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DEFINING THE FUTURE

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

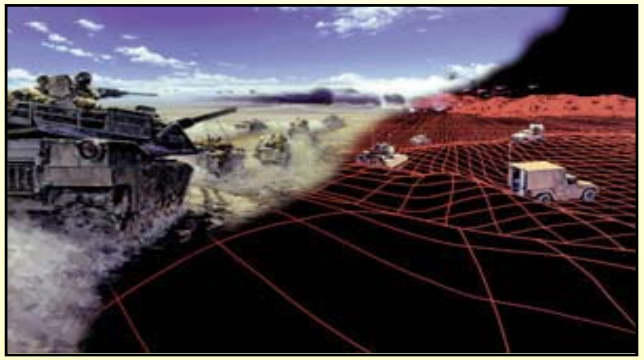
Customers

- 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

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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

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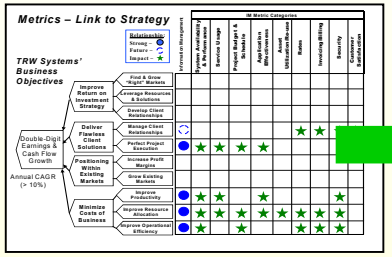
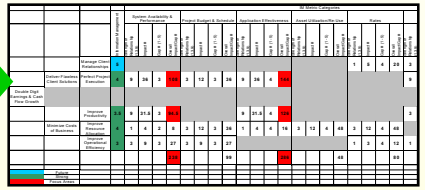
Six Sigma Lifecycle

Define



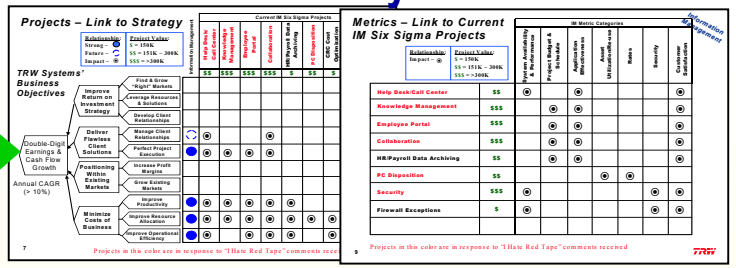
Six Sigma Business Goals & Metric Category Linkage

Measure



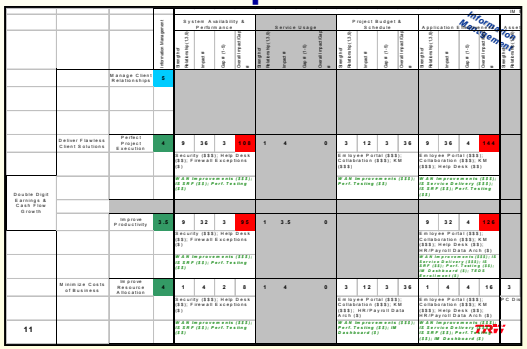
High Level Priorities (Quantified Gap Analysis)

