



Six Sigma Overview

A KPA Presentation

KPA Ltd. 
Management Consulting

sixsigma@kpa.co.il

KPA Ltd. **Management Consulting**

- **KPA** is an international management consulting firm with offices in Israel and strategic partners in the US, Spain, Belgium, France and Central Europe. Formed in 1990 by Professor Ron Kenett as a partnership, the firm incorporated in 1994.
- The **KPA** staff consists of specialized consultants with expertise in strategic planning, market research, industrial statistics, quality and risk management, business development and human resource management. **KPA** is currently involved in the strategic planning of medium and large companies, in international market research and customer surveys, establishing quality systems and Six Sigma initiatives, organizational development, risk management and change management consulting.

The KPA Vision and Mission Statement

Our Mission

“To provide our customers with the expertise required to formulate strategies, concepts and breakthrough business processes that will turn their organizations into leaders in their field.”

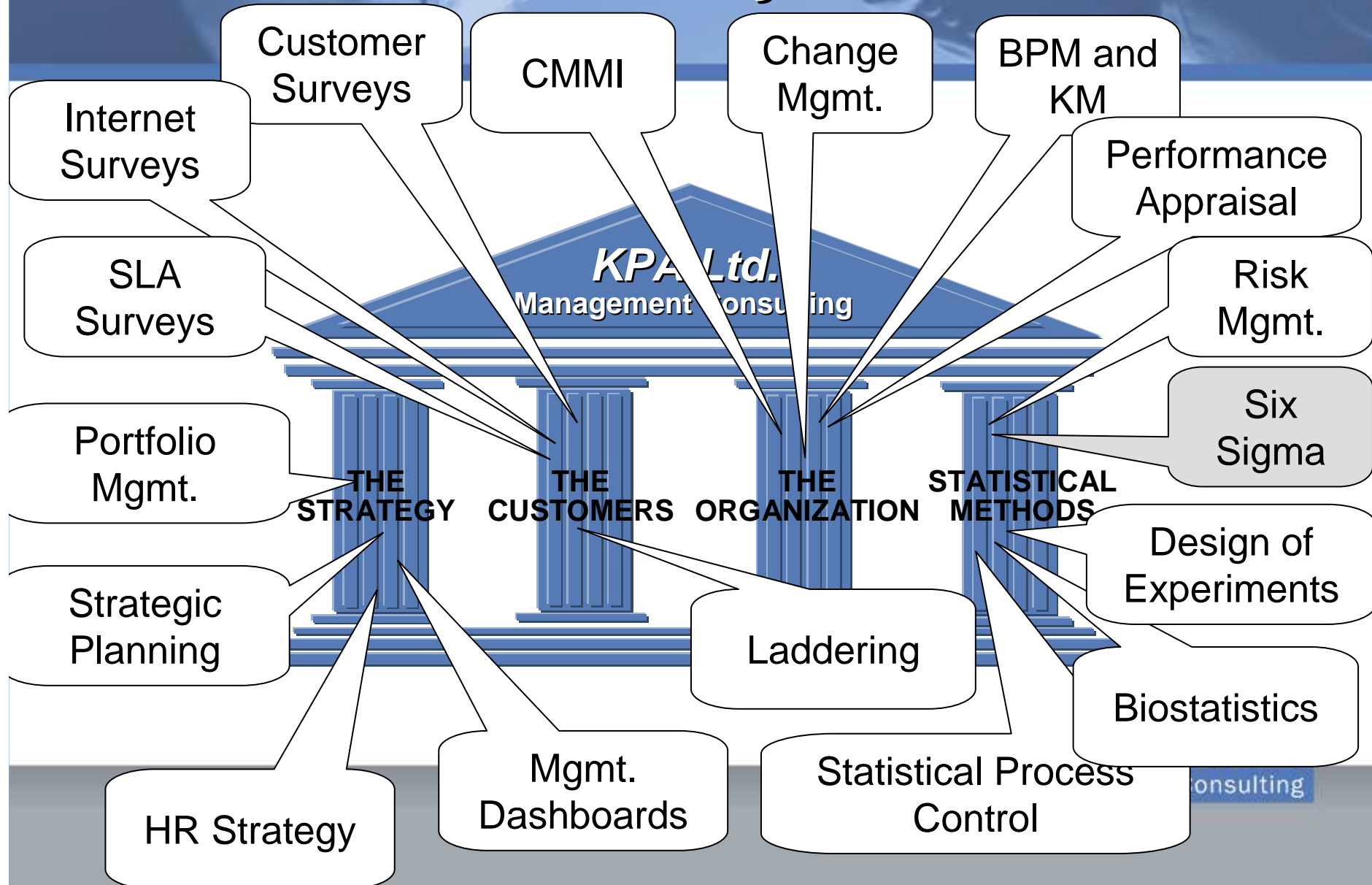
Our Vision

“To be known as a center of excellence in modern management methodologies and as a source of research and training in our field.”

KPA areas of activity



KPA areas of activity



KPA products and services

- Strategic Planning, Change Management, Six Sigma initiatives, joint ventures and M&A facilitation
- Market Research and Voice of the Customer Surveys
- Organizational Development, Appraisal Systems and Voice of the Workforce Surveys
- Statistical Consulting, Data Mining, Risk Management, Industrial Statistics, Biostatistics
- **Six Sigma training and consulting**

KPA clients' industrial areas

- Telecommunications
- Software
- Banking
- Plastics
- Chemicals
- Pharmaceuticals
- Food & Beverage
- Electronics
- Cellular Services
- Health Care
- Education
- Energy
- Transportation



KPA partial list of clients

- The Israel Electricity Corporation, utility
- The Open University, education
- hp Indigo, the electronic printing division of hp
- Cellcom, a leading Israeli cellular service provider
- ECI, telecom supplier
- Perrigo, pharmaceuticals
- Eden Springs, home office delivery
- Cisco, network management software
- Amdocs, billing systems
- Dead Sea Bromine Group, chemicals
- Bank Leumi, financial services
- Rafael, electronics

Why Six Sigma ?

