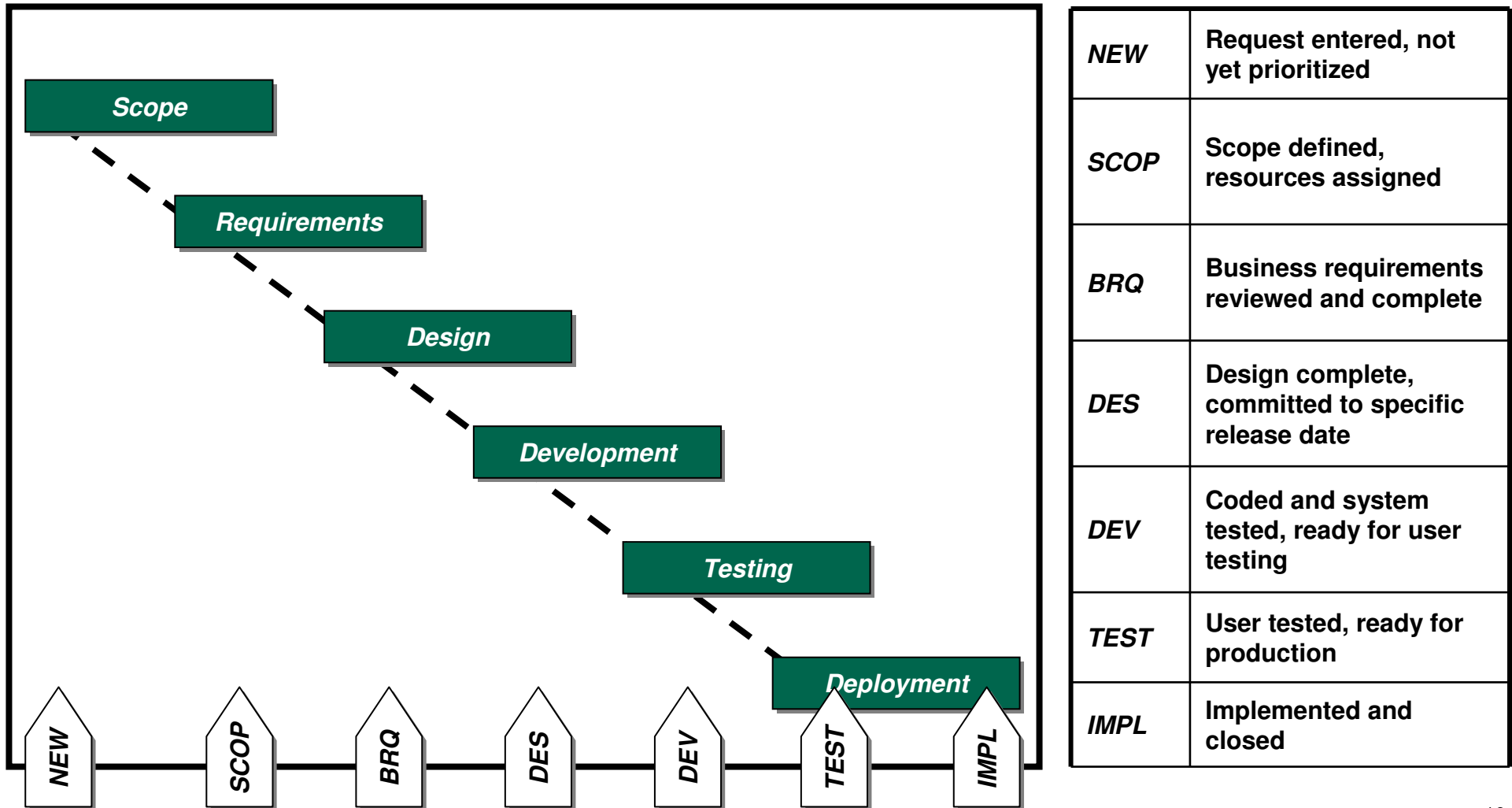
The concept of a *Glide Plane* comes from the manner in which airplanes are coordinated during their final descent. Within certain parameters, pilots have discretion on the management of their aircraft, but must follow increasingly strict protocols as they approach the airport.



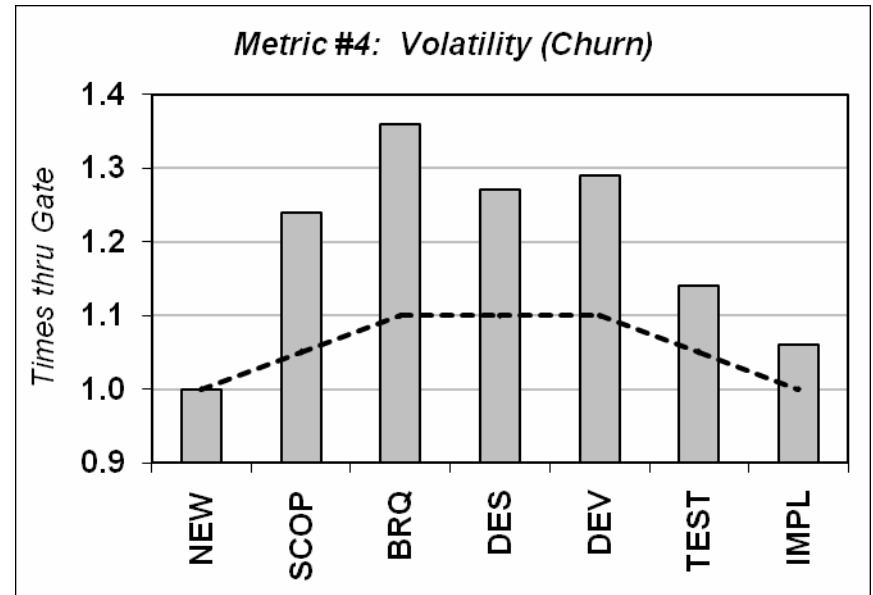
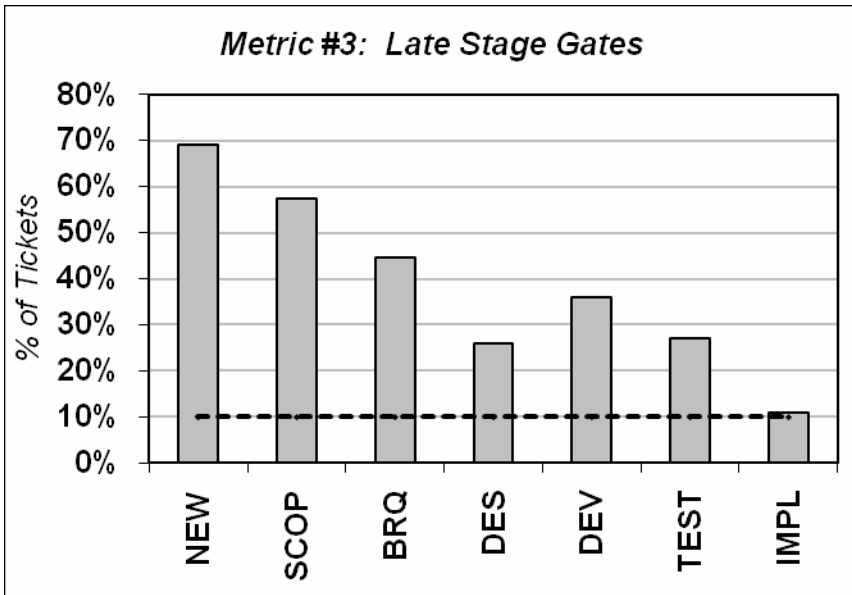
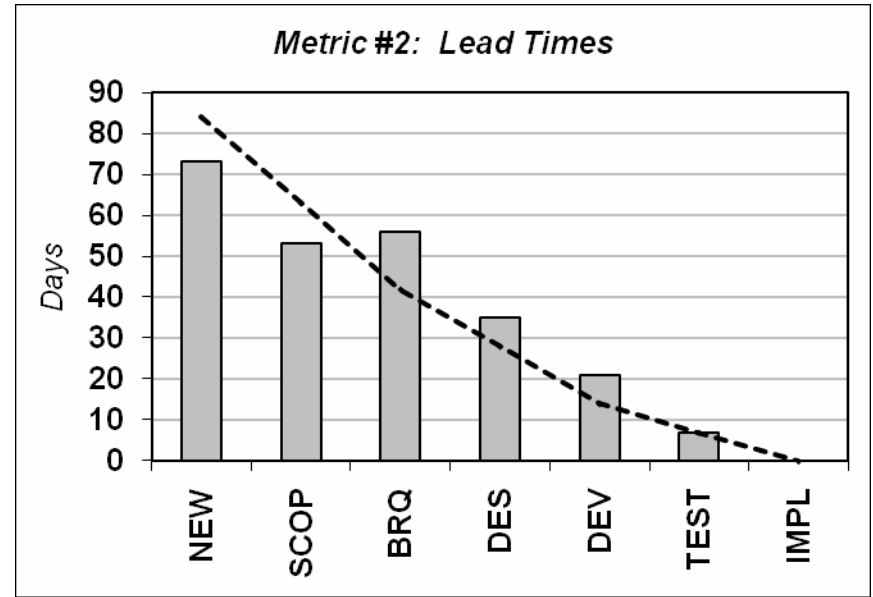
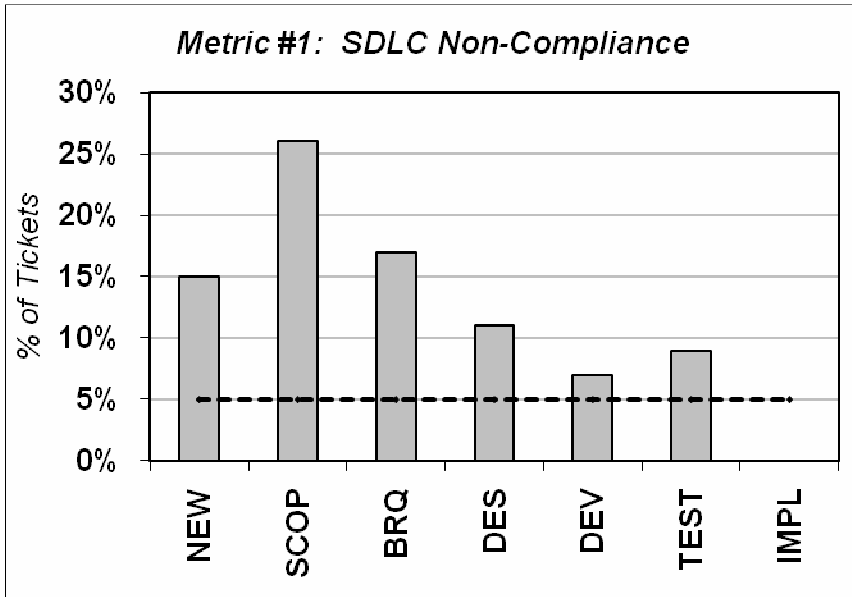
1. Landings coordinated in waves (releases)
2. Well-defined checkpoints (stage gates) to identify out-of-place aircraft
3. Increasingly tight parameters as planes get closer to airport
4. Efforts to land closest aircraft first
5. Even for emergencies or accelerated landings, glide plane is still followed

