Lean Aerospace Plenary Conference

March 23, 2004

Enterprise Transformation Through Knowledge Transfer

Bill Baker

Raytheon Company

Knowledge Sharing

Raytheon Company

- **A global technology leader in:**
  - Defense, government and commercial electronics
  - Space
  - Information technology
  - Technical services
  - Business and special mission aircraft
- **2003 sales: $18.1 billion**
- **76,400 employees worldwide**
- **Headquarters: Waltham, Massachusetts, USA**
  - http://www.raytheon.com
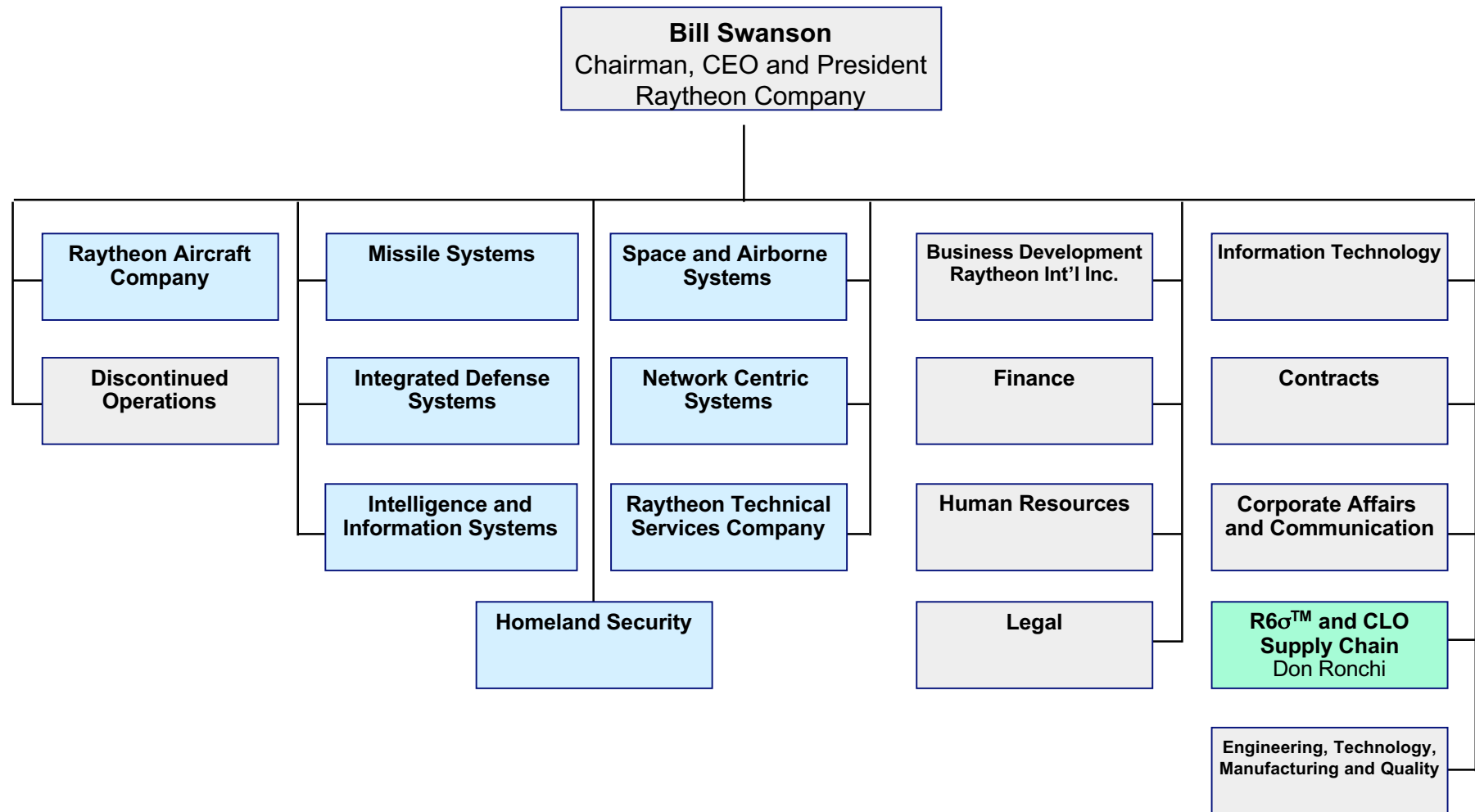 - Common stock ticker symbol: RTN

Partners in customer success

Raytheon's Strategy

- **Achieve above market growth**

- **Earn the customer's confidence as a company that listens, anticipates, responds and performs — a Customer-Focused Marketing company**

- **Raytheon Aircraft to achieve preeminence in aviation, showcasing the Beechcraft and Hawker brands**

- **Continually demonstrate operational excellence through Raytheon Six Sigma™**

- **Work as "One Company" to leverage our strengths in technology, integration and services for superior customer solutions**

- **Build a global presence**

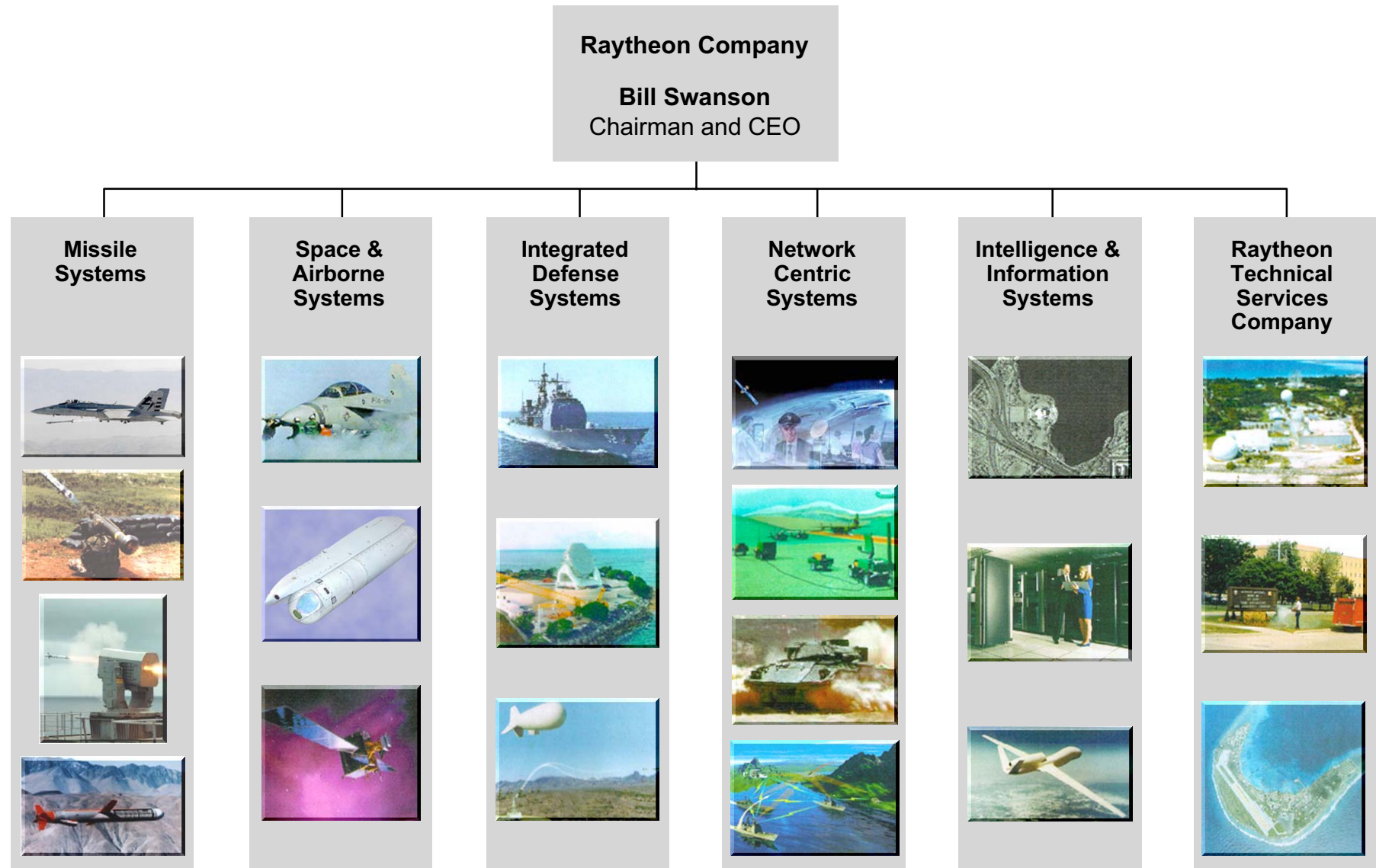**Strategy and goals aligned to put the customer first**