Analyze



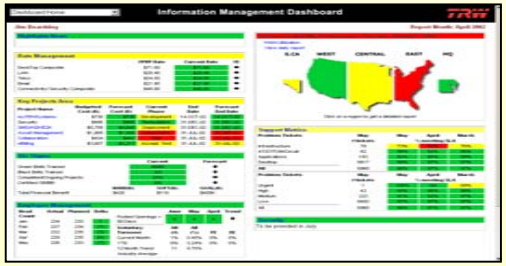
Map Projects

Improve



Prioritize & Select Projects

Control



Metrics Tracking

Voice-of-the-Customer

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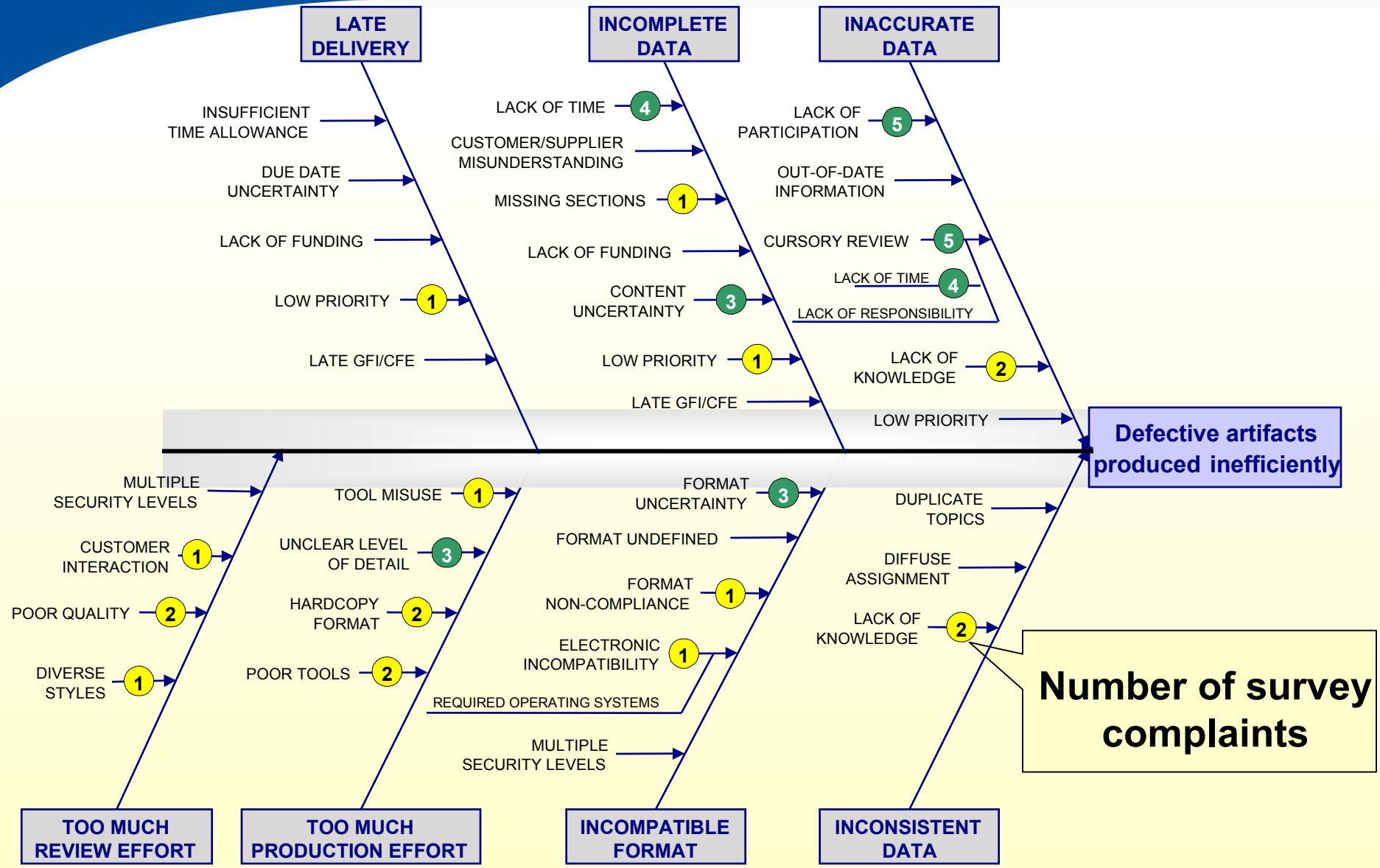
CDRL Production Defect Cause and Effect



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CDRL Production Survey Results

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

* Value added step

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CDRL Production Improvements

Process improvement	Benefits and project effort reduction
▪ Outline definition	0.28% → 0.09% (as-is → to-be)
– Predefined templates	– Improved definition efficiency, improved artifact quality and consistency
– Consistent Data Item Descriptions	
– Guidelines for template use	– Tailoring for unique contract features
– Compliance with policies/processes	– Improved definition efficiency
▪ Artifact translation	0.35% → 0.18% (as-is → to-be)
– Alternative data format guidelines	– Reduced translation effort
– Electronic referencing	– Improved generation / review efficiency
▪ Review and update	0.60% → 0.30% (as-is → to-be)
– Customer pre-coordination	– Reduced rework, increased satisfaction
– Electronic document cross reference	– Improved preparation/review efficiency
– Reviewer checklists	– Improved review quality & efficiency
– Electronic editing and commenting	– Improved review and update efficiency
Total	1.23% → 0.57% (as-is → to-be)

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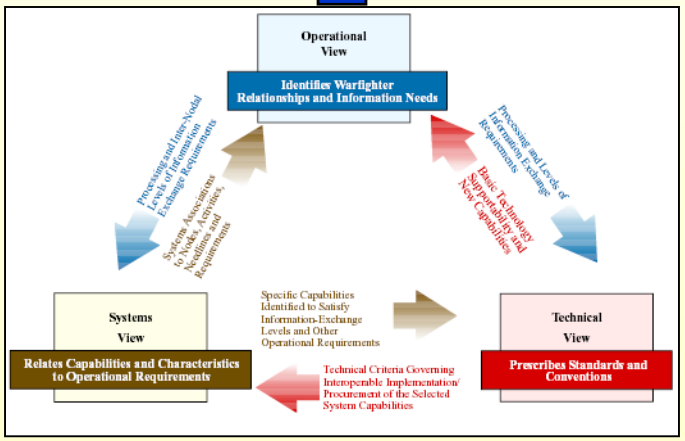
CDRL Templates

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)

Requirements Development & Management	Design and Implementation	Integration	Verification and Validation	Acceptance and Deployment



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

C4ISR Operational, System & Technical Views

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Institutionalizing Improvements

- Communications
- Sharing best-practices
- Measurement & dashboards

Industry/Government Standards

Organizational Policies & Processes

Organizational Training & Tools

Project Plans

Project Schedules & Budgets

Project Results

Project Performance

Metrics Database

Organizational Performance

Process Improvement