# Better Change Control – The Software “Glide Plane”

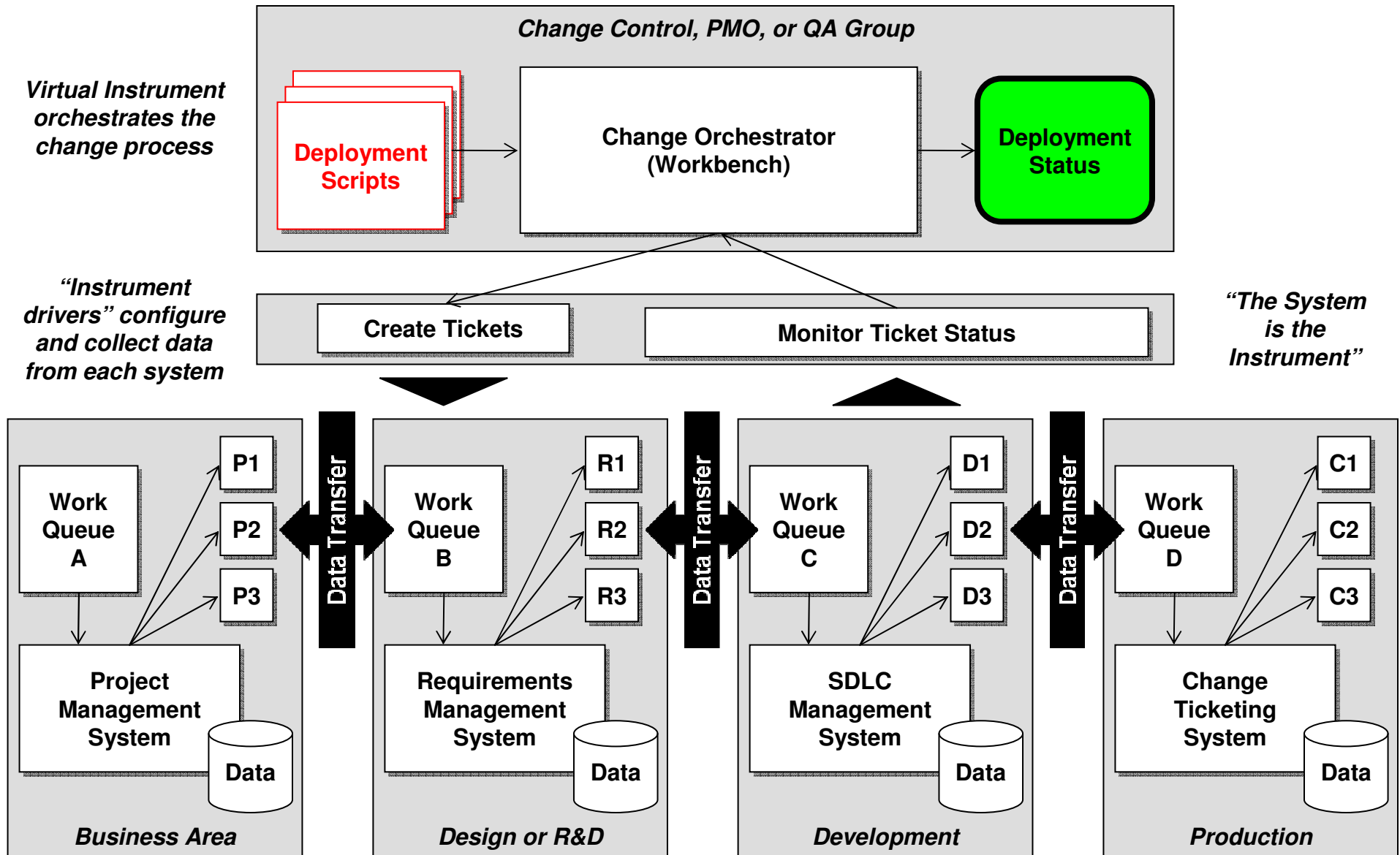
The *Software Glide Plane* tracks change tickets as they move through the SDLC process. End of phase “stage gates” for each ticket are set by working backward from target release date. Helps ensure developers are respecting the SDLC, and highlights when projects are at-risk of missing key stage gates.