Leadership Team

Bill Swanson
Chairman, CEO and President
Raytheon Company

Raytheon Aircraft Company	Missile Systems	Space and Airborne Systems	Business Development Raytheon Int'l Inc.	Information Technology
Discontinued Operations	Integrated Defense Systems	Network Centric Systems	Finance	Contracts
	Intelligence and Information Systems	Raytheon Technical Services Company	Human Resources	Corporate Affairs and Communication
	Homeland Security		Legal	R6σ™ and CLO Supply Chain Don Ronchi
				Engineering, Technology, Manufacturing and Quality

Proven business and functional leaders

Government and Defense Business Content

Raytheon Company

Bill Swanson
Chairman and CEO

Missile Systems	Space & Airborne Systems	Integrated Defense Systems	Network Centric Systems	Intelligence & Information Systems	Raytheon Technical Services Company

Raytheon Aircraft Company

Hawker

Hawker 800XP

Hawker Horizon

Beechcraft

Beechjet 400A

Premier I

Beech King Air Family

Beech Baron
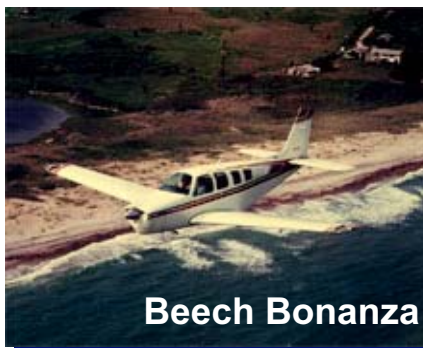
Beech Bonanza

T-6A Texan II

Quote from Bill Swanson

"As we focus on performance, relationships and solutions, all of us have the opportunity to learn from each other, regardless of what time zone we may be in. It is the diversity of our worldwide team that provides us with so many different experiences to draw upon and share. Thank you for putting this knowledge to work to help our customers succeed and to enable our company to grow."

Bill Swanson

Chairman, CEO - 2004

Suppose you were on this platform.

Taking "no action" is no longer an option. There is a clear and pressing need for change!

We must take action!

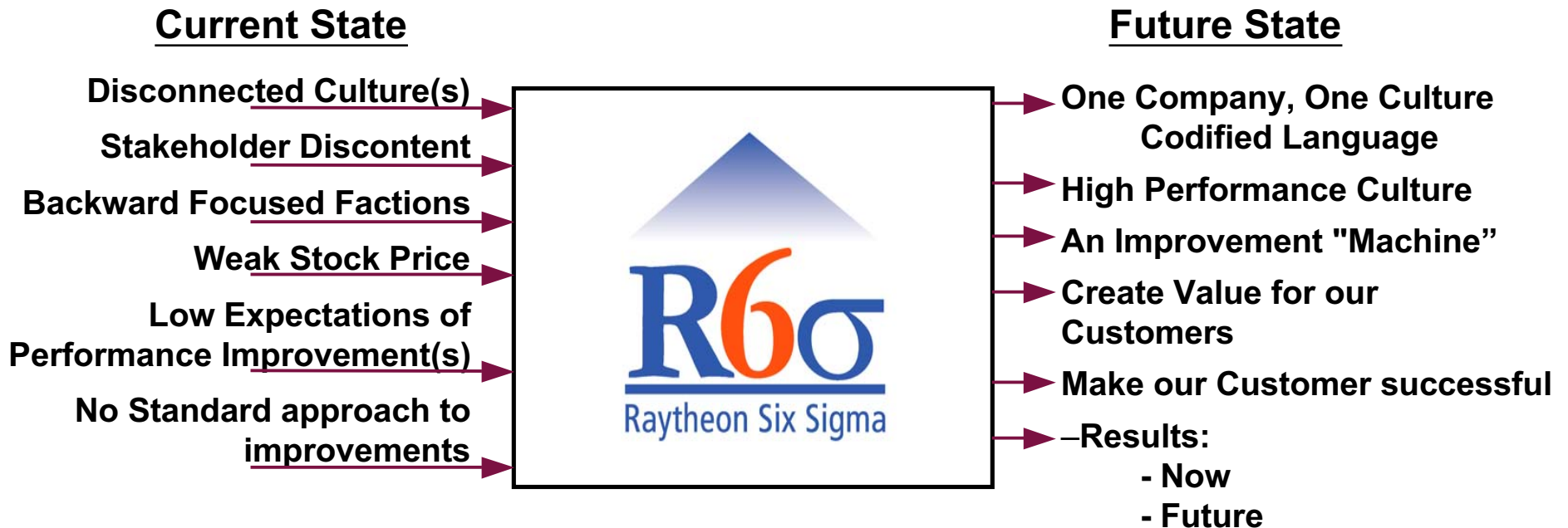**Burning Platform = term used to describe the** *pressing need for change*

Dan Burnham's Vision
(Ex Chairman & CEO) – 1999

"Raytheon Six Sigma™ …is a whole new way to think about work… It's going to touch everything that we do."