“At Motorola we use statistical methods daily throughout all of our disciplines to synthesize an abundance of data to derive concrete actions....

How has the use of statistical methods within Motorola Six Sigma initiative, across disciplines, contributed to our growth? Over the past decade we have reduced in-process defects by over 300 fold, which has resulted in a cumulative manufacturing cost savings of over 11 billion dollars”*.

Robert W. Galvin
Chairman of the Executive Committee
Motorola, Inc.



*From the forward to MODERN INDUSTRIAL STATISTICS: Design and Control of Quality and Reliability, Kenett and Zacks, Duxbury Press, 1998, Spanish edition 2000, 2nd paperback edition 2002, Chinese edition 2004.

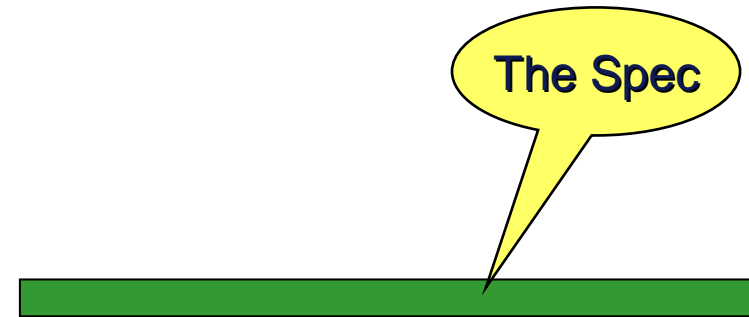
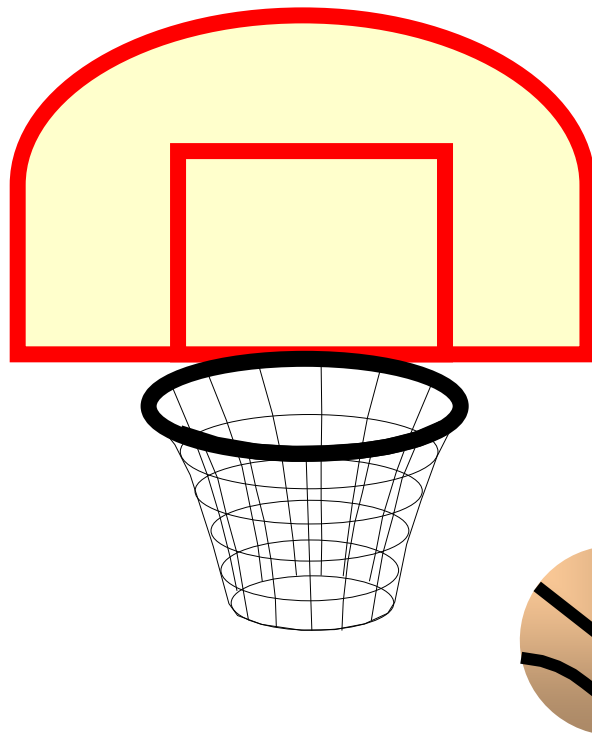
Who implements Six Sigma ?

A.B. Dick Company, Abbott Labs, Adolph Coors, Advanced Micro Devices, Aerospace Corp, Airborne, Alcoa, Allen Bradley, Allied Signal, Ampex, Apple Computers, Applied Magnetics, ASQC, Atmel, Baxter Pharmaseal, Beatrice Foods, Bell Helicopter, Boeing, Bombardier, Borden, Bristol Meyers - Squibb, Bryn Mawr Hospital, Campbell Soup, Cellular 1, Chevron, Citicorp, City of Austin, TX, City of Dallas, TX, Clorox, Cooper Ind, Dannon, Defense Mapping

Agency, Delnosa (Delco Electronics in Mexico), Digital Equipment Corp, DTM Corp, Eastman Kodak, Electronic Systems Center, Empak, Florida Dept. of Corrections, Ford Motor Company, GEC Marconi, General Dynamics, General Electric, Hazeltine Corp, Hewlett packard, Holly Sugar, Honeywell, Intel, Junior Achievement, Kaiser Aluminum, Kraft General Foods, Larson & Darby, Inc, Laser Magnetic Storage, Lear Astronics, Lenox China, Littton Data Systems, Lockheed Martin, Loral, Los Alamos National labs, Martin Marietta, McDonnell Douglas, Merix, Microsoft, Morton Int'l, Motorola, NASA, Nat'l Institute of Corrections, Nat'l Institute of Standards, Nat'l Semiconductor, Natural Gas Pipeline Company of America, Northrop Corp, PACE, Parkview Hospital, Pentagon, Pharmacia, PRC, Inc, Qualified Specialists, Ramtron Corp, Rockwell Int'l, Rohm & Haas, Seagate, Society of Plastics EGINEERS, Solar Optical, Sony, Star Quality, Storgae Tek, Symbios Logic, Synthes, Technicomp, Tessco, Texaco, Texas Commerce Bank, Texas Dept. of Transportation, Texas Instruments, Titleist, Trane, TRW,

