

**Improving CDRL Production - A
Northrop Grumman Mission Systems
Six Sigma Initiative**

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Mission Systems Overview

❑ Tactical

- Battlefield Digitization
- Tactical Operations Centers
- Army Logistics

❑ Strategic

- Missile Systems
- Command and Control

❑ Missile Defense

- Battle Management C3
- Joint National Test Facility
- Systems engineering

❑ Space Operations

- Satellite Command & Control
- Space Network Sustainment

❑ Professional services

- Defense Travel System

Customers

- U.S. Army
- U.S. Air Force
- Ballistic Missile Defense Organization
- Joint Forces Command
- U.K. Ministry of Defense



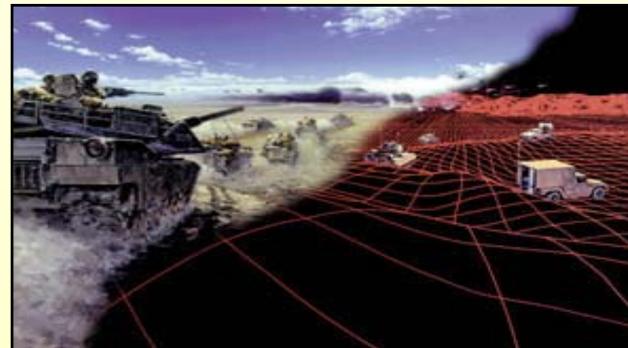
Command & Control Systems



Battle Management



Intercontinental Ballistic Missile Program



Battlefield Digitization

Mission Systems Six Sigma Initiative

A disciplined, data-driven methodology improving program and business performance

- **Focuses on process performance by eliminating defects and reducing variation**
- **Establishes a common language and set of tools**
- **Identifies what's critical to quality in the eyes of the customer**
- **Uses metrics to measure process capability**
- **Process improvement linked to organizational strategic objectives**
 - **Decomposes larger, strategic goals / gaps into a series of projects**
 - **Prioritized based upon expected financial benefit**

Six Sigma is about satisfying our customers

Six Sigma Lifecycle

Define

Metrics - Link to Strategy

TRW Systems' Business Objectives	Financial Performance	Operational Performance	Customer Satisfaction	Human Resources	Compliance
Improve Return on Investment	★	★	★	★	★
Double-Digit Earnings & Cash Flow Growth	★	★	★	★	★
Positioning Within Growing Markets	★	★	★	★	★
Minimize Costs of Business	★	★	★	★	★

Six Sigma Business Goals & Metric Category Linkage



Voice-of-the-Customer

Measure

High Level Priorities (Quantified Gap Analysis)

Objective	Target	Actual	Gap	Priority
Return on Investment	15%	12%	3%	High
Operational Efficiency	95%	90%	5%	High
Customer Satisfaction	4.5	4.0	0.5	Medium
Human Resources	80%	75%	5%	Medium

High Level Priorities (Quantified Gap Analysis)

Analyze

Projects - Link to Strategy

Project Name	Strategic Impact	Financial Impact	Operational Impact	Customer Impact	Human Resources Impact	Compliance Impact
Help Desk/Call Center	High	High	Medium	Low	Low	Low
Knowledge Management	High	High	High	Medium	Medium	Medium
Employee Portal	High	High	High	High	High	High
Collaboration	High	High	High	High	High	High
HR/Payroll Data Archiving	High	High	High	High	High	High
PC Disposition	High	High	High	High	High	High
Security	High	High	High	High	High	High
Financial Exception	High	High	High	High	High	High

Metrics - Link to Current IM Six Sigma Projects

Metric Category	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
Help Desk/Call Center	★	★	★	★	★	★
Knowledge Management	★	★	★	★	★	★
Employee Portal	★	★	★	★	★	★
Collaboration	★	★	★	★	★	★
HR/Payroll Data Archiving	★	★	★	★	★	★
PC Disposition	★	★	★	★	★	★
Security	★	★	★	★	★	★
Financial Exception	★	★	★	★	★	★