**Dan Burnham, Chairman, CEO**
Raytheon Leadership Forum - January 14, 1999

Current State

- Disconnected Culture(s)
- Stakeholder Discontent
- Backward Focused Factions
- Weak Stock Price
- Low Expectations of Performance Improvement(s)
- No Standard approach to improvements

R6σ
Raytheon Six Sigma

Future State

- One Company, One Culture Codified Language
- High Performance Culture
- An Improvement "Machine"
- Create Value for our Customers
- Make our Customer successful
- Results:
  - Now
  - Future

Raytheon Six Sigma™ – Our Improvement Machine

Raytheon

An Integrated Business Strategy

Customer

Tools

Culture

R6σ
Raytheon Six Sigma
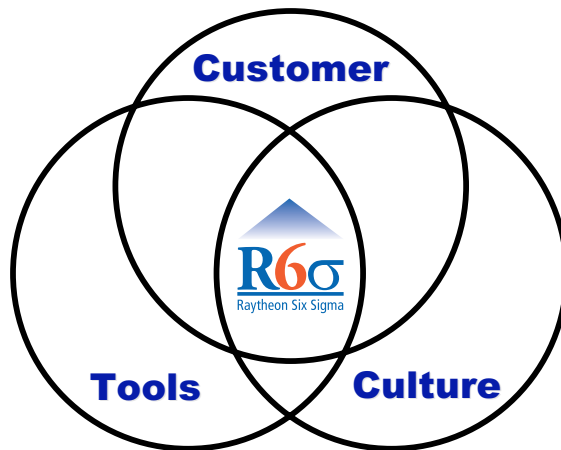
Our Operational Definition

Raytheon Six Sigma™ is a
Knowledge-Based Process
we will use to
Transform Our Culture
in order to
Maximize Customer Value
and
Grow Our Business

Principles

1. Specify **value** in the eyes of the **customer**
2. Identify **value stream** and eliminate waste/variation
3. Make value **flow** at **pull** of the customer
4. Involve and **empower** employees
5. **Continuously improve knowledge** in pursuit of perfection

The Same Process at Every Level of Our Business

Visualize

Commit

Prioritize

Characterize

Improve

Achieve

R6σ
Raytheon Six Sigma
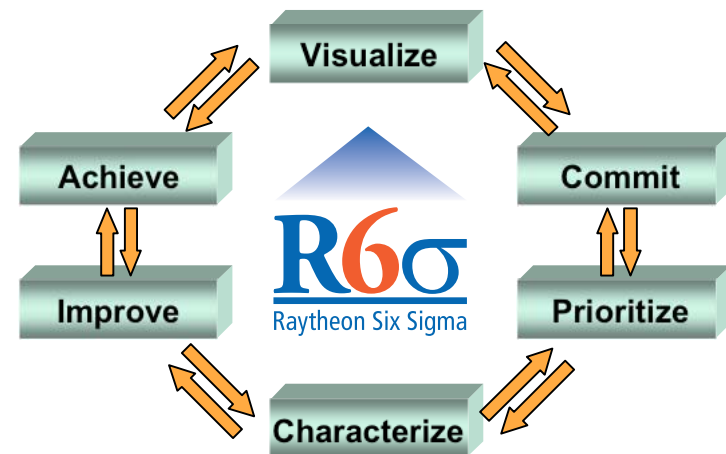
# Six Sigma - A Historical Perspective

The classical 6 Sigma approach, developed by Motorola, has its underpinnings in producible Hardware design and manufacture.

- Ability to reproduce units of product identically and without waste
- Statistical focus; 6 sigma process = only 3.4 defects/million opportunities

Historical Six Sigma

LSL   USL

Defect Reduction
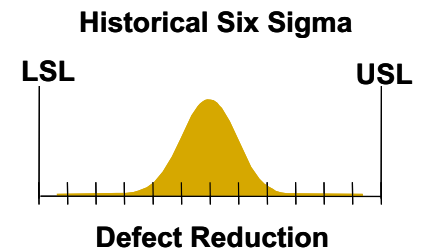
The Raytheon Six Sigma™ Approach is based on Benchmarking with Allied Signal and General Electric and others and is very broad in scope –

- Six Sigma Umbrella = a structured and rigorous approach to problem solving using a 6-step process and 5 guiding principles
- Philosophy of continuous improvement, including throughput improvement and defect / cycle time reduction in all business processes and products
- Integrates Proven Philosophies and a Number of Continuous Improvement Techniques and Tools: **Lean, Six Sigma & Change Management**
- Supported by a full time Six Sigma Expert Network
- Focused on Customer and Value Stream
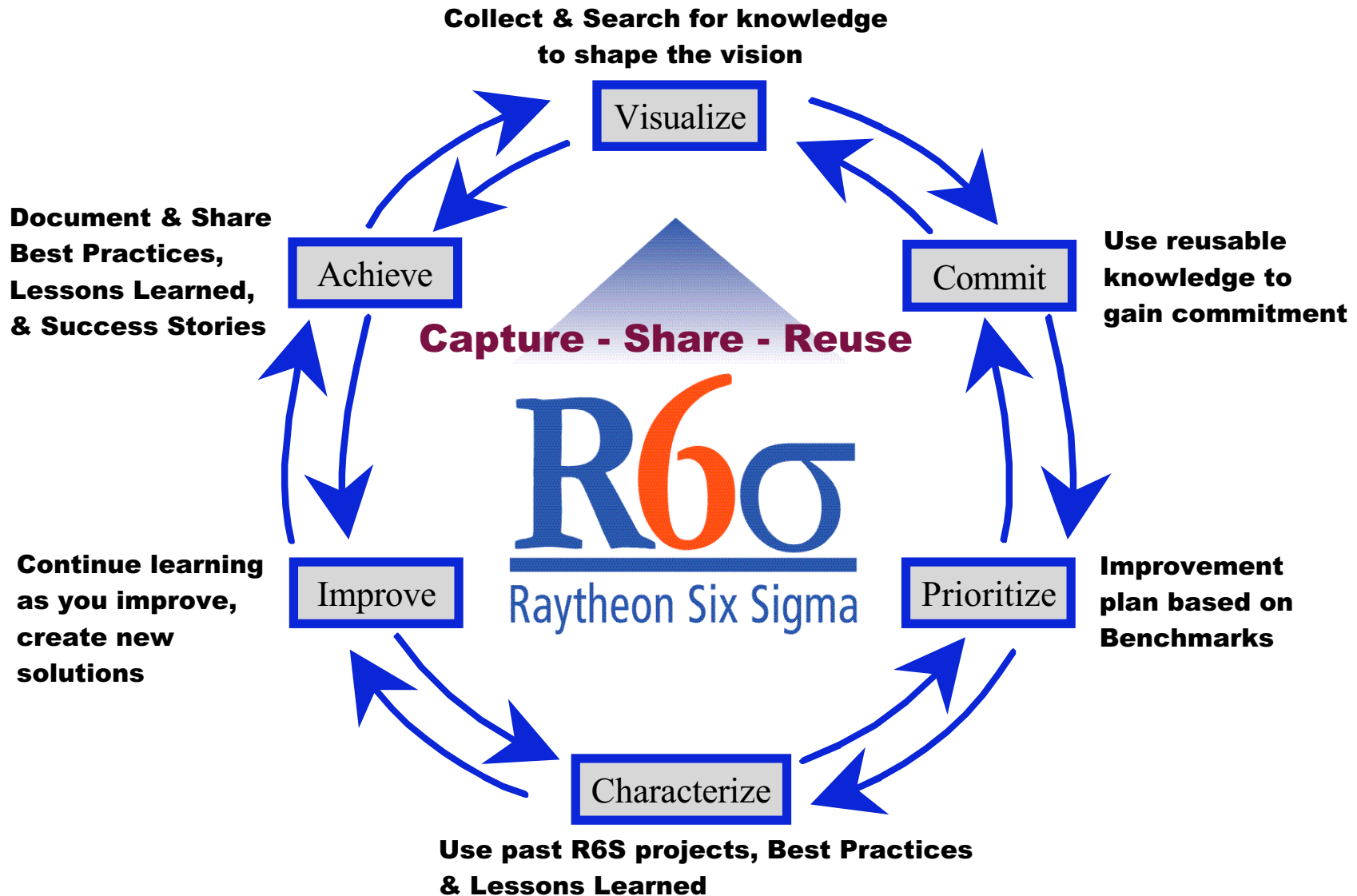- Leads to a Culture Change