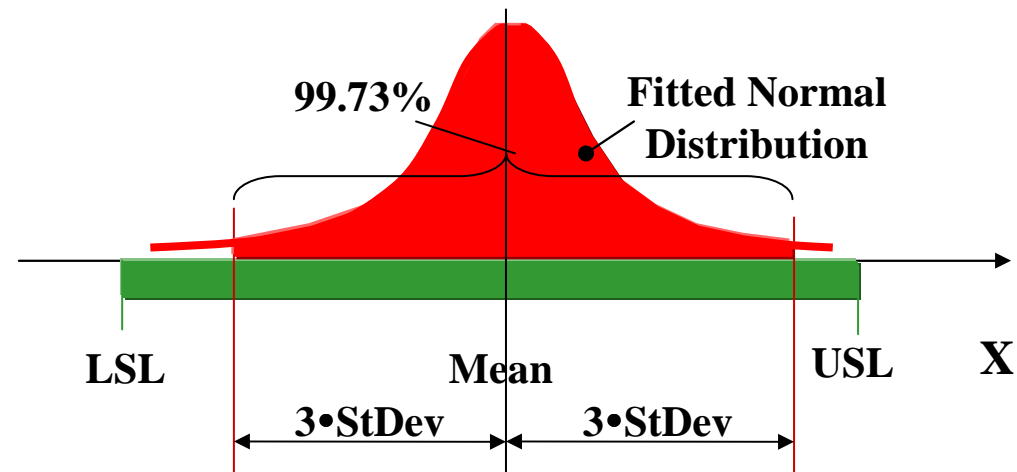
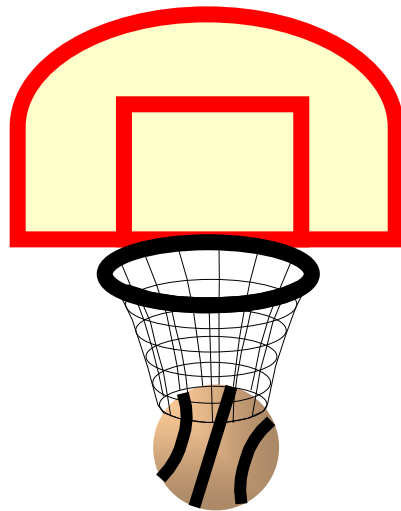
Ultratech Stepper, United States Air Force, United States Army, United technologies, UPS, USAA, Verbatim, Walbro Automotive, Walker parking, Woodward Governor, Xerox, NovoNordisk, Glaxo, GE,.....

The Basketball Analogy



How do we Perform?

The Basketball Analogy (2)

