

*Teamwork +
Continuous Improvement*

Raytheon Six Sigma™ — *Its Our Difference*

AME Champion's Meeting
"Principles of Excellence"

Raytheon Missile Systems, Tucson Ariz.
April 13–15

Juliette Hagg
R6σ® Master Expert



= Success

Agenda

- How and why Raytheon Six Sigma™ was created
 - R6σ® definition and principles
- R6σ enables cultural transformation
- R6σ is a driving force for business success
- Comparing R6σ with DMAIC
 - Model similarities and differences
 - R6σ Specialist toolbox
- How Raytheon Company supports deployment
 - Local RMS R6σ strategy
 - Lessons learned
 - Taking R6σ to the next level
- That's our difference
- Questions?



How and Why Raytheon Six Sigma Was Created

- In the early 90s economic and political conditions, and a lull in the defense industry led to several major mergers and acquisitions; for Raytheon, this meant integrating the defense businesses of Hughes Electronics, Texas Instruments Inc. and others
- To address mounting debt incurred while adding to the business base, an internal team, sponsored by the CEO and supported by a consortium of external industry experts, worked to explore and define a strategy unique to Raytheon
 - Key success factors included DMAIC principles, lean practices, principles of excellence, human behavior, organization and team dynamics
 - In 1999, the first accelerated wave of experts comprising of legacy company change leaders developed the circular bi-directional model
- Raytheon's R6 σ Vision:
 - Build one distinctive company like no other
 - Create a unique culture and language
 - make it ours — shaped by our people
 - Drive productivity, savings, growth and prosperity
 - Make Raytheon a great place to work
 - Establish Raytheon as one of world's most admired companies



R6 σ combines traditional Six Sigma, lean, customer focus, change leadership, business acumen and team leadership

R6σ Definition and Principles

Definition

- Raytheon Six Sigma is our disciplined, knowledge-based approach designed to increase productivity, grow the business, enhance customer satisfaction, and build a customer culture that embraces all of these goals

R6σ Principles

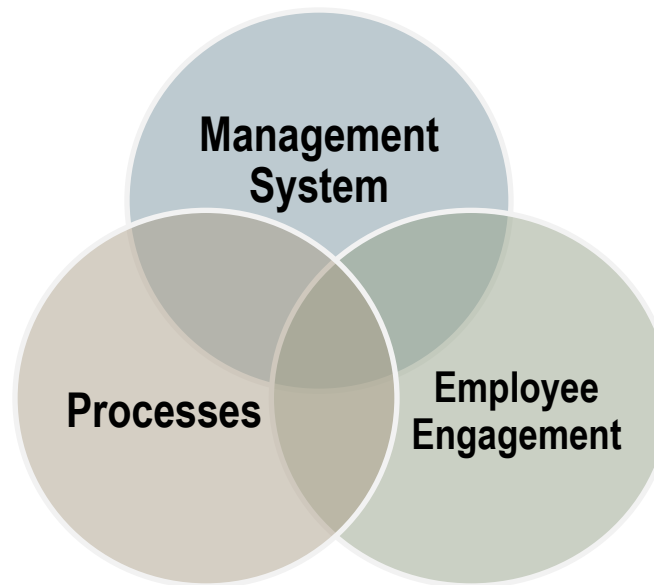
- Specify value in the eyes of the customer
- Identify the value stream: Eliminate waste and variation
- Make value flow at the pull of the customer
- Involve, align and empower employees
- Continually improve knowledge in pursuit of perfection



R6σ Enables Cultural Transformation

Key Success Criteria

- Adhere to R6σ Principles and Lean Principles of Excellence
- Strategic planning and integration
- Marketing and communications
- Adaptable, engaged workforce
- Standardization of processes and practices across the organization
- Leadership alignment and “leader as teacher” behaviors



Raytheon’s knowledge based approach unites our workforce

R6σ is a Driving Force For Business Success

- **R6σ is a strategic enabler for achieving business success and flawless execution**
 - Wall Street expects to hear how Raytheon Six Sigma helped the company achieve business objectives
 - R6σ differentiates us from our competition, we are committed to being best in class
 - Customers and suppliers regularly participate in R6σ training as Specialists or Experts and often partner with us in continual improvement activities

- This chart shows the highs and lows of Raytheon's stock price. When we acquired companies our stock went down because our debt was so high. R6σ was a driving force in getting us out of debt due to the results from process improvements, Lean, and culture change.