# Better Change Control – Metrics



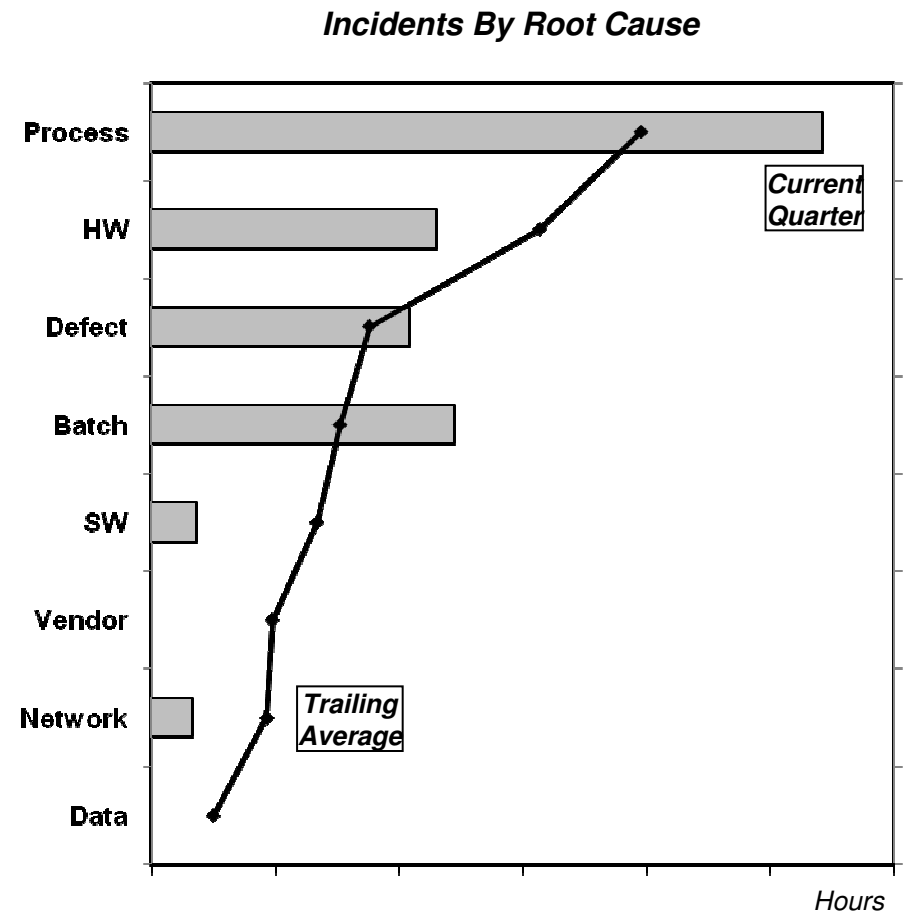
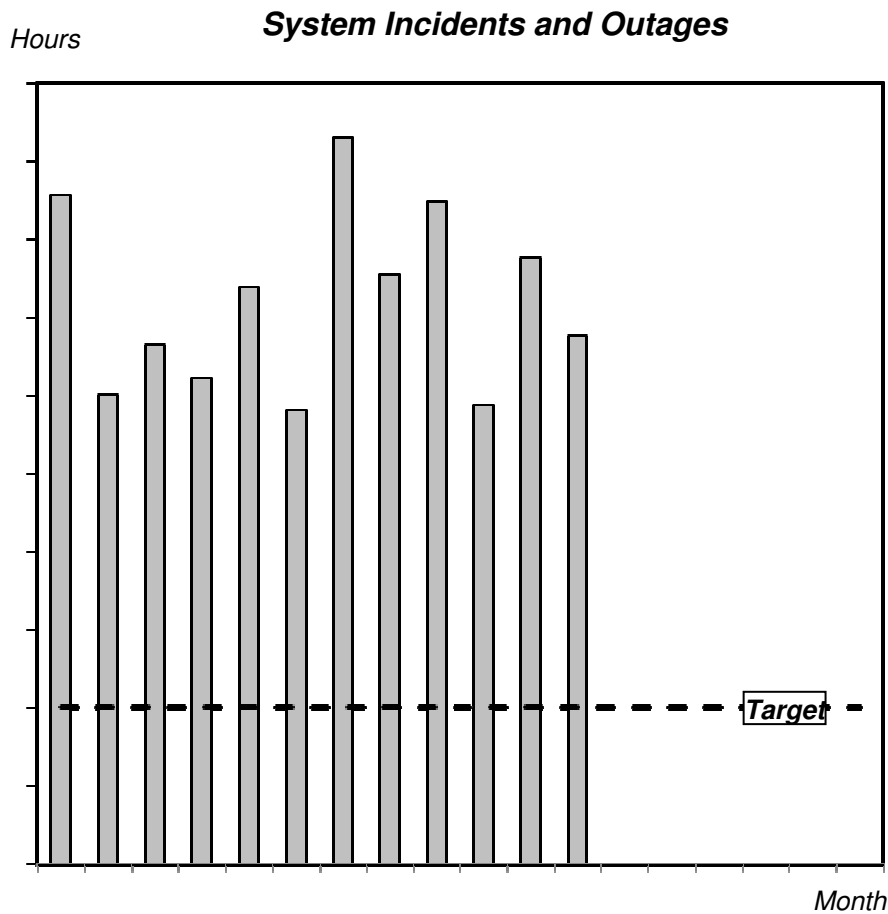
# Virtual Instrument for Change Control



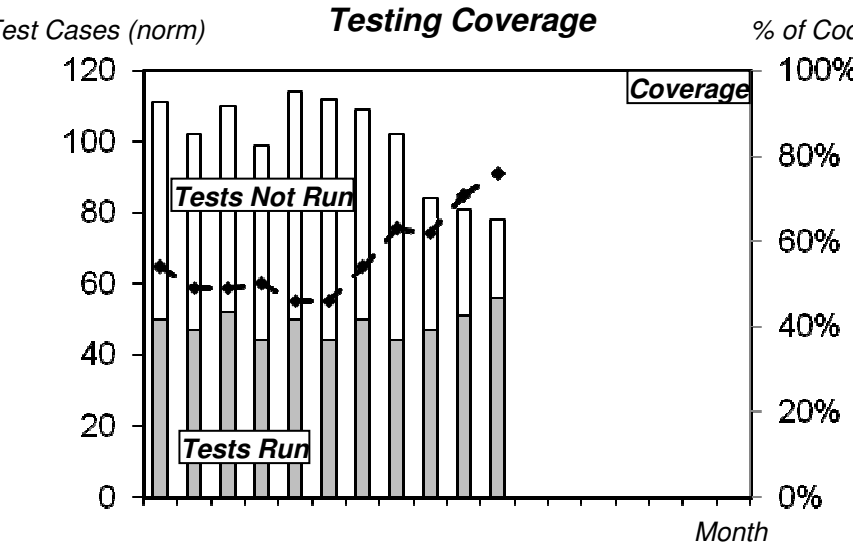
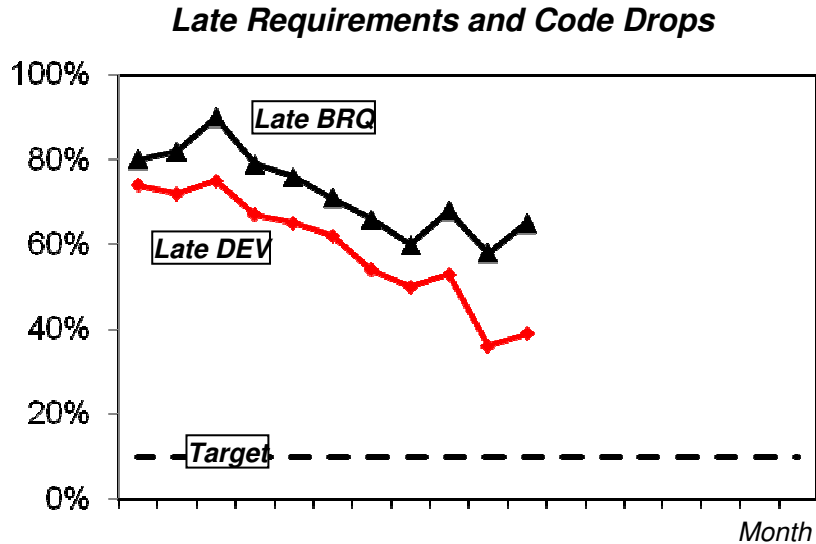
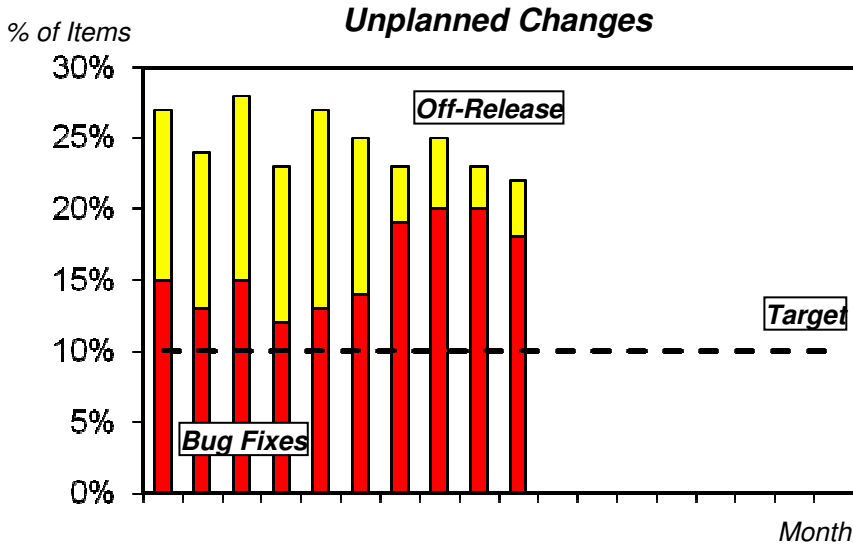
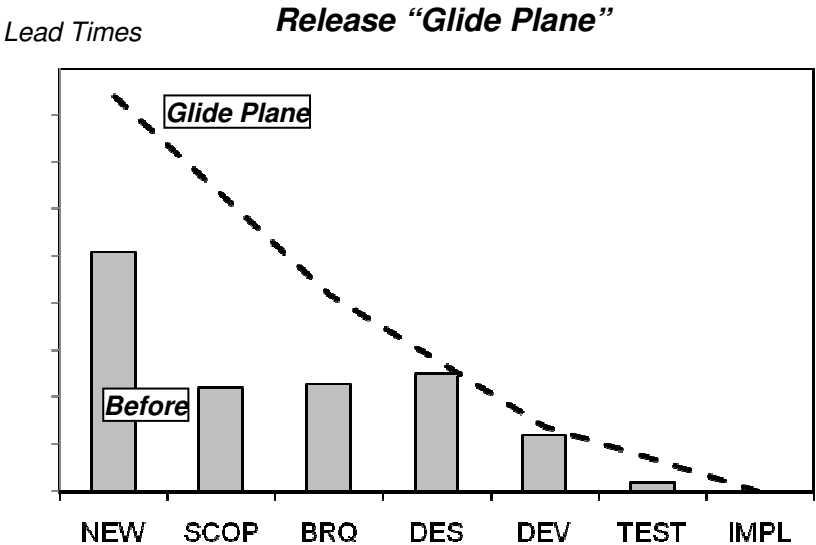
## **EXAMPLE – MEASURING SOFTWARE QUALITY**