Raytheon 6 Sigma Approach

Motorola 6 Sigma Approach

Value Stream
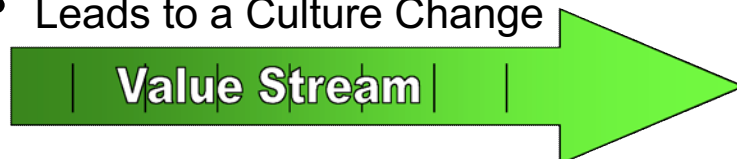
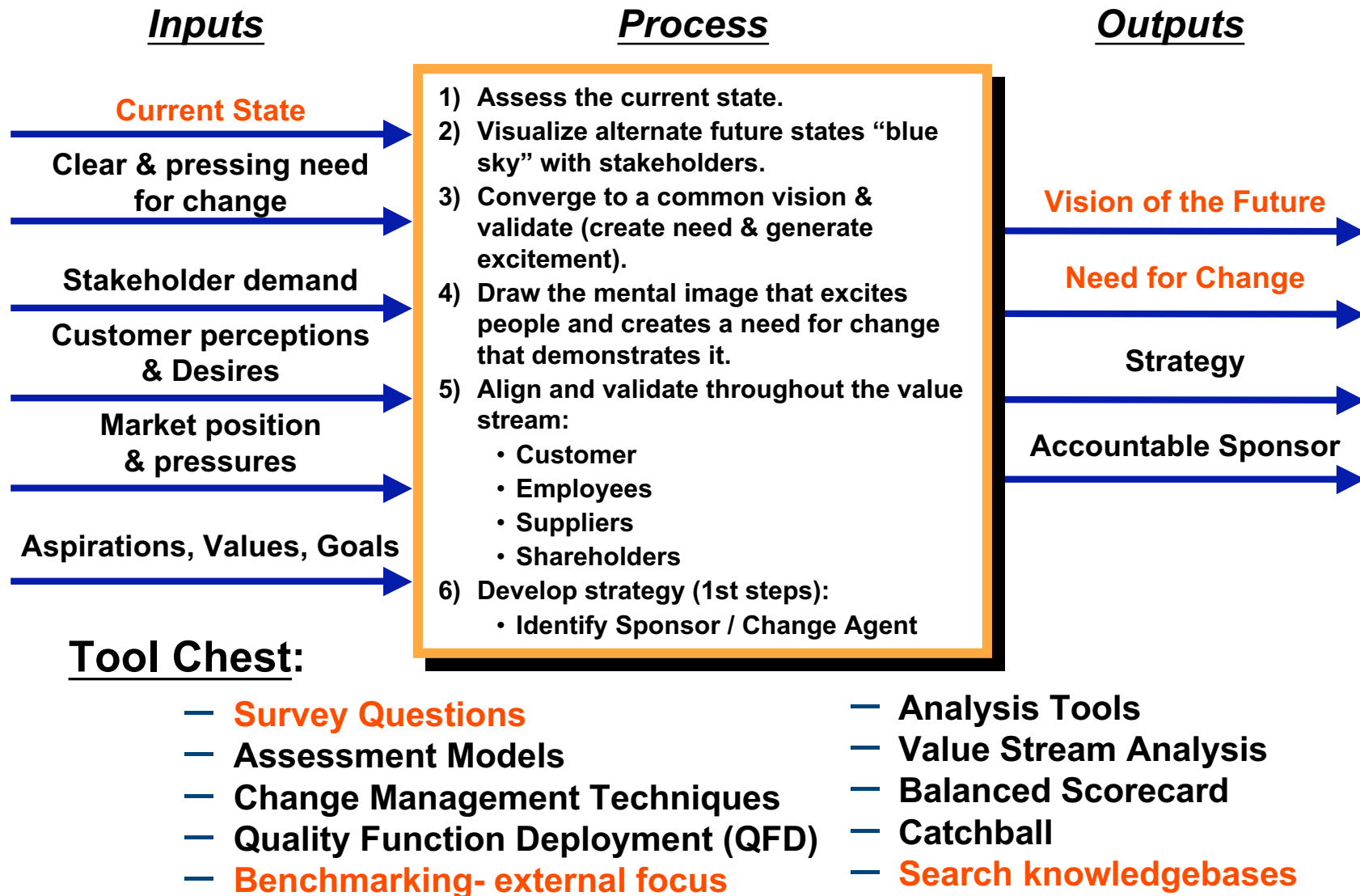**Customer Value & Customer Success**

Raytheon

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Raytheon Six Sigma™

Six Sigma Quality
- Design of Experiments
- Process Capability Analysis Tool (PCAT)
- Gauge R&R
- Ishikawa Tools
- Process Mapping
- Statistical Process Control

Design for Six Sigma
- Design To Cost
- Statistical Requirements
- Analysis
- FMECA
- Statistical Design Performance Simulation
- Software Predictive Statistical Tools
- Risk Management
- DFMA

Quality Function Deployment

Re-engineering
- Process Mapping
- Value Stream Mapping
- Change Management Skills
- Process Improvement Teams
- Problem-Solving Tools
- Benchmarking

Lean/Agile Manufacturing
- Value Stream Analysis
- Lean Enterprise
- Lean Manufacturing
- Agile Manufacturing
- Just In Time
- Supply Chain Management
- Kaizens
- Mistake Proofing
- Cycle Time Reduction
- Continuous Flow Manufacturing