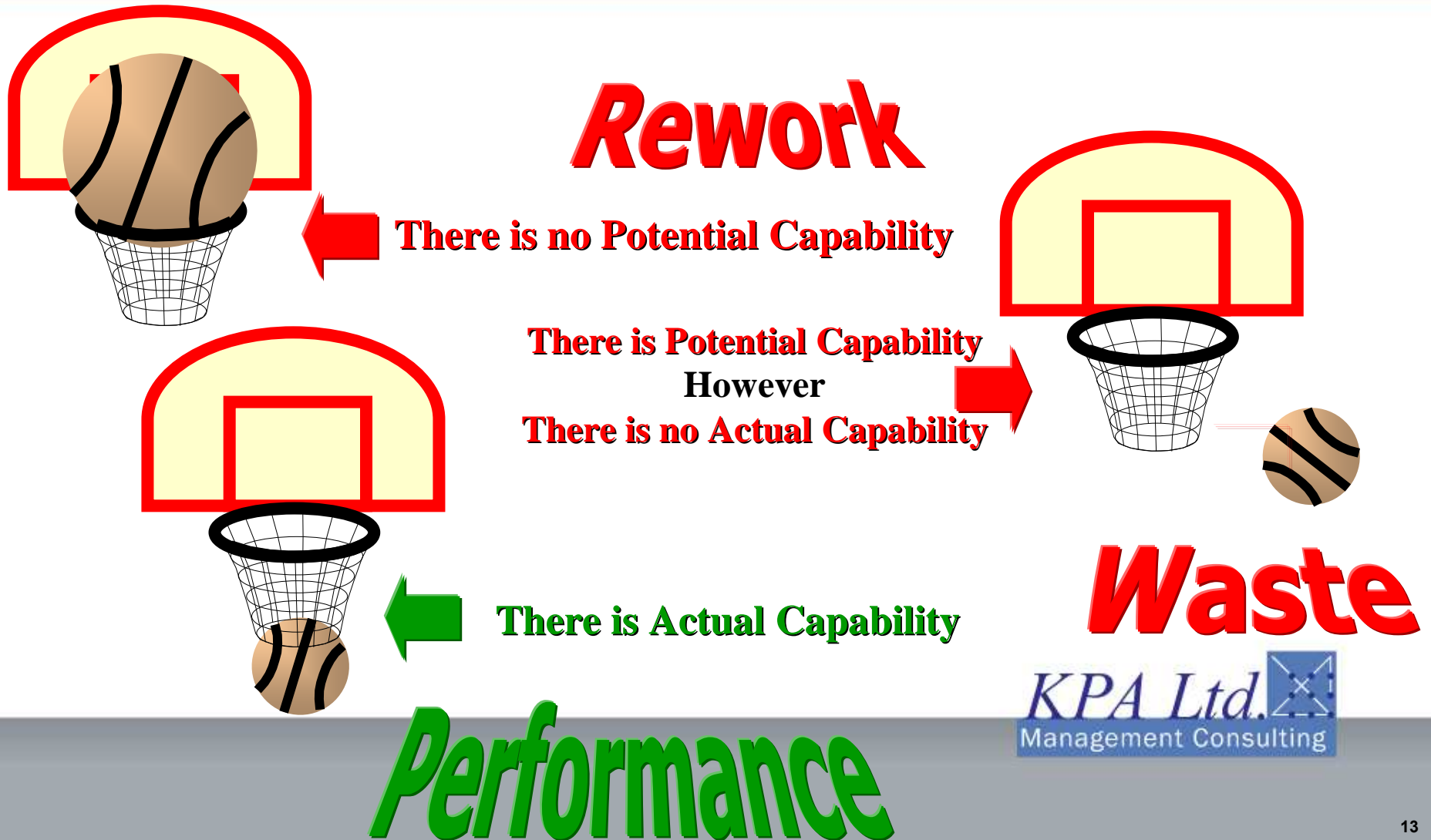


$$C_p = \frac{USL - LSL}{6 \cdot StDev}$$

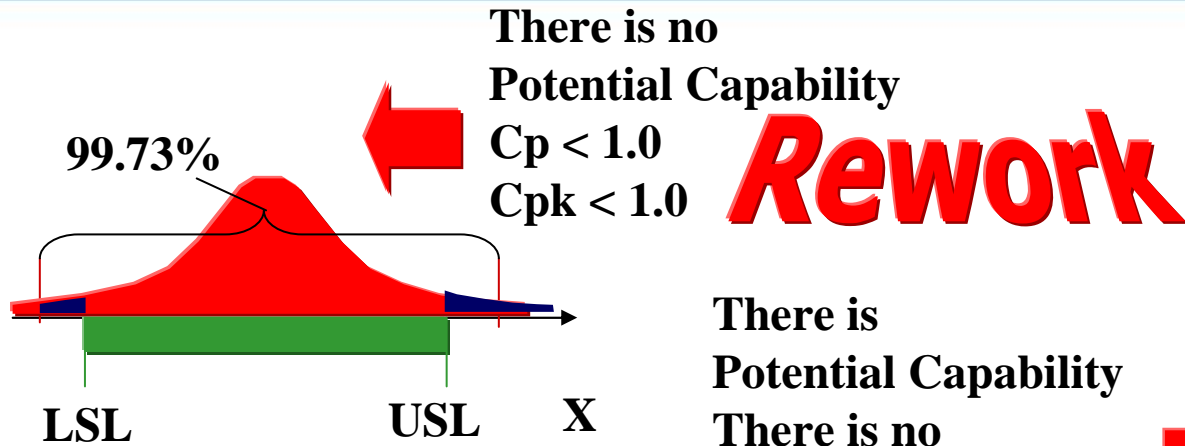
$$C_{pk} = \frac{\text{Min} \{ \text{Mean} - LSL, USL - \text{Mean} \}}{3 \cdot StDev}$$

Performance Assessment

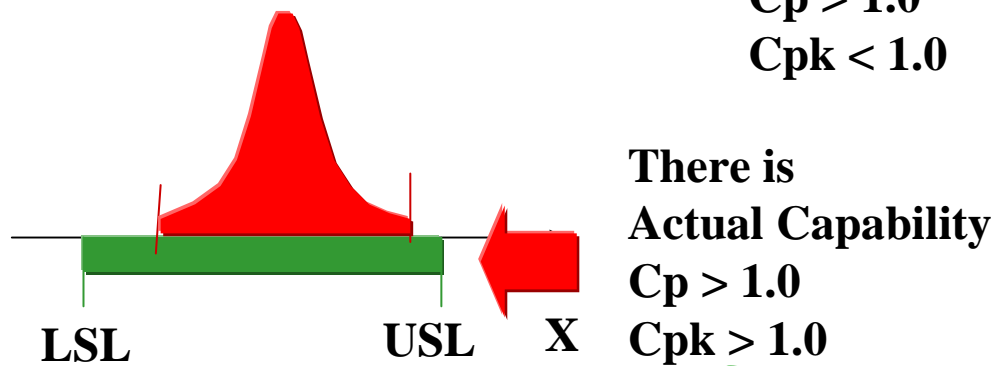
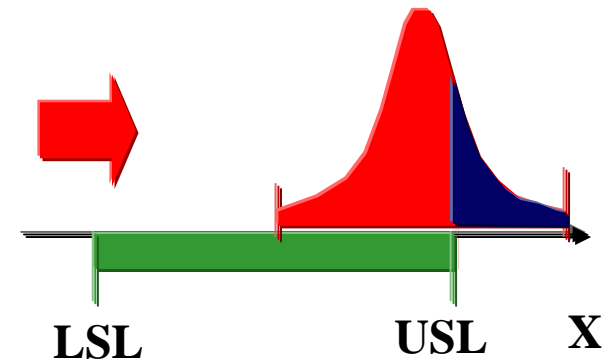
The Basketball Analogy (3)



Six Sigma Indicators



There is Potential Capability
There is no Actual Capability
 $C_p > 1.0$
 $C_{pk} < 1.0$