# Issues with Software Stability and Quality

Identified *process* (change), *HW*, *defects*, and *batch* as top causes of stability problems. Pressure for more and faster output putting stress on already troubled development organization. Increase in defects influenced by late, poor quality requirements, late code drops, and rushed testing. Too much code being put in off-cycle.

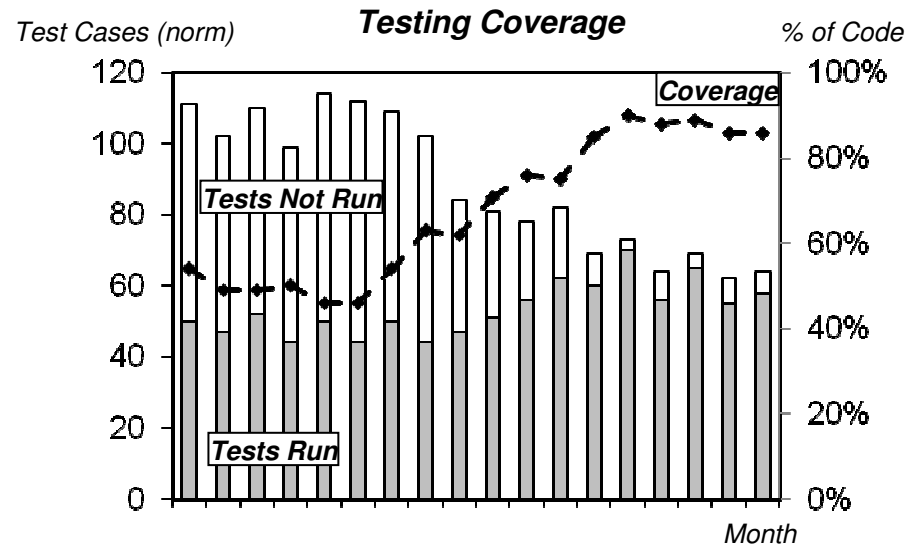
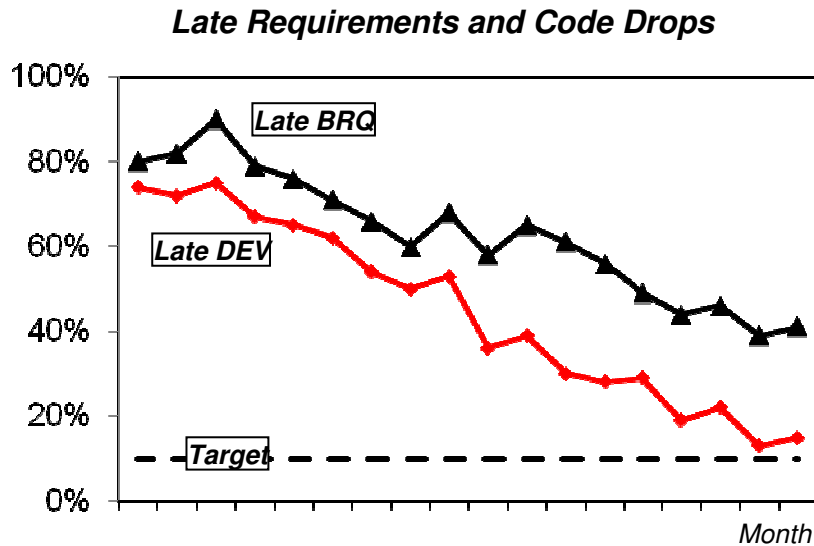
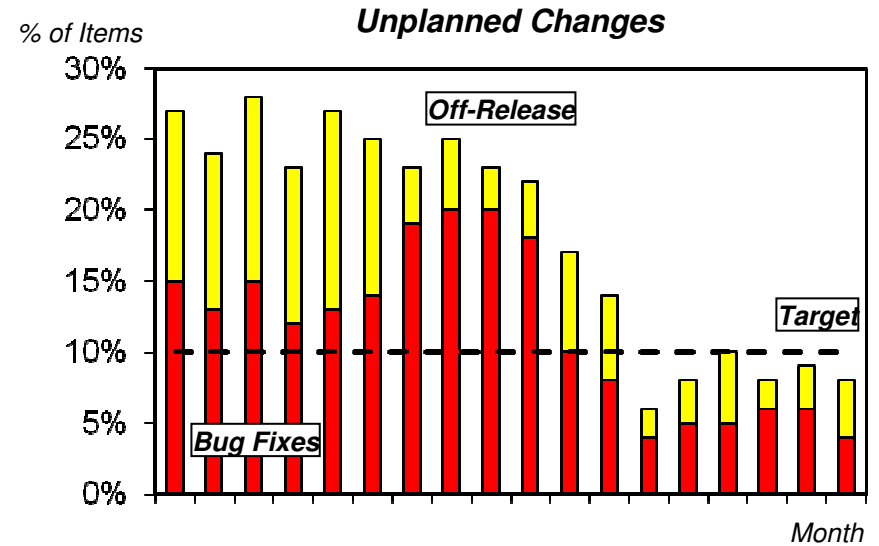
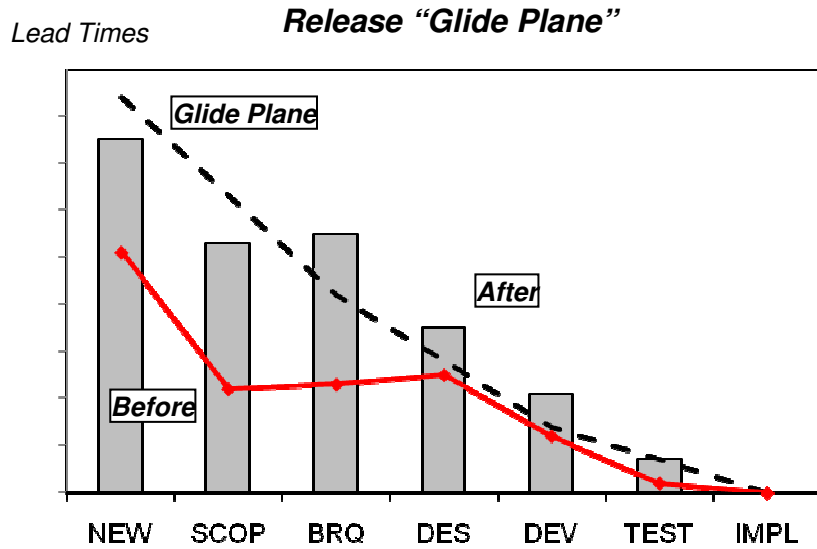