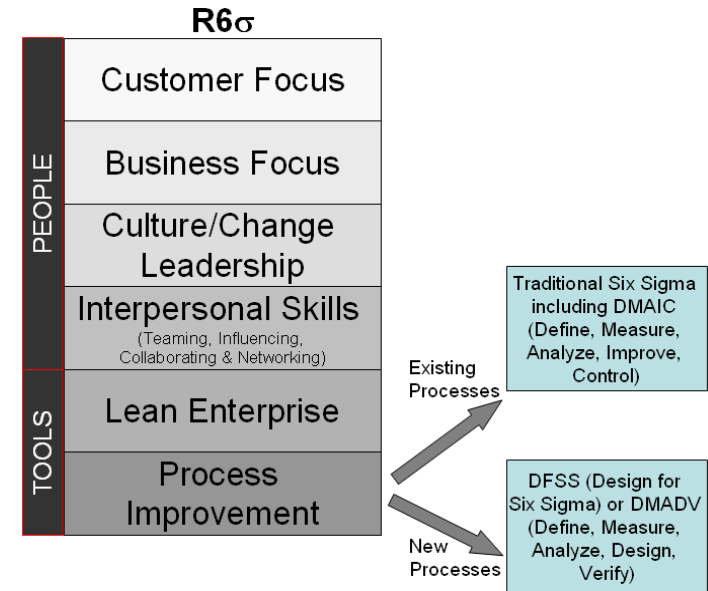
**RMS Team
Recognized For:**

***Journey to a
Perfect EVMS
Score***

2008 RAYTHEON
SIX SIGMA
awards

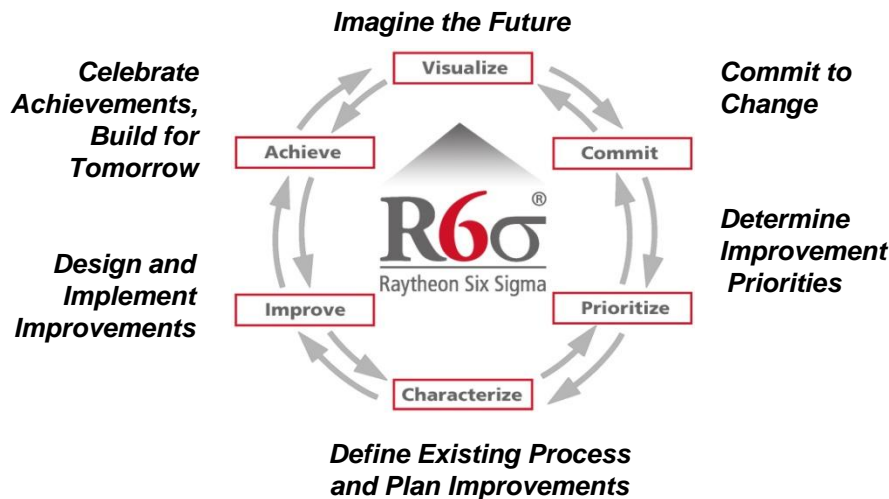
Comparing R6σ With DMAIC

R6σ	DMAIC
<ul style="list-style-type: none"> Visualize & Commit Prioritize Characterize Improve Achieve 	<ul style="list-style-type: none"> Define Measure Analyze Improve Control



R6σ Six-Step Process

What



Who

- Sponsor
- Specialist
- Greenbelt
- Expert
- Master Expert

How

- Use Tools
- Kaizen
- Total Employee Engagement
- Business Diagnostic Project

- Executives** provide overall alignment by establishing the strategic focus of the Six Sigma program within the context of the organization's culture and vision
- Champions** translate the company's vision, mission, goals and metrics to create an organizational deployment plan, identify individual projects and identify resources, and remove roadblocks