Goal Deployment
- Balanced Scorecard

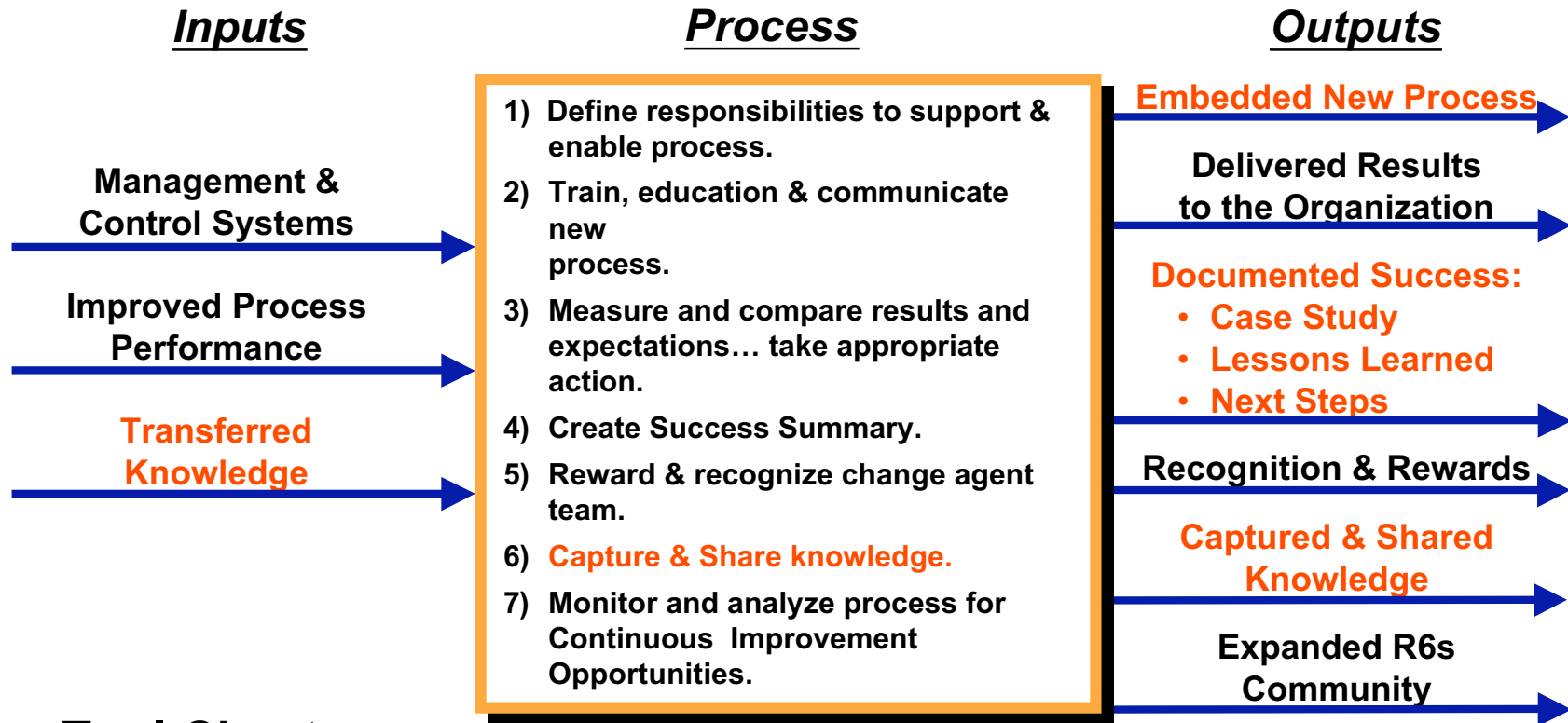# Raytheon Six Sigma™ & Knowledge Transfer Embedded Aspects

Collect & Search for knowledge to shape the vision

Visualize

Document & Share Best Practices, Lessons Learned, & Success Stories

Achieve

Commit

Use reusable knowledge to gain commitment

Capture - Share - Reuse

R6σ
Raytheon Six Sigma

Continue learning as you improve, create new solutions

Improve

Prioritize

Improvement plan based on Benchmarks

Characterize

Use past R6S projects, Best Practices & Lessons Learned

Step 1 Visualize – IPO

Inputs

Current State

Clear & pressing need for change

Stakeholder demand

Customer perceptions & Desires

Market position & pressures

Aspirations, Values, Goals

Process

1) Assess the current state.
2) Visualize alternate future states "blue sky" with stakeholders.
3) Converge to a common vision & validate (create need & generate excitement).
4) Draw the mental image that excites people and creates a need for change that demonstrates it.
5) Align and validate throughout the value stream:
   - Customer
   - Employees
   - Suppliers
   - Shareholders
6) Develop strategy (1st steps):
   - Identify Sponsor / Change Agent

Outputs

Vision of the Future

Need for Change

Strategy

Accountable Sponsor

Tool Chest:

— **Survey Questions**
— **Assessment Models**
— **Change Management Techniques**
— **Quality Function Deployment (QFD)**
— **Benchmarking- external focus**

— **Analysis Tools**
— **Value Stream Analysis**
— **Balanced Scorecard**
— **Catchball**
— **Search knowledgebases**

Step 6 Achieve – IPO

Inputs	Process	Outputs

Inputs

Management & Control Systems

Improved Process Performance

Transferred Knowledge

Process

1) Define responsibilities to support & enable process.
2) Train, education & communicate new process.
3) Measure and compare results and expectations… take appropriate action.
4) Create Success Summary.
5) Reward & recognize change agent team.
6) Capture & Share knowledge.
7) Monitor and analyze process for Continuous Improvement Opportunities.

Outputs

Embedded New Process

Delivered Results to the Organization

Documented Success:
- **Case Study**
- **Lessons Learned**
- **Next Steps**

Recognition & Rewards

Captured & Shared Knowledge

Expanded R6s Community

Tool Chest:
- **Knowledge Management System**
- New Financial/ Accounting Systems
- Change Management Tools
- Control Charts
- Organizational Development
- Employee Satisfaction Monitoring
- Communication Systems
- Data Analysis Tools

Raytheon Knowledge Management

Process Details ---

➢ **Embedding Knowledge Management in R6_ ™**

KM Basics - The Burning Platform

The KM Burning Platform

Knowledge management addresses these issues:

- **Competitive Environment (better, faster, less expensive)**

- **Leverage our knowledge in R6_™ projects: "If we only knew what we know" (better, faster)**

- **Reduce duplication of efforts (e.g. redundant R6_™ projects)**

- **Implement change through lower risk solutions**

KM at Raytheon makes us more *competitive!*

KM Vision

The goal is to provide the right knowledge to the right person at the right time in order to enable more informed decisions and to ensure customer success.

Leadership Team

R6_™ KM Strategy -- Scope

- **Help Raytheon Six Sigma™ community leverage our knowledge across projects**

- **Focus on continuous improvement & deploy company wide**

- **Cultural transformation to achieve knowledge sharing and reuse as a core competency**

- **Coordinate all KM efforts to align and be "one company"**

R6σ™ KM Communities/Users

- **R6_™ Community**
  - R6_™ Leadership
  - Master Experts 41
  - Experts ~1275
  - Specialists ~14,435
  - Project Team members
  - Projects
  - KM Champions 22
  - KM Brokers

- **Goals**
  - 76K employees
  - 25% specialists
  - 1% Experts

Company

Govt
Business

R6_™
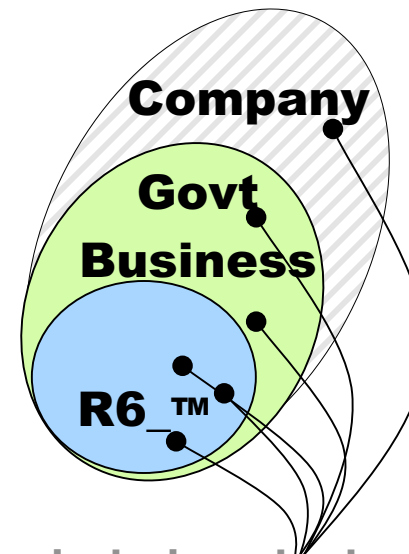
Our R6σ™ KM Strategy is being deployed across Raytheon

KM Definition

- **Knowledge Management –**

The systematic processes that create, capture, share, and reuse knowledge within the company

The four action sub-processes that bring meaning to KM

Knowledge Sources – Where to Look ?