# 1. Change Process – Before



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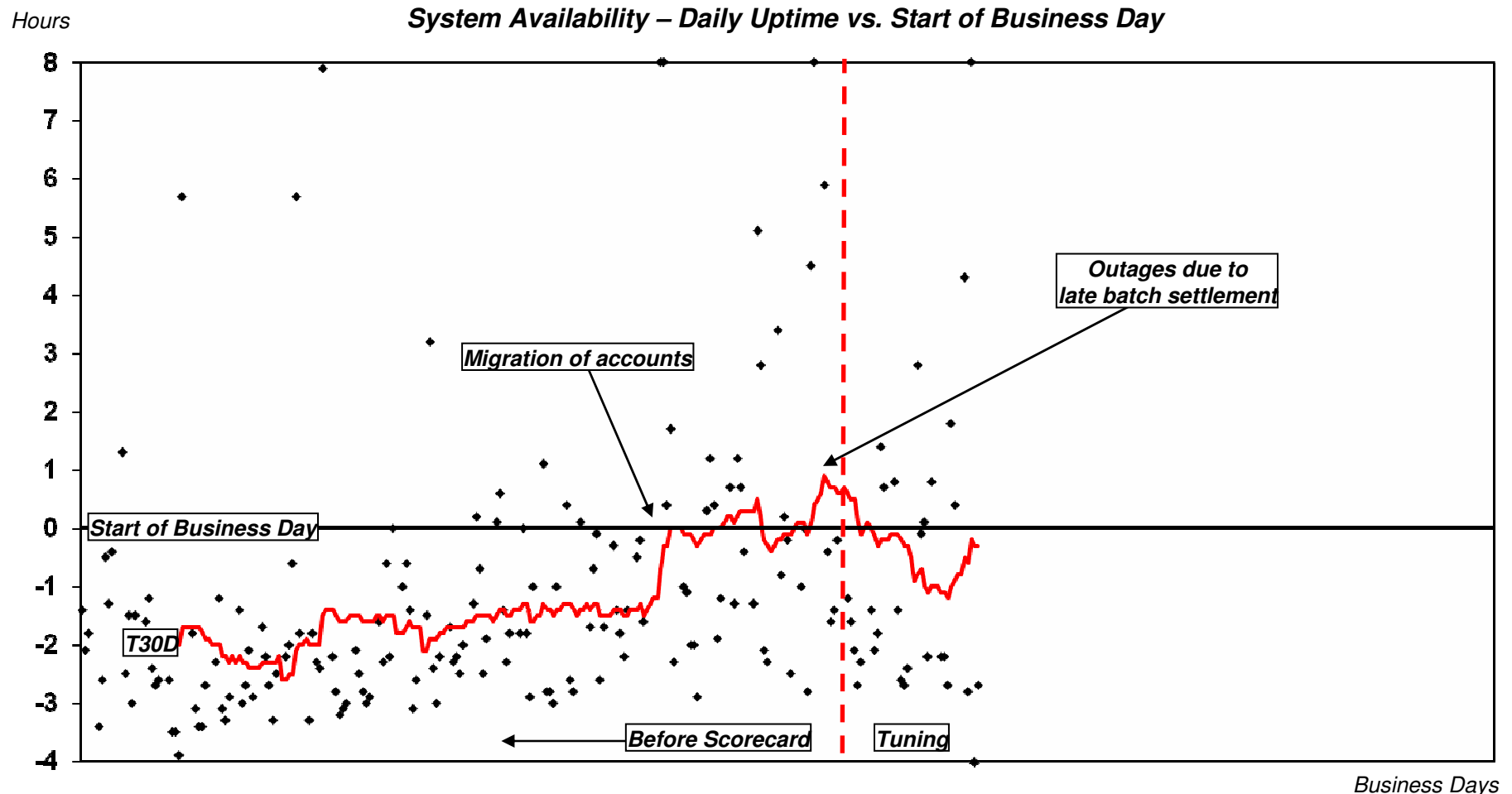
# 1. Change Process – After



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## 2. Batch Settlement – Before

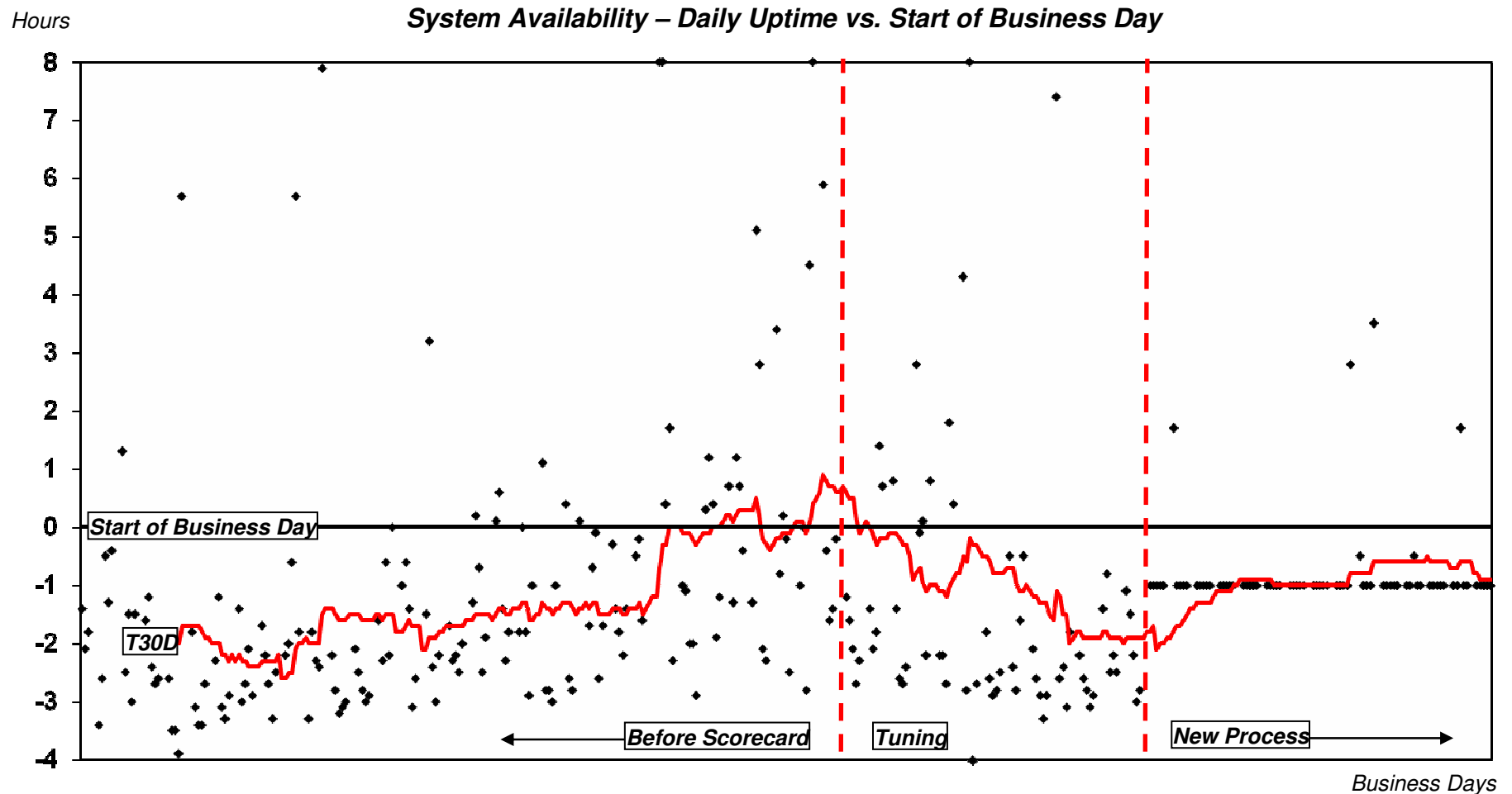
Unpredictable overnight batch process, usually settled within allowable window. However, legacy shutdown and migration of accounts to new system caused spike in volume and degradation of availability. Efforts made to tune application code for faster processing, but process still essentially uncontrolled and unreliable.