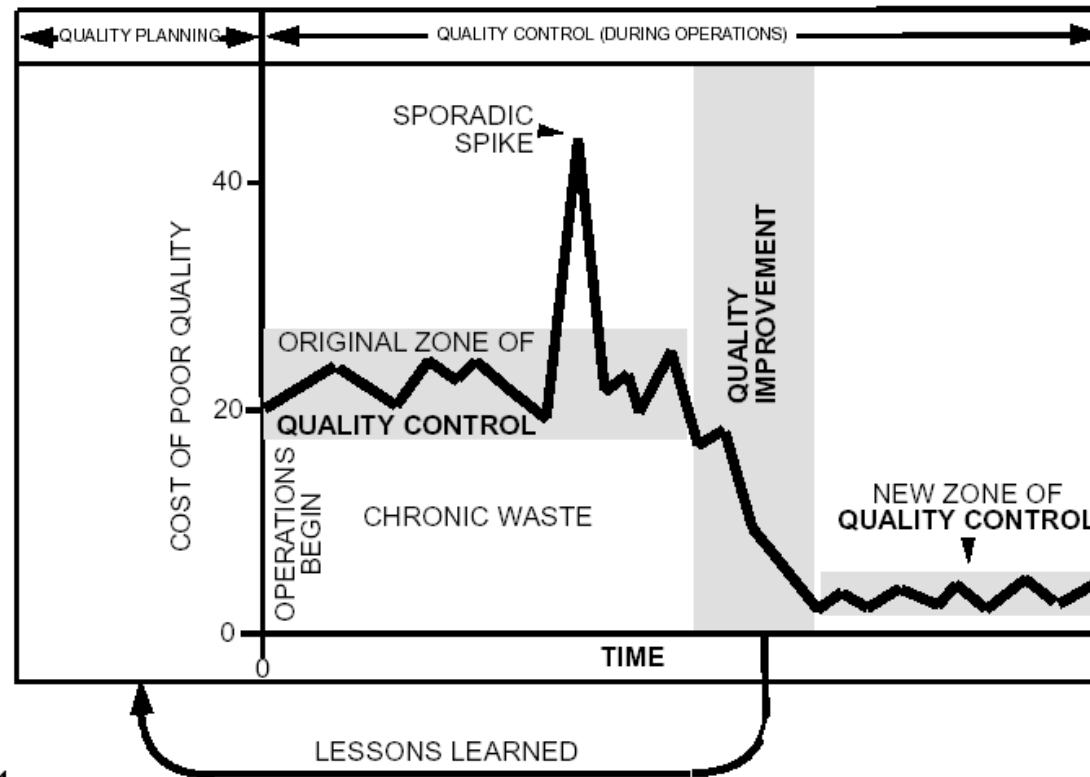
Six Sigma Indicators (2)

C_p , C_{pk} , Defects Per Million and Sigma Level

C_p	PPM	C_{pk}	PPM	Sigma Level
0.67	50,000	0.17	308,770	2
1.00	2,700	0.50	66,811	3
1.33	63	0.83	6,210	4
2.00	0.002	1.50	3.4	6

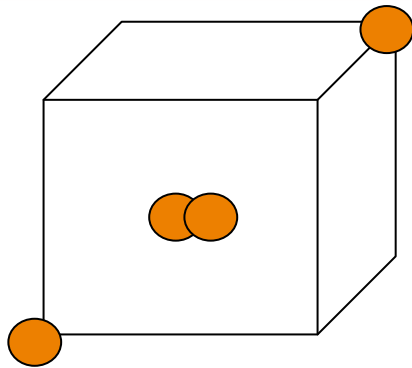
Where are your critical processes?

The Juran Trilogy: Planning, Improvement and Control*



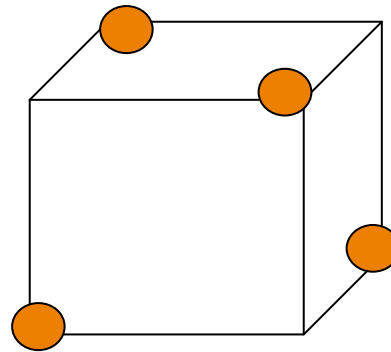
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Design for Six Sigma