Map Projects

Improve

Prioritize & Select Projects

Project	Strategic Impact	Financial Impact	Operational Impact	Customer Impact	Human Resources Impact	Compliance Impact
Help Desk/Call Center	4	3	2	1	1	1
Knowledge Management	5	4	3	2	2	2
Employee Portal	6	5	4	3	3	3
Collaboration	7	6	5	4	4	4
HR/Payroll Data Archiving	8	7	6	5	5	5
PC Disposition	9	8	7	6	6	6
Security	10	9	8	7	7	7
Financial Exception	11	10	9	8	8	8

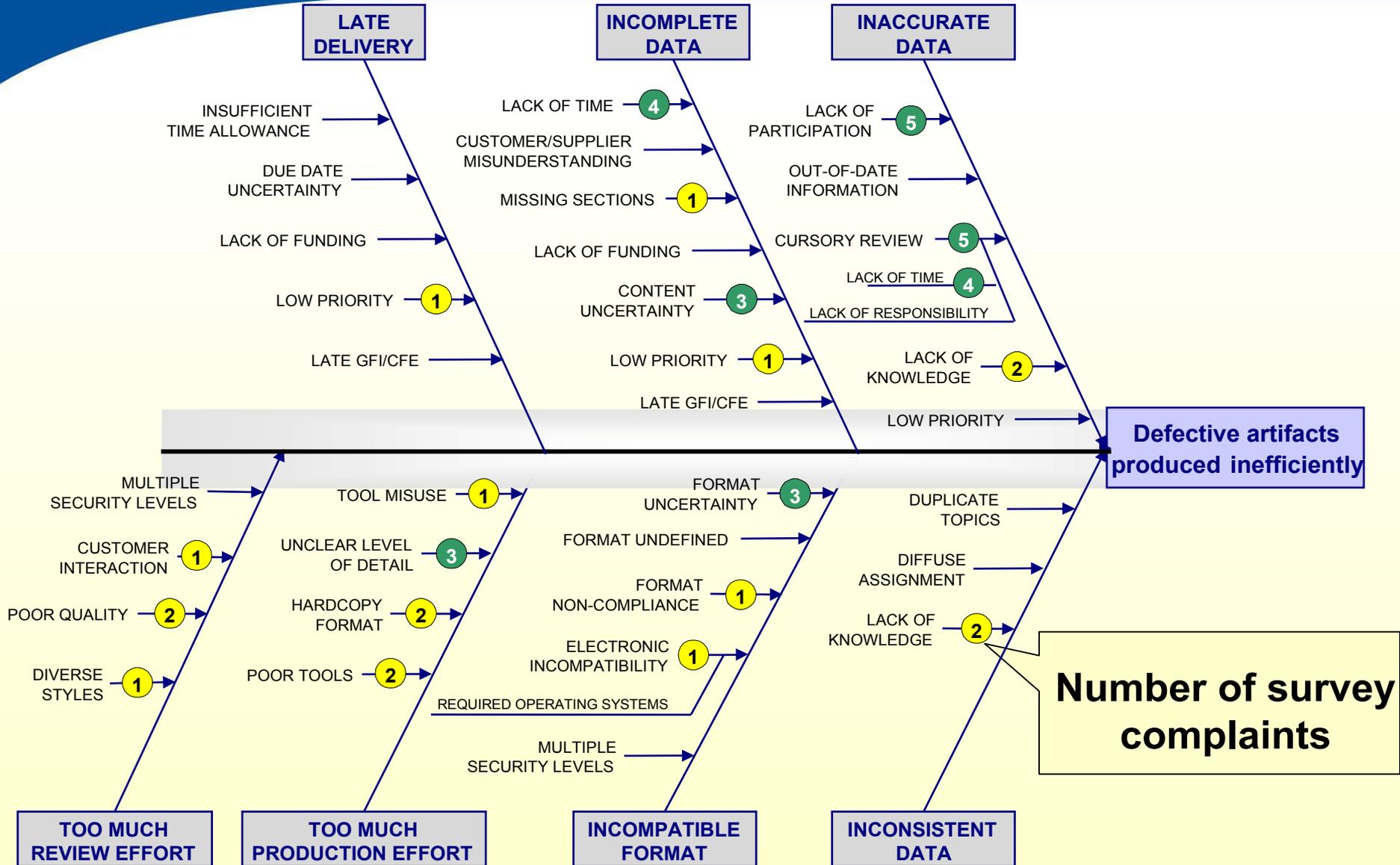
Prioritize & Select Projects

Control

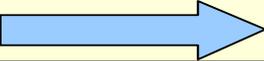
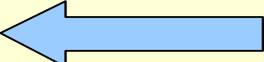
Metrics Tracking

Metrics Tracking

CDRL Production Defect Cause and Effect



CDRL Production Survey Results

Stakeholders						
	Program Manager	Responsible Engineer	Project Reviewers	Customer Reviewers	Project Resources	
CDRL Production Process Steps	Assign CDRLs					
	Negotiate and Plan					
		Research Policies & DIDs			0.28%	
		Coordinate Outline				
		Interpret DIDs				
		Translate Design Products			0.35%	
		Prepare CDRLs*				
	Perform Internal Review					
		Update CDRLs				
	Publish Draft CDRLs				Review CDRLs & Release Comments	0.60%
	Analyze Customer Comments					
		Update CDRLs				
	Publish CDRLs*					

* Value added step

CDRL Production Improvements

Process improvement

- **Outline definition**
 - Predefined templates
 - Consistent Data Item Descriptions
 - Guidelines for template use
 - Compliance with policies/processes
- **Artifact translation**
 - Alternative data format guidelines