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## 2. Batch Settlement – After

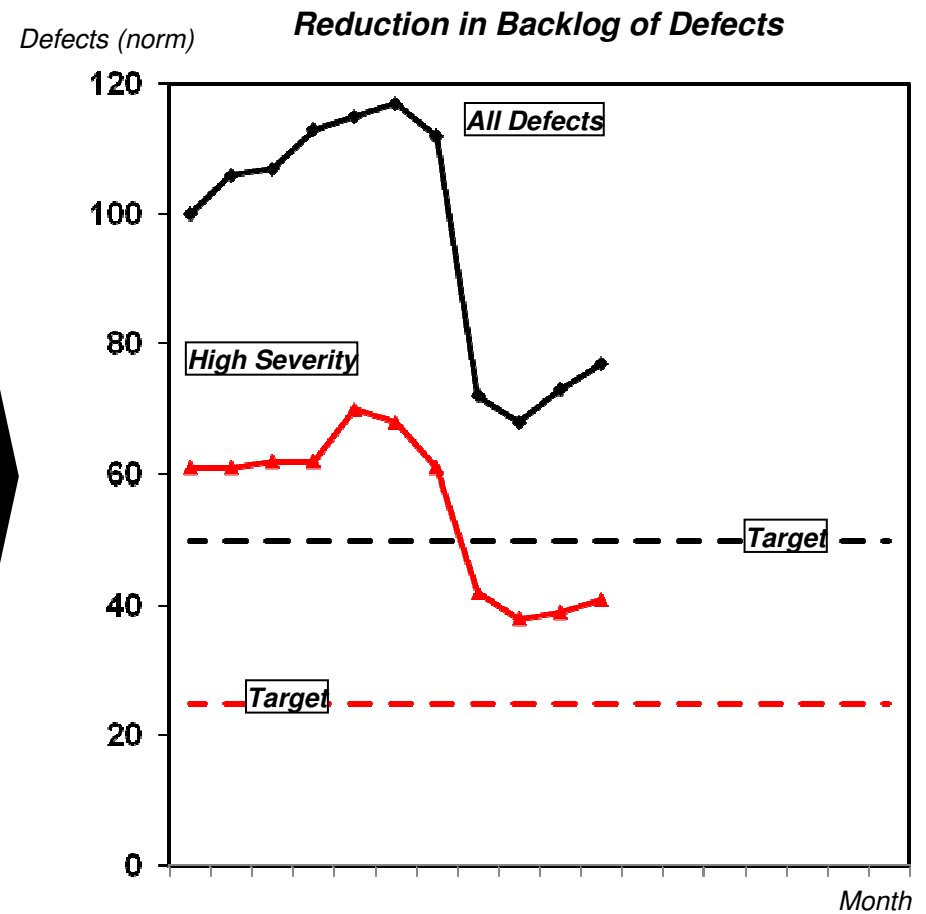
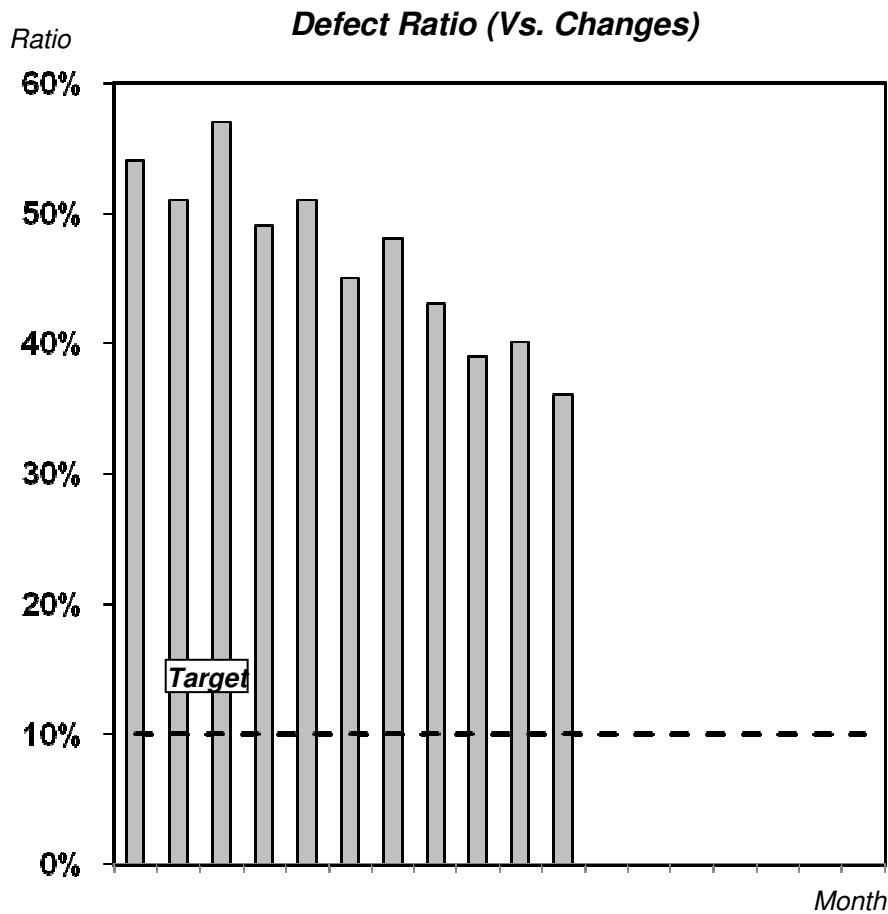
Improved availability by reconfiguring on-line environment, tuning batch jobs, and fundamentally rethinking process flows to make sure critical jobs necessary to bring up “on-line mode” are run at beginning of nightly process, and non-critical (e.g., reporting) are run afterwards.