Searching for Knowledge

Explicit   **Tacit**

Connecting People to Data	Connecting People to People

Internal

- R6_™ Project Library
- Best Practice Knowledgebase
- Benchmarking Library
- Docushare Servers

• Verity Search
• KM Portal
• Power Search

External

- APQC
- Global Bench-marking Council
- Best Mfg Practices
- AME
- Lean Aerospace Initiative

Communities Of Practice

- Supply Chain
- R6s Experts
- Critical Chain
- Collaboration Council
- KM Champs
- Engineering groups

Subject Matter Experts

- Skills database
- Directory Services
- SME Locator
- Kamoon

Benchmarking

- Internal
- External

Networks & Friends

• xxx

← **Knowledge Management Champions** →

Link People to Knowledge

KM Strategy

KM Key Result Areas

People

By Benchmarking Knowledge Management leaders, we found that there are four key areas that must be optimized to build, grow and sustain a KM strategy

Enabling Environment

Process

Tools
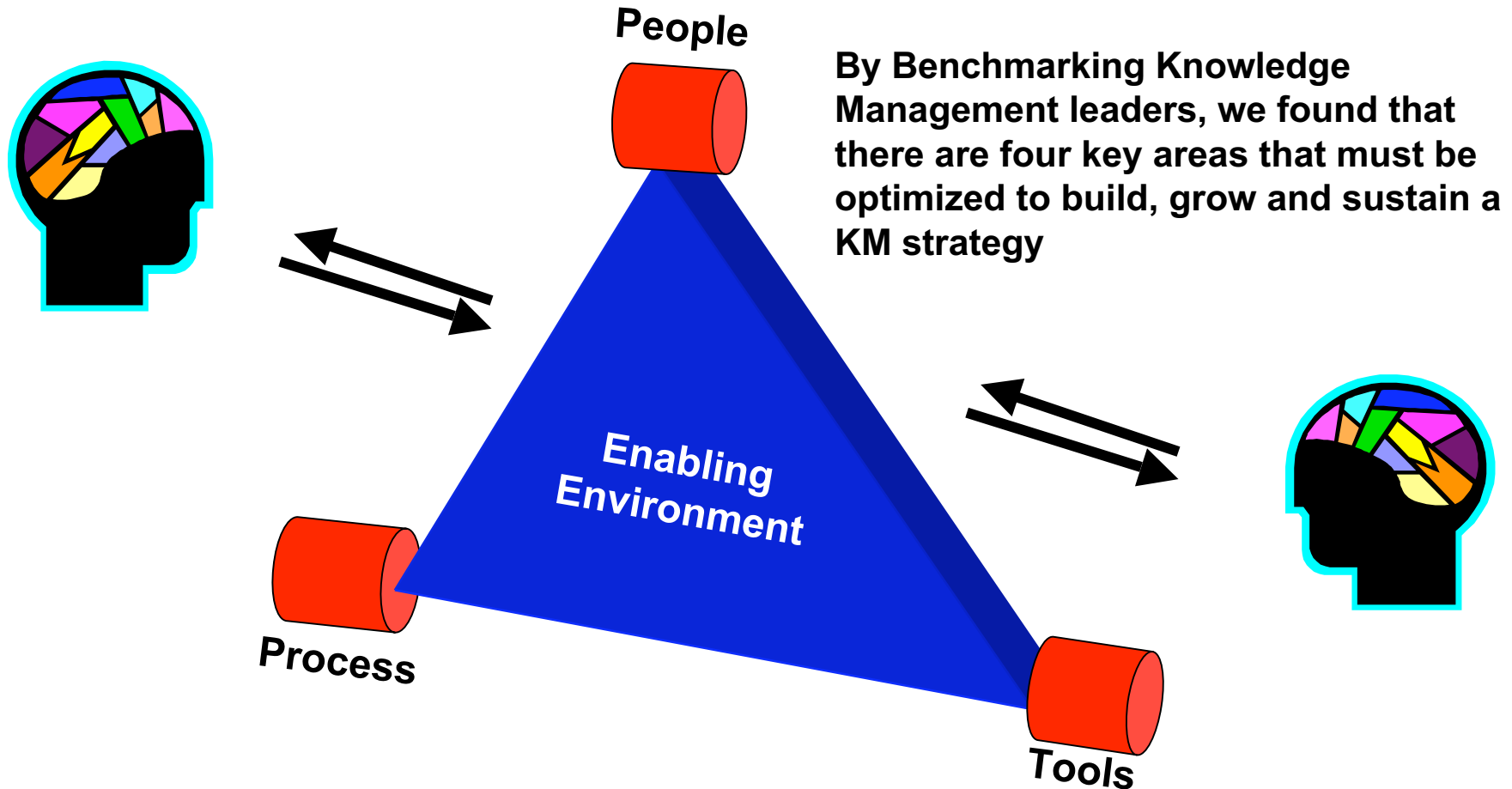
All four KRA's must be worked and integrated to form a successful strategy

Knowledge Management Strategy Four Key Result Areas

Raytheon

People

- KM Office
- KM Champions
- KM Brokers
- Communities of Practice
- Subject Matter Experts

Process

- Key Result Areas
- Create, Capture, Share, Reuse
- CoP Process – start up & support
- Peer Assist
- Knowledge Café
- Content Management
- Knowledge Mapping

Tools

- One step, focused access
- Role-based approach
- Easy capture and share
- SME locator
- CoP locator &collaboration tools
- Webpage → Portal
- ♣ Search

Enabling Environment

- Management priority
- Communication
- Sharing and reusing is a core competency
- Recognition & Rewards
- Reinforcement
- "How we do work"

KM People – KM Champions
Roles & Responsibilities

KM Champions lead knowledge management in support of Business improvements company wide. Their duties include:

- Capture and Share Strategic Best Practices and Lessons Learned

- Deploy Knowledge Management Process across business units

- Facilitate Business unit CoPs and information network

- Connect individuals and SME's with one another and with the knowledge and tools they need to improve

KM People

- **The majority of our intellectual assets are tacit knowledge and are embedded in our people**

- **We have several ways to tap into our people**
  - **Subject Matter Experts usually have deep, very specific knowledge on key subjects**
    - **We identify SME's or "Go To Guys/Gals" and create a sharing environment**
  - **Communities of Practice (CoPs) usually are groups of people that meet to push the leading edge thinking on specific Knowledge Domains**
    - **We established a CoP process to identify current CoPs, promote new ones & provide them flexible tools to collaborate, and make it easy for them to capture and share their knowledge**

KM People
What is a Community of Practice?

CoPs are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by <u>interacting on an ongoing basis</u>.