Model Similarities and Differences

Similarities	Differences	
	R6σ	DMAIC
Capture Voice of Customer Develop Problem Statement Perform Value Stream Analysis Identify Sponsor Analyze Stakeholders	Visualize: Create a vision of the vision with a compelling reason for change.	Define: Create Project Plan with defined project goals and customer deliverables. Vision and need for change not emphasized.
Define goals & objectives	Commit: Develop a committed sponsor and team aligned with the vision, accountable and energized to make change. Commitment phase is explicit and iterative.	Done in Define stage to a lesser degree. Sponsor commitment and team building not emphasized. Toll-Gate Review does include team readiness questions.
Collect data Map processes	Prioritize: Using facts and data discover improvement opportunities, readiness, and resources. Estimate results/ROI to prioritize. Identify root cause. Lean methods often come into play.	Measure: Determine current performance and display process variation. Emphasis on identifying defect.
Both emphasize heavy use of analytical/statistical tools during this phase	Characterize: Define existing process and plan improvements. Project Plan done here. More emphasis on team building and change readiness.	Analyze: Analyze and determine root cause of defect.
Use many of the same tools at this phase: DOE, FMEA, Mistake Proofing	Improve: Design solution, implement and measure results. More emphasis on change leadership.	Improve: Improve process by eliminating defects.
Transfer knowledge Ensure sustainability Celebrate	Achieve: Celebrate achievements; build for tomorrow. Expand the R6σ community.	Control: Control future process performance.

Similarities?

- Both based on customer value
- Encourage customer participation
- Decisions are knowledge-based/data-driven
- Fundamental element of corporate culture
- Focus on continual improvement
- Effort to determine root cause
- Don't jump to a solution prematurely

Differences?

- One big difference between the two is that DMAIC is about eliminating defects, which applies really well to technology.
- R6σ includes this, but acknowledges you cannot extrapolate this to human relationships.

R6σ focuses on human relationships, technology and tools

R6σ Tool Chest

<ul style="list-style-type: none"> ■ Five whys ■ Six Sigma Checklist ■ ABC Behavior Model ■ Affinity Diagram ■ After Action Report ■ Brainstorming ■ Catchball ■ Cause and Effect/Fishbone Diagram ■ Check sheet ■ Conducting Effective Meetings ■ Connellan Loyalty Grid ■ Control Charts ■ Criteria-based Matrix ■ Cycle -Time Analysis ■ Design for Manufacturing and Assembly ■ Design for Experiment (DOE) ■ Equipment Effectiveness ■ Failure Modes and Effects Analysis (FMEA) 	<ul style="list-style-type: none"> ■ Force Field Analysis ■ Gantt Chart ■ GEMBA ■ Gauge Repeatability and Reproducibility ■ Histogram ■ Hypothesis Testing ■ IPO Diagram ■ Logical Process map ■ Meeting Agenda ■ Mistake Proofing ■ Multi-voting ■ Nominal Group Technique ■ Observation Form ■ Pareto Chart ■ Parking Lot ■ Physical Process Map ■ Piloting ■ Plus/Delta ■ Priority Matrix ■ Process ■ Problem-Solving ■ Quality Function Deployment ■ Radar Chart 	<ul style="list-style-type: none"> ■ RASCI Chart ■ Reality Tree ■ Rewards and Recognition ■ Run Chart ■ Scatter Diagram ■ Single Minute Exchange of Dies ■ Supplier-Input-Process-Output-Customer (SIPOC) ■ Six Thinking Hats ■ SPACER ■ Spaghetti Diagram ■ Standard Operating Procedures (SOP) ■ Statistical Process Control (SPC) ■ Staffing Analysis ■ Stakeholder Analysis ■ Team Guidelines ■ Team Stages ■ Time Value Map ■ Theory of Constraints ■ Value Stream Analysis ■ Waste Elimination Strategies
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Lessons Learned