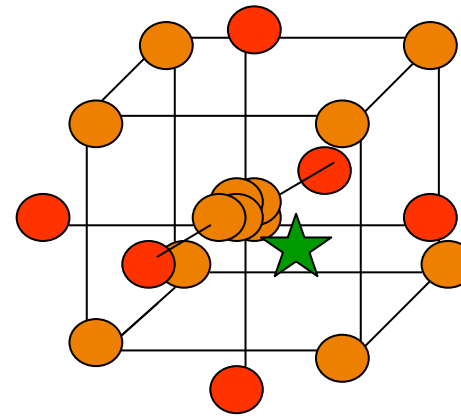
Scoping

Initial assessment



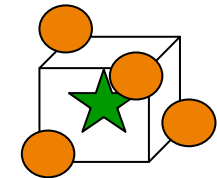
Screening

Fractional designs



Optimizing

Response surfaces



Robustness

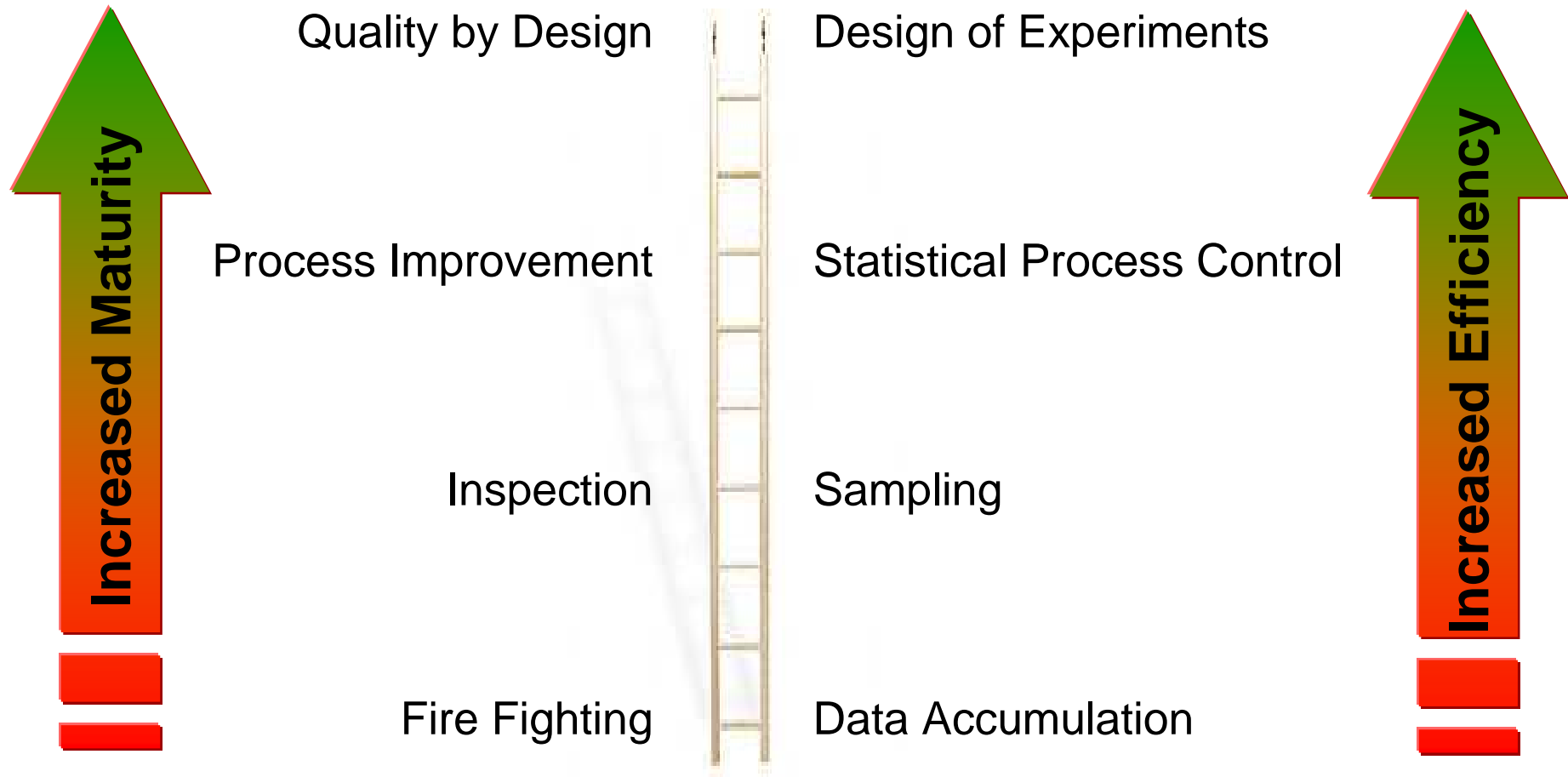
Robust designs

Process Confidence

Process knowledge

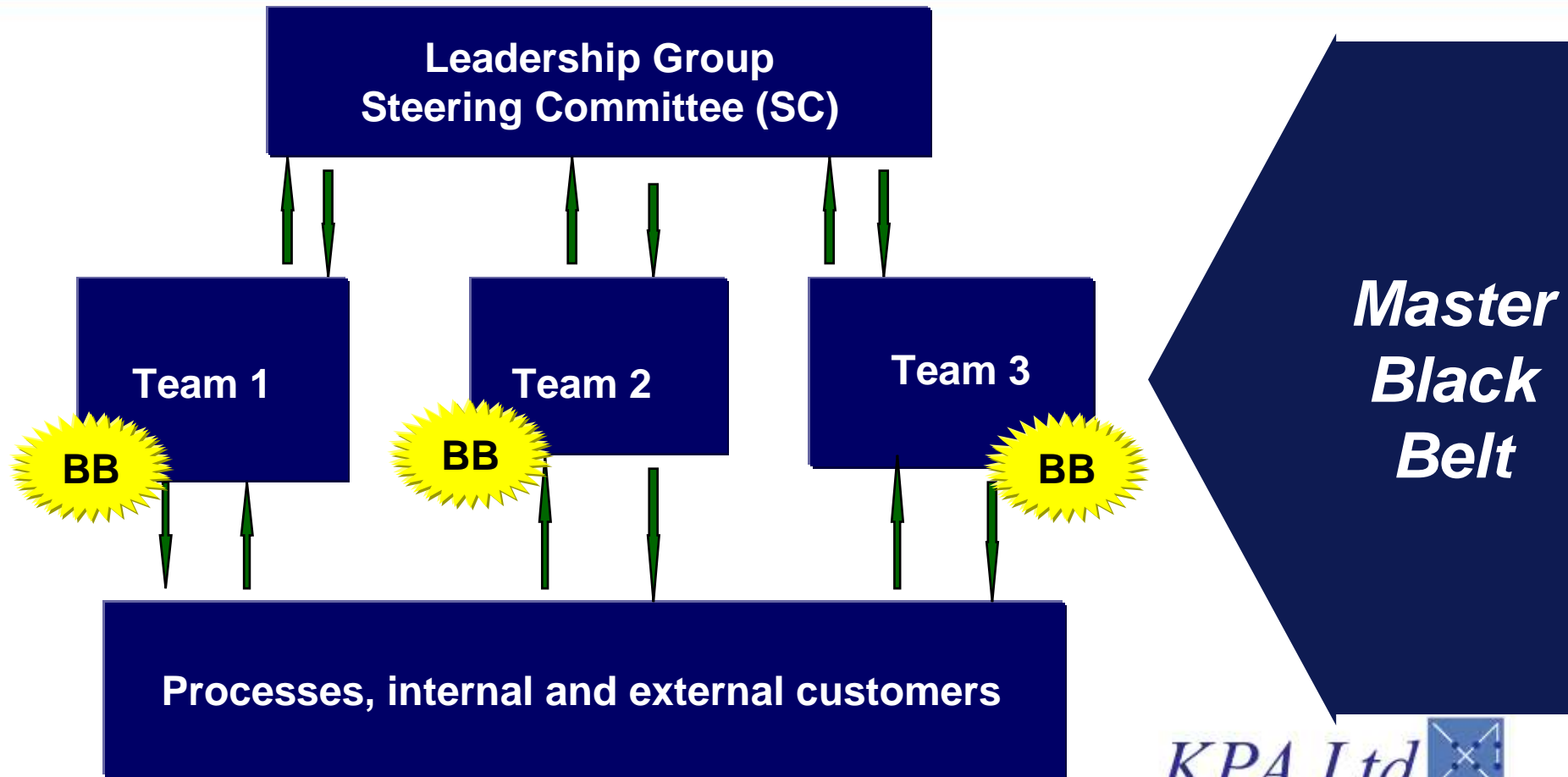
Management Consulting