Structural Model

A domain of knowledge that defines a set of issues

Shared practices that they are developing to be effective in their domain

- Ideas - Tools
- Language
- Stories
- Documents

A community of people who care about this domain

Wenger, McDermott, Snyder, 2002

KM People
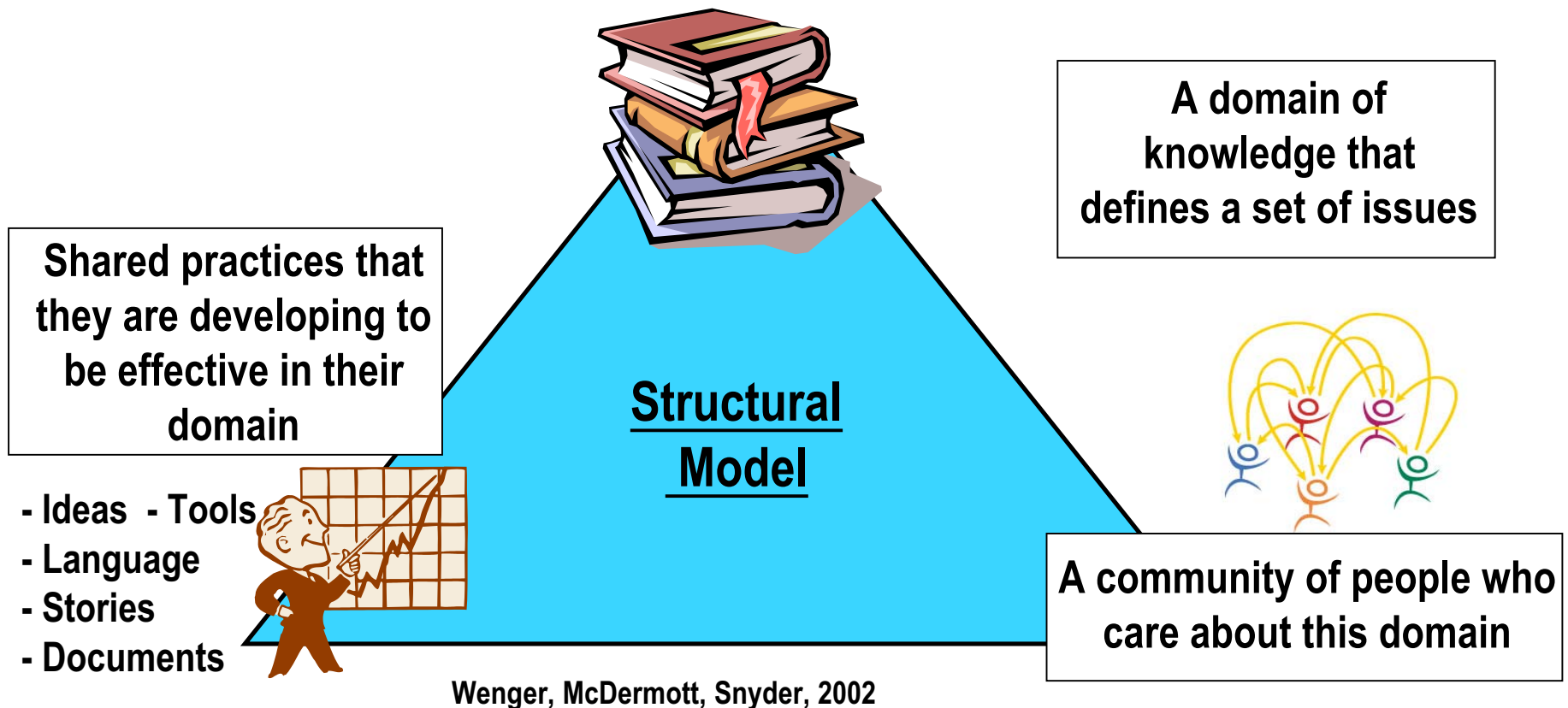
Communities of Practice -- Summary

- A CoP is a group that shares a passion about a topic (i.e., Knowledge Domain)

- CoPs can meet at lunch-hour or after hours with food hosted by Management

- They may or may not have deliverables

- Candidate CoPs are reviewed by the CoP Steering Committee

- After approval, it's easy to register a CoP on the KM CoP portal and kick off the sharing sessions

KM Process Lifecycle

CAPTURE

Learn from Others

SHARE

Abstract our Knowledge

REUSE

Leverage our Knowledge

- R6_™ Projects
- Internal Benchmarking
- External Benchmarking
- Best Practices
- Lessons Learned
- Communities of Practice
- Many other sources

- Forums
- Load KM Repository
- Put in Project Library
- Becomes Intellectual asset
- Tacit knowledge → Explicit knowledge
- Communicate success

- Knowledge maps
- Match gaps to Solve our problems
- Reuse proven solutions
- Lower risk
- Agile customer response

Create

KM Tools – Portal Toolset —
One-Stop Shopping for Access to Knowledge

KM Enabling Environment

- **Goal:** The Raytheon working environment supports creating, capturing, sharing, and reusing knowledge.

Key aspects:

- Part of our Corporate Strategy
- Recognition and reward is key
- Communication is continuous
- People see KM as a help to do their job to arrive at better solutions
- Emphasizes "one company" philosophy

It has to be cool to share & reuse!!!

KM Enabling Environment Example: Recognition & Reward

— **From Raytheon Missile Systems** —

**Qualified Specialists receive a certificate & R6_™ shirt**
— If project has significant impact or financial benefits, the supervisor may provide a "spot award"- $$

Recognition for employees and expressing appreciation are key to sustaining the effort

Rewards are important also…. but

- **We carefully choose rewards that will motivate people to support the process and use the rewards to celebrate milestones on the journey**
- **Most sites have a photo board**
- **For achieving team milestone of 100%, everyone received**
  - A gift certificate
  - A backpack/luggage combination