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### 3. Code Defects – Before

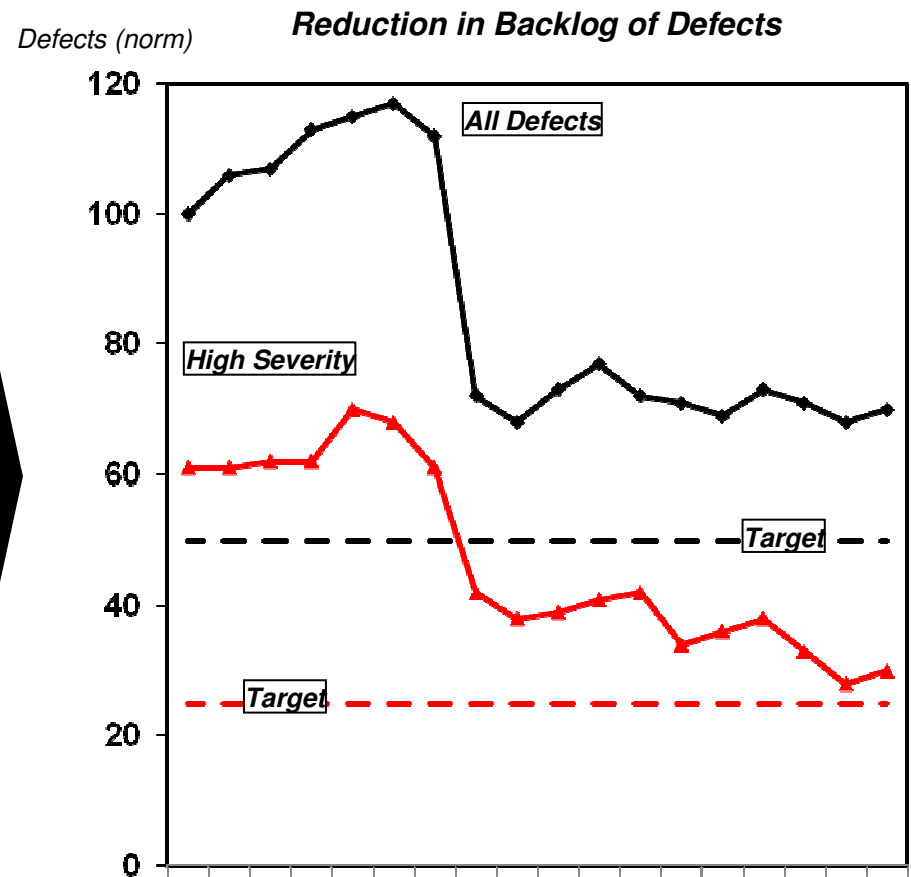
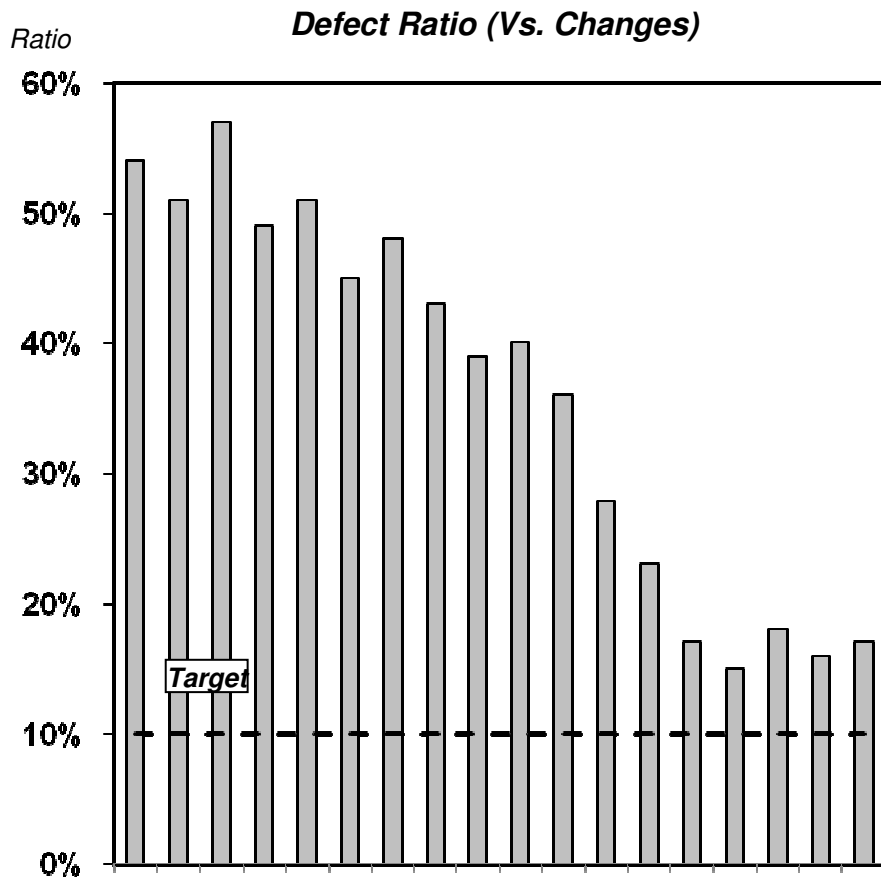
High defect ratios, rushed releases, and insufficient testing resulted in large backlog of known production bugs. One-time clean-up of defect tracking system removed many old and duplicate bugs. However, backlog continued to grow at similar rate immediately afterwards.



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### 3. Code Defects – After

Improved quality of development and reduced number of high-severity defects. As known production problems got fixed, manual workarounds and instabilities that plagued systems for years were eliminated, freeing up operational resources for other activities.