The Quality Ladder: Matching Management Approach and Statistical Tools



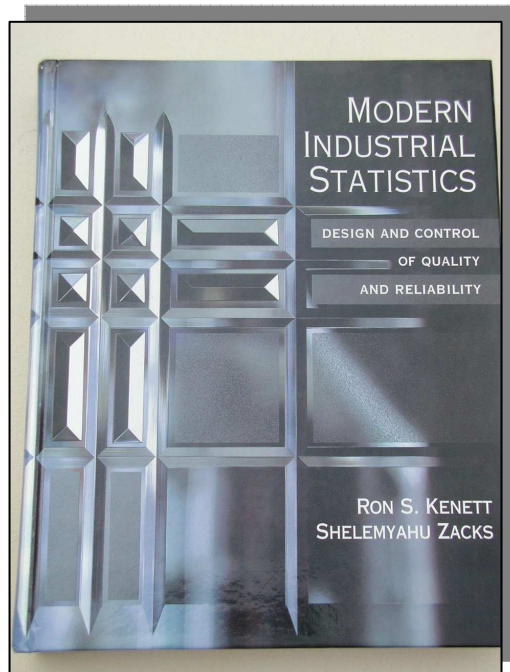
Ron S. Kenett, A. de Frenne, X. Tort-Martorell and C. McCollin, *The Statistical Efficiency Conjecture*, in **Applying Statistical Methods in Business and Industry – the state of the art**, Coleman, S., Greenfield, T., Stewardson, D. and Montgomery, D. (editors), Wiley, 2008.