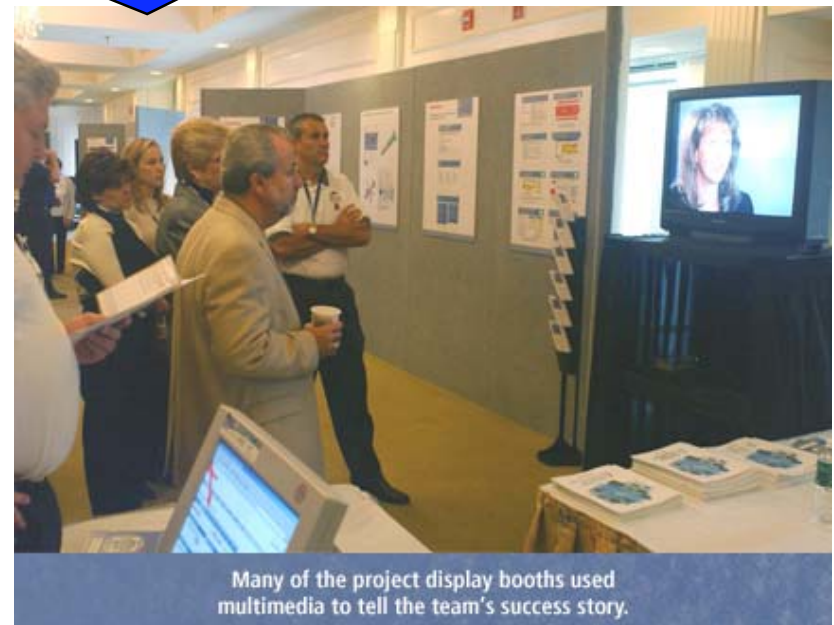*2003 rewards were based on the team's combined success as opposed to the individual*
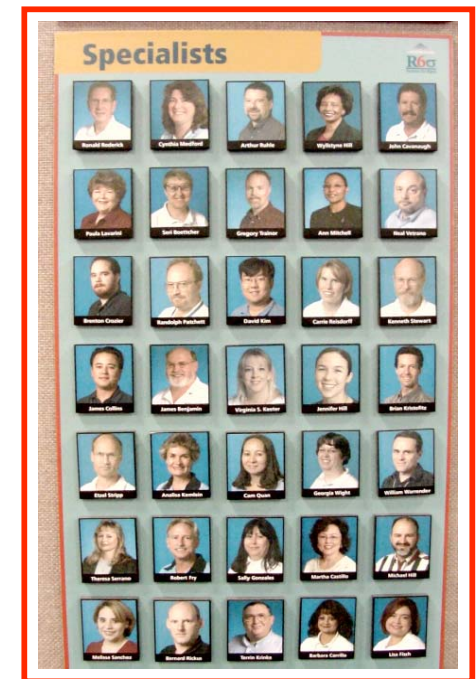
KM Enabling Environment
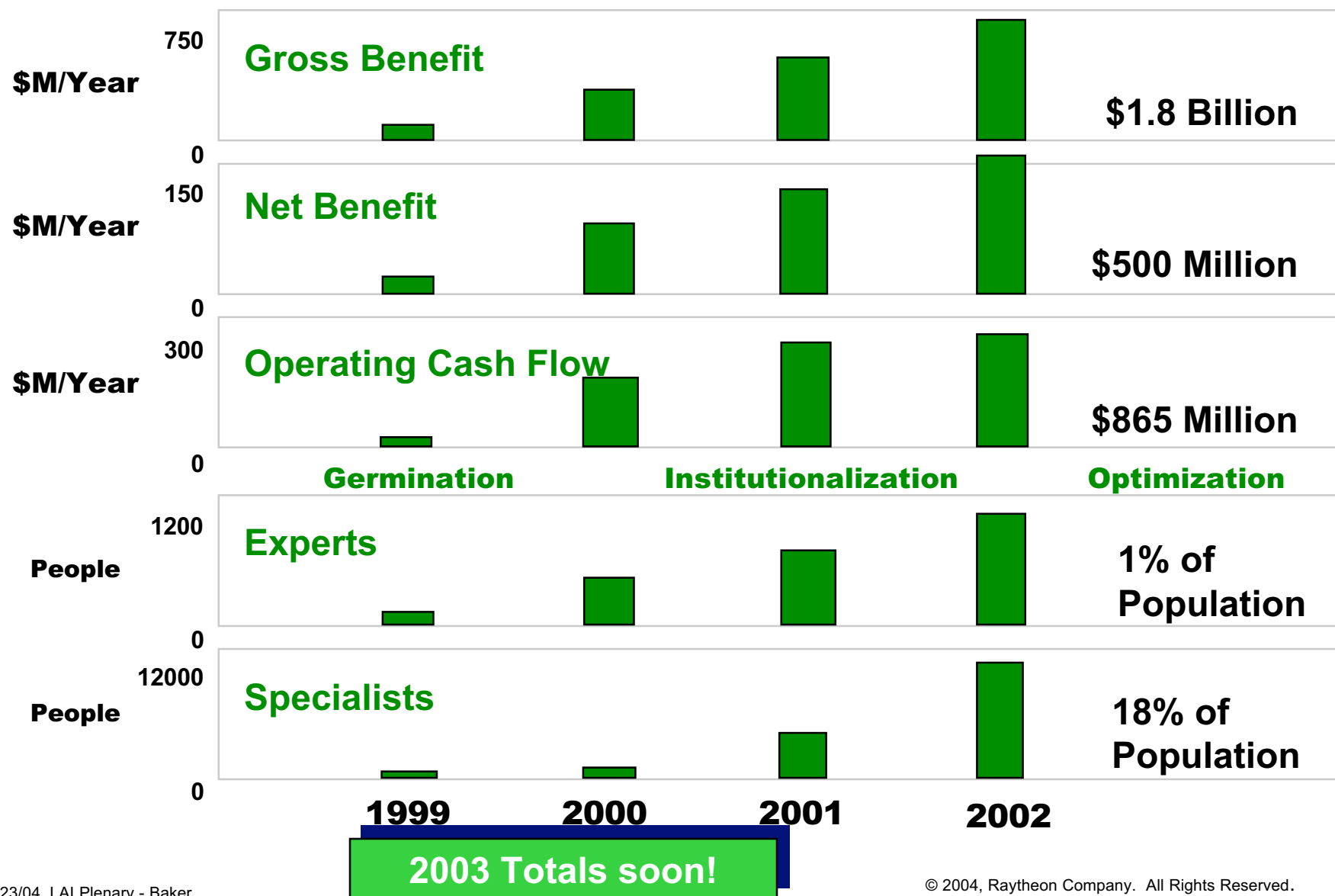
— Communication, Communication, Communication, etc.

Communication Venues

- **R6_™** Forums and Celebrations

- **R6_™** Expert/Specialist Training

- **R6_™** Master Expert Meetings

- **R6_™** Council Meetings

- Business Leadership Meetings

- Customer/Supplier Conference

- Others

Many of the project display booths used multimedia to tell the team's success story.

R6σ™: Cumulative Achievement

Raytheon

|		Germination	Institutionalization	Optimization	
Gross Benefit ($M/Year, 750–0)					$1.8 Billion
Net Benefit ($M/Year, 150–0)					$500 Million
Operating Cash Flow ($M/Year, 300–0)					$865 Million
Experts (People, 1200–0)					1% of Population
Specialists (People, 12000–0)					18% of Population
	1999	2000	2001	2002	

2003 Totals soon!

Wrap Up Summary

- **Our Raytheon R6_™ Knowledge Transfer journey continues**

- **It takes committed people, a simple process, easy-to-use tools AND a supporting environment**

- **You may be challenged with deploying across large groups. We use Knowledge Champions & Brokers to facilitate deployment of Knowledge Transfer**

- **Knowledge Sharing and Reuse is NOT a Natural Act!!!**

■ *Questions?*
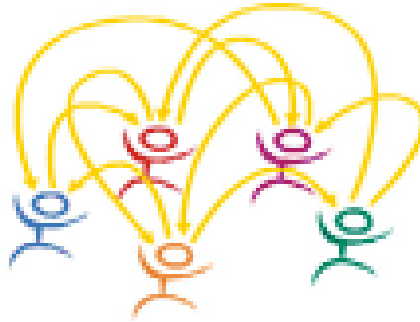
Raytheon is an organization recognized for knowledge sharing

❑ **2001 APQC KM Best Practice Company**

❑ **2003 MAKE Award Finalist (Most Admired Knowledge Enterprise)**

❑ **2003 APQC Lean Six Sigma Knowledge Transfer Best Practice Company**

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Champion
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