- In 2009, RMS studied the maturity of its own program versus industry

Top Success Factors

1. Leadership support and direction

2. Program relevance: alignment to company strategy, change priorities, culture

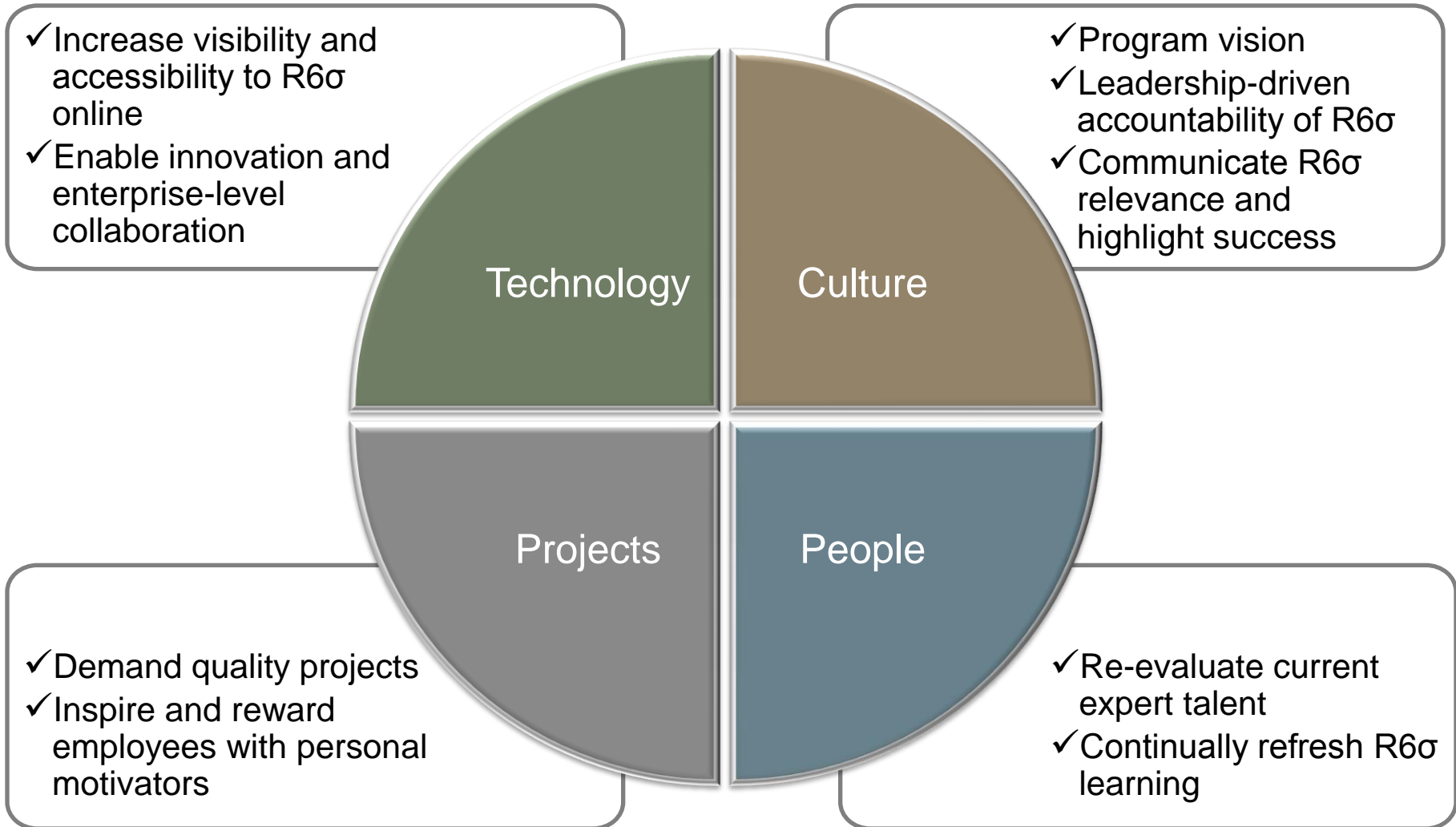
3. Ability to evolve and respond to external and internal business changes

Successful companies have programs that embody many of the following characteristics:

- Leaders own the process and fully support it
- Projects directly align with company strategy and are driven from the top down
- Employees are engaged and involved
- Approach is consistent with unique cultural norms
- It is perceived to be marketed and communicated as a competitive advantage
- CIP is embedded in employee job descriptions
- Focus is born out of a strategy to improve in specific areas; manufacturing, design and customer satisfaction
- Realistic consideration is given to resource needs, funding, and employee workload and priorities
- They benchmark regularly
- They have a budget that is covered in their operating model
- They respect an individual organization's maturity level as they deploy
- They use metrics
- They embed the methods in leader training
- Sponsor and change agent share responsibility for results
- Two-thirds of companies today are focused on supply chain

Best performing companies have a holistic approach that aligns and integrates continual improvement across the enterprise

Revised Corporate R6σ Strategy



R6σ. Rethink Success. At all levels.