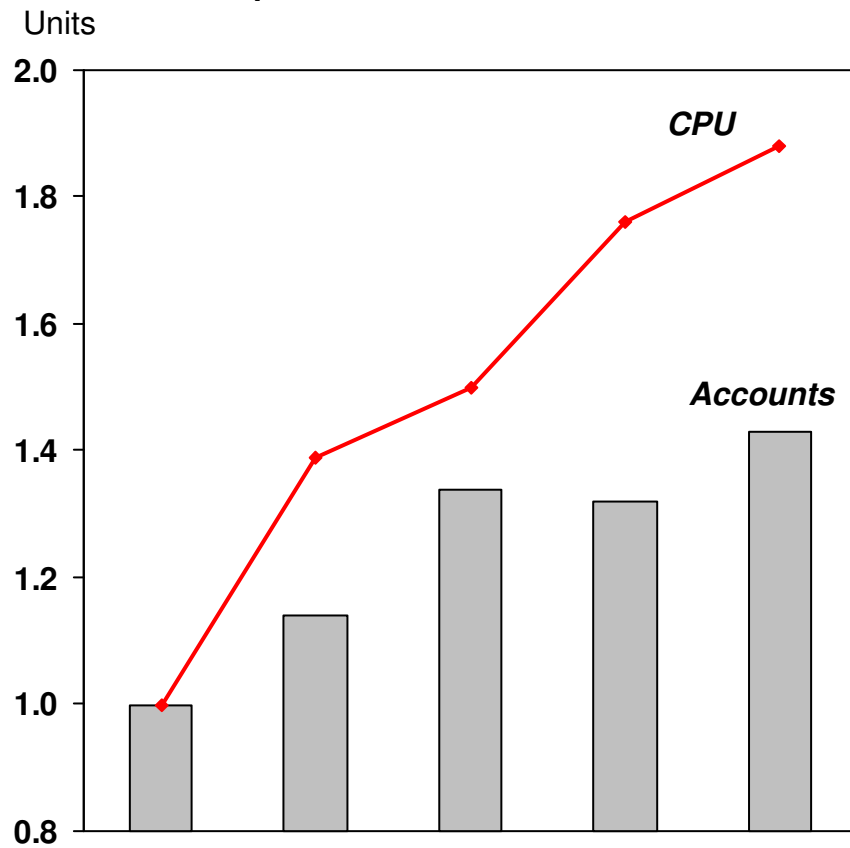


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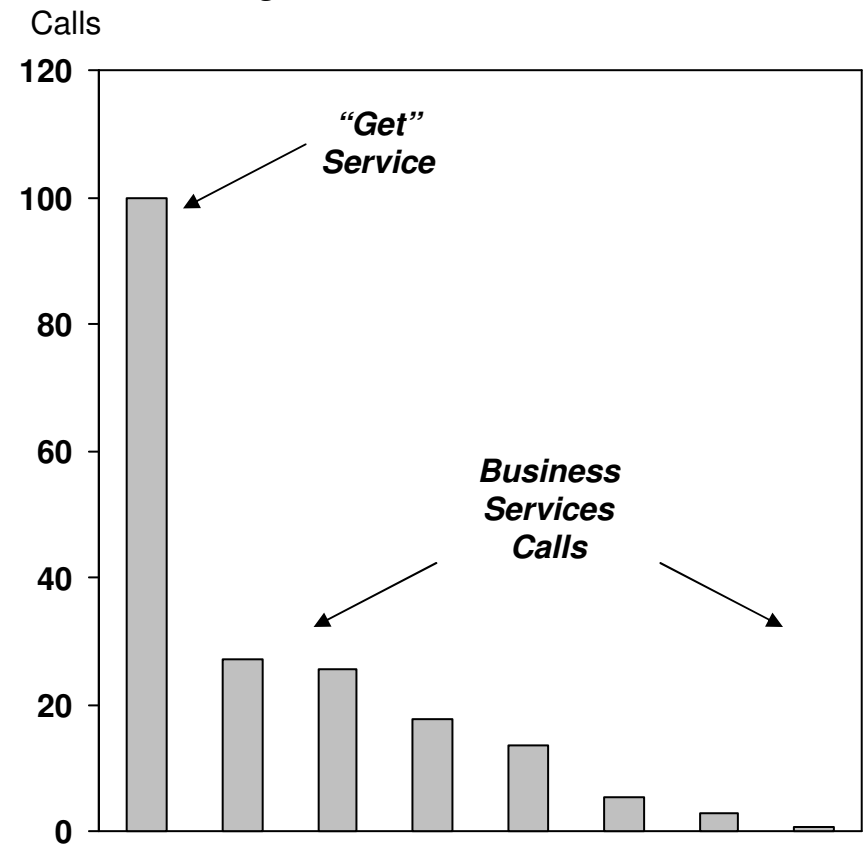
## 4. Better Code Structure – Before

Concerns over rapid CPU growth vs. business growth led to discovery of a set of “smoking gun” data access services that were draining processing capacity. These services, originally written to support a single application, could not handle SOA requirements of multiple business services trying to access the enterprise data model.

*Rapid Growth in CPU vs. Accounts*



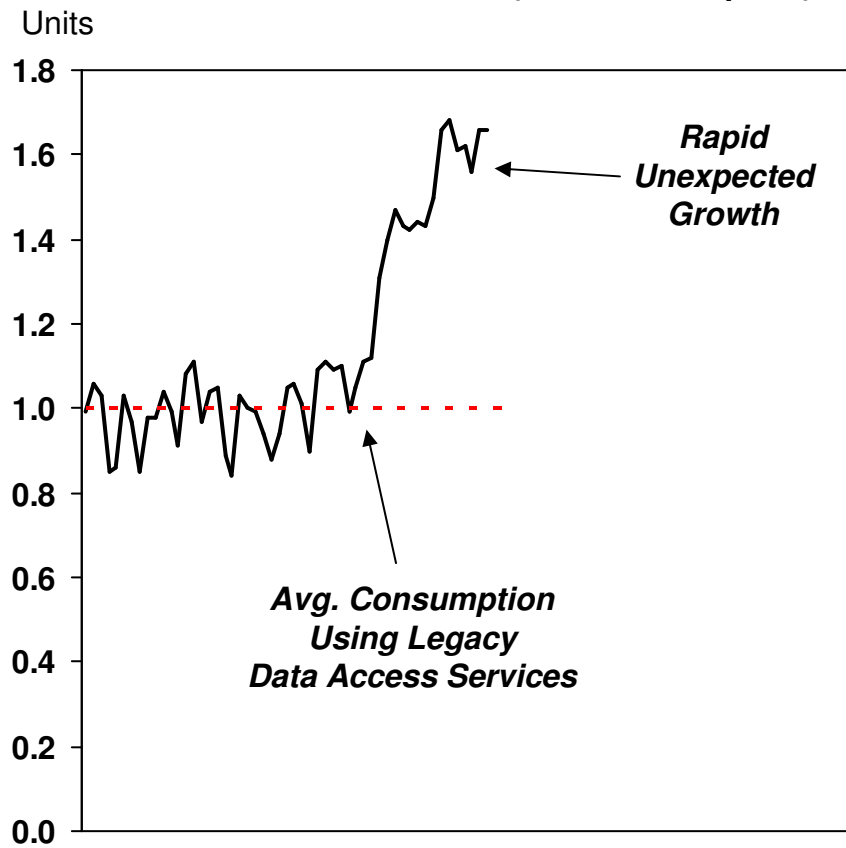
*“Smoking Gun”—Poor Control of Data Access*



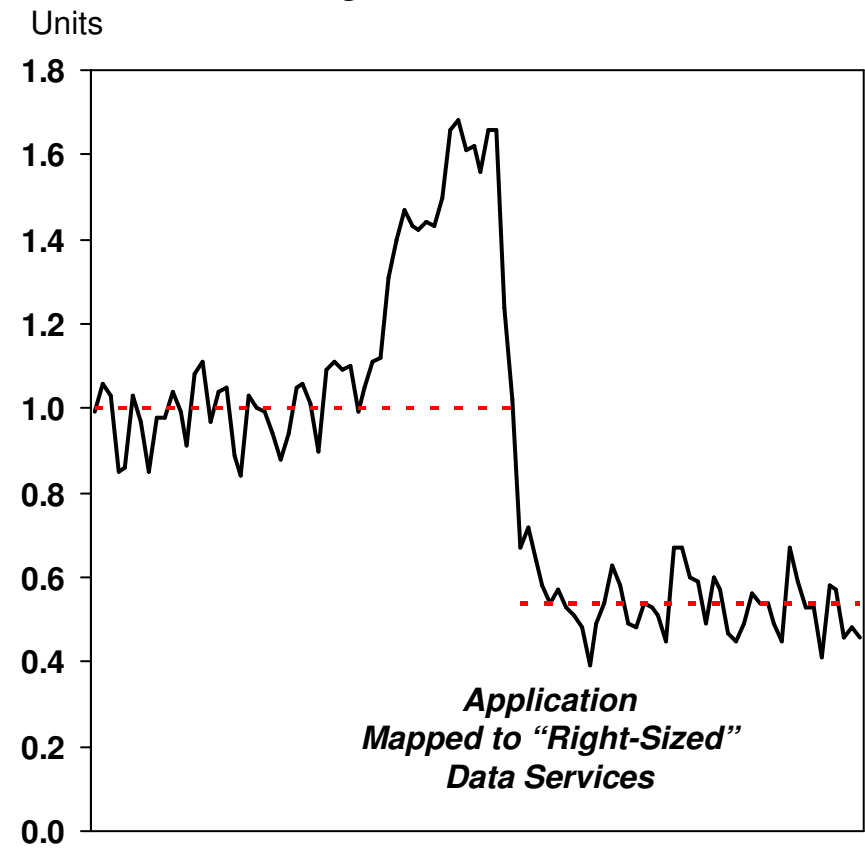
## 4. Better Code Structure -- After

The need to “right-size” data access became critical with rollout of a new platform that used shared data services. Simple rewrite of a few core services, plus redirection of high-volume users to those services, resulted in immediate performance improvement. Also defined a methodology for reviewing more services for tuning opportunities.

*Inefficient Data Services (CPU Consumption)*



*“Right-Sized” Data Services*



# **SUMMARY**

# Summary

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- **Business operations is a measurable process like anything else**
  - Yet measurement is not a required skill for most operations managers
- **Efforts to improve operations (and technology) management start with measurement**
  - Measure First, Reengineer Second, Automate Third
  - Six sets of metrics to characterize the business operation
- **The hard part isn't getting people to use the tools, but rather to think about how they want to use the data**
  - What metrics to track the operation, and what to do with the data?
  - What data is currently available, and how accessible is it?
  - How to collect the data with minimal disruption to the operation?
  - What analysis and metrics (and targets) to deliver to the organization?
- **Common Test and Measurement concepts, such as *ATE*, *Virtual Instrumentation*, and *LabVIEW* are directly relevant to helping business managers address this gap**
- **National Instruments and Alliance Members could take the lead in helping transform how companies measure and control their business operations**
  - A huge untapped market for proven tools, concepts, and services

***Like Dorothy and her ruby slippers, the power to measure and improve business operations has always been there.***

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