 - Electronic referencing
- **Review and update**
 - Customer pre-coordination
 - Electronic document cross reference
 - Reviewer checklists
 - Electronic editing and commenting

Benefits and project effort reduction

0.28% → 0.09% (as-is → to-be)

- Improved definition efficiency, improved artifact quality and consistency
- Tailoring for unique contract features
- Improved definition efficiency

0.35% → 0.18% (as-is → to-be)

- Reduced translation effort
- Improved generation / review efficiency

0.60% → 0.30% (as-is → to-be)

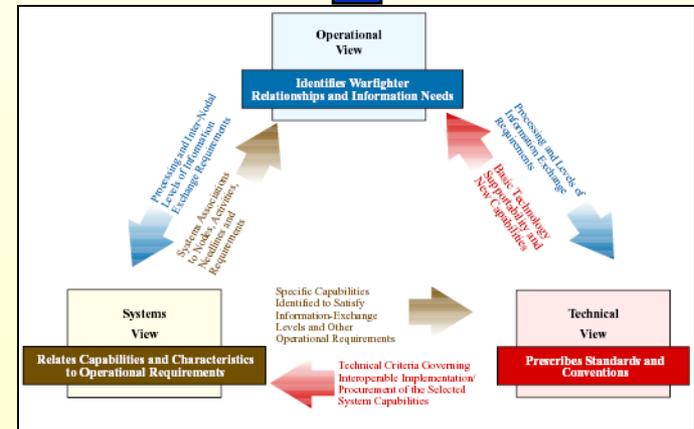
- Reduced rework, increased satisfaction
- Improved preparation/review efficiency
- Improved review quality & efficiency
- Improved review and update efficiency

Total

1.23% → 0.57% (as-is → to-be)

Design and implementation artifacts

- Software System Design Description (SSDD)
- Interface Design Description (IDD)
- Software Description Document (SDD)
- Database Description Document (DBDD)
- Software Product Specification (SPS)
- Software User Manual (SUM)



- System Development Life Cycle
- IEEE 12207 development process
- Military Standard 498 DIDs

Institutionalizing Improvements

Industry/Government Standards



- Communications
- Sharing best-practices
- Measurement & dashboards

Organizational Policies & Processes



Organizational Training & Tools



Project Plans



Metrics Database



Organizational Performance

Project Results



Project Performance

Project Schedules & Budgets