Revised Missiles Systems R6σ Strategy

- 80 percent of the RMS population has one or more qualification as Master Expert, Expert, industry belt and/or Specialist
- Business Partners are assigned as R6σ continuous improvement champions within the largest organizations
- Small R6σ homeroom supports training and data management and:
 - Maintains a connection to corporate
 - Manages the communication plan
 - Works across the business to identify constraints and high leverage opportunities
 - Supports benchmarking and trend analysis



Team performance is measured by the annual employee opinion survey of improvement processes and financial contributions

Taking R6 σ To The Next Level

- **Corporate council considering several changes**
 - Rotation of business leaders as program champion
 - Expert certification as a leadership requirement
 - Expect projects bring measurable value to business
 - Active and consistent introduction of new concepts and methodologies
 - Benchmark and regularly engage across the enterprise and industry
- **RMS will continue to align with corporate and evolve to meet changing local business needs**
 - Shifting to a smaller homeroom in favor of stay-in-area Expert deployment
 - Actively engaging in partnerships with University of Arizona
 - A study team working to analyze convergent companies that have experienced a switch-point and levers that enabled them to respond like a small company despite being a large corporate entity



Vision: To be the continual improvement approach — valued and utilized by every employee — that drives customer value and business results

That's Our Difference



APPLE a Day Leads to \$14 Million

R6s Step 5 • Improve
The Adaptive Photonic Phase-Locked Element (or APPLE for short) team aggressively advanced the Optical-Phased Array product line to exceed a \$14 million Phase I DARPA program. Their efforts helped build more OPAs in the past year than had been produced in the previous 10 years.
— MEGAN TREMER AND AMANDA KIRCHNER, ANDOVER, MASS.
R6s SPECIALISTS

RAYTHEON SIXSIGMA
Success is Six Steps Away




Take the Fast Track to Your R6s Specialist Qualification

Get qualified in as little as 30 to 60 days!


Follow these three easy steps:

- 1. Identify the Project and Align with Your Sponsor**
Collaborate with your sponsor to agree on a project idea that contributes to business success.
- 2. Attend the One-day Specialist Training Event**
Participants will learn from R6s experts, interact with their peers and work with coaches who will provide support and guidance throughout their Specialist Qualification journey.




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“It doesn't take a rocket scientist to figure this stuff out, but I brought one in just in case.”




My Tropical Fish Hobby Saved \$90,000



By using the same chemical hand warmers that pet stores use when shipping exotic fish, I was able to save more than \$90,000 in special courier fees. — MEGAN ALEXANDER, ANDOVER, MASS.

Innovate. Raytheon Six Sigma.

Raytheon
Customer Success is Our Mission



I'm Ardvias Mousessian, and I'm a **Raytheon Six Sigma™ Specialist.**


I am a senior project manager responsible for delivery of the Science Information Processing System (SIPS) for two different instruments on NASA's Aqua satellite orbiting the earth. These instruments provide measurement and information that are critical to improve understanding of the global change in the Earth's atmosphere and upper troposphere.

The result of my Six Sigma project is a redesigned system that supports a data processing/analysis processing campaign with no failure, no loss of data, with minimal manual intervention while providing a three fold increase in throughput.

Six Sigma steps help you to stay focused on the project and getting to the best solution. It presents opportunity for team members to explore new ideas. It provides a vast array of easy-to-use tools to help you uncover hidden issues.

Ask me about: Project management processes from project initiation, planning and execution to management and closure. You can also ask me how to deal with various project constraints.

Raytheon
Missile Systems



DRIVEN TO WIN

Raytheon
Customer Success is Our Mission

Diversity, Passion, Personal Commitment
Rethink Success — R6σ