The Organizational Structure: Supporting Six Sigma implementation



Six Sigma Training

Black Belt certification process



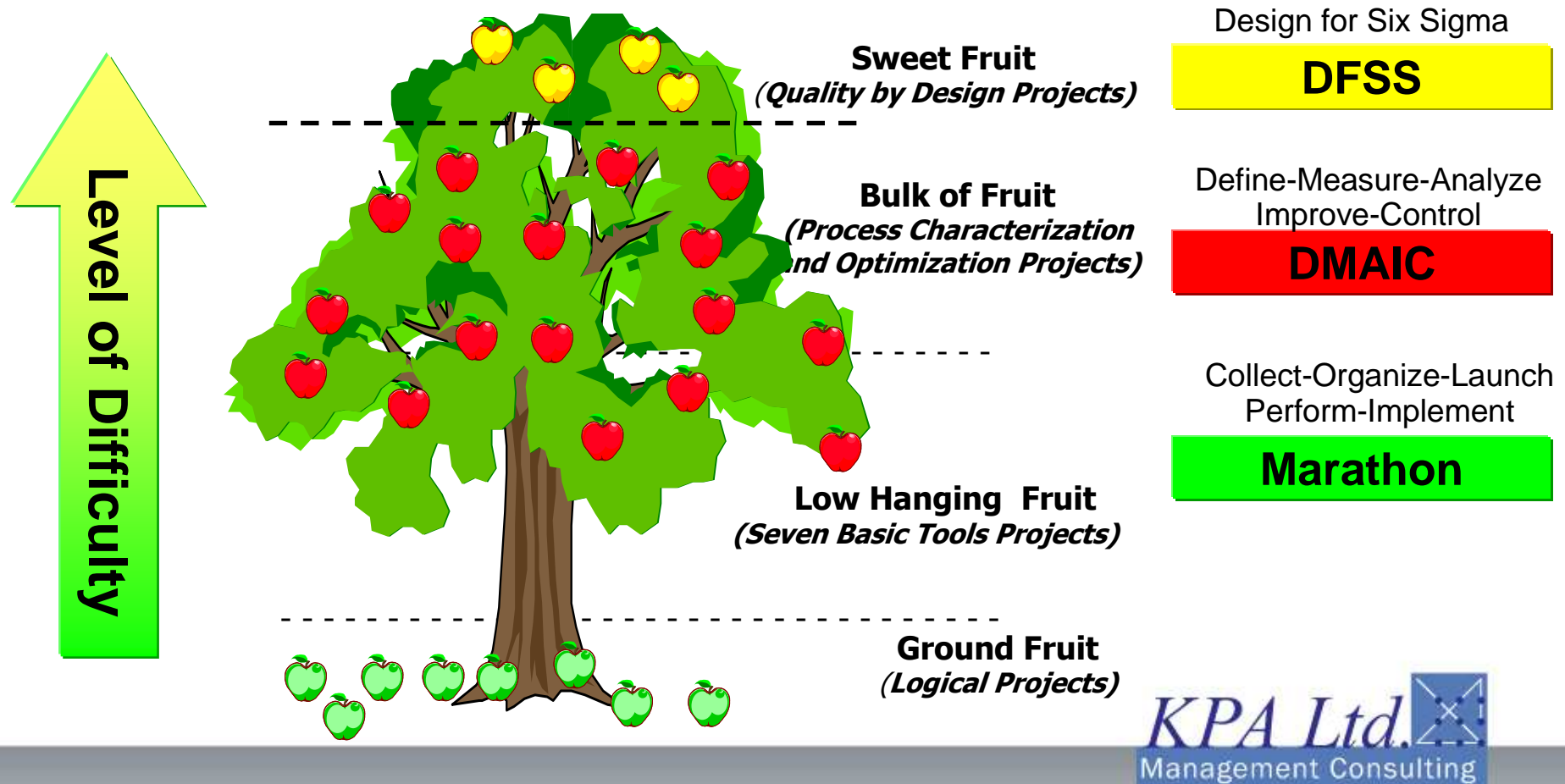
Part I: Statistical Thinking

- Understanding Variability
- Variability in Several Dimensions
- Basic Models of Probability
- Sampling for Estimation
- Parametric Statistical Inference
- Computer Intensive Techniques
- Multiple Linear Regression and ANOVA

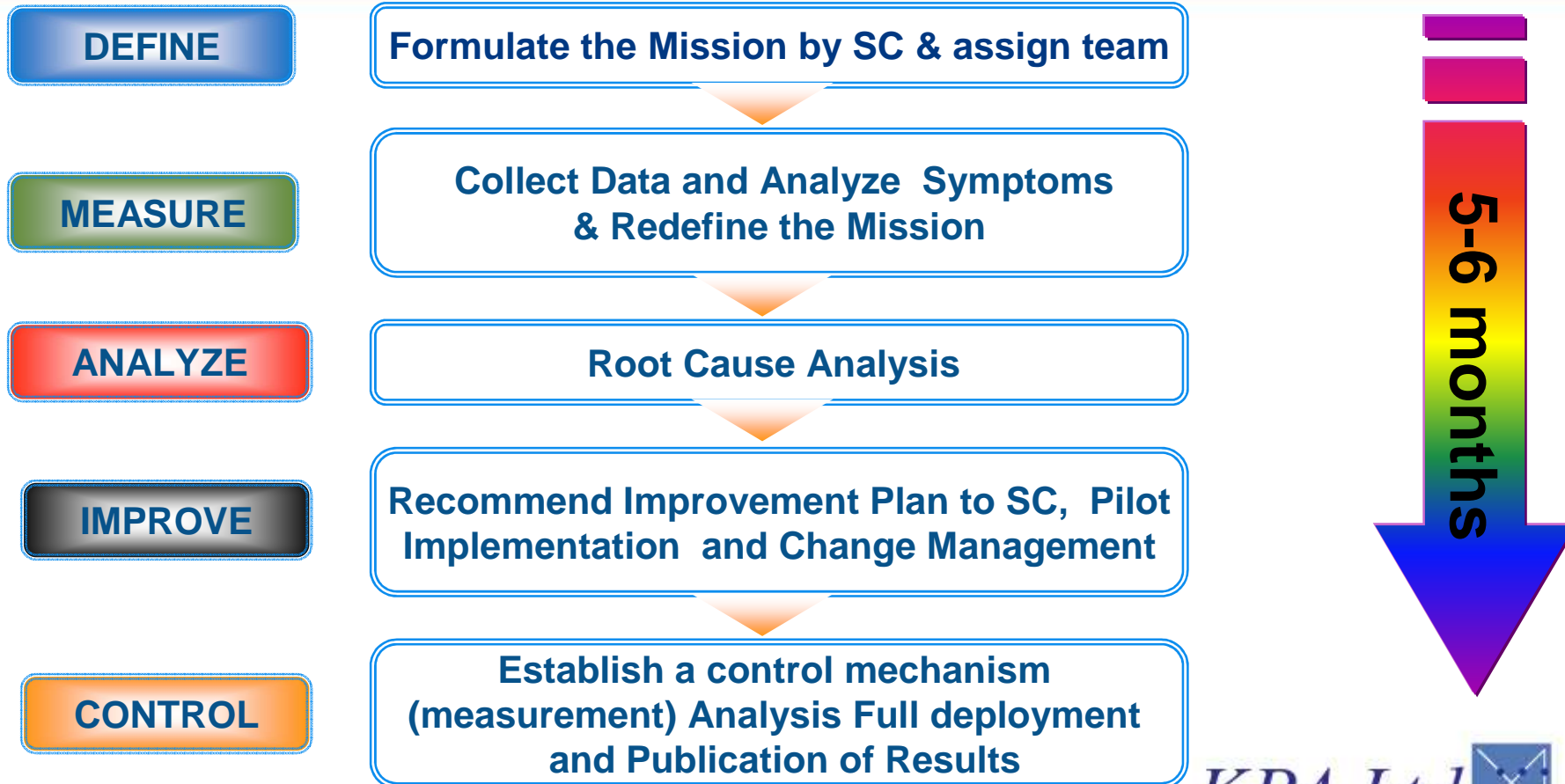
Part II: Industrial Statistics

- Acceptance Sampling
- Statistical Process Control
- Advanced Statistical Control
- Design of Experiments
- Quality by Design
- Reliability

Project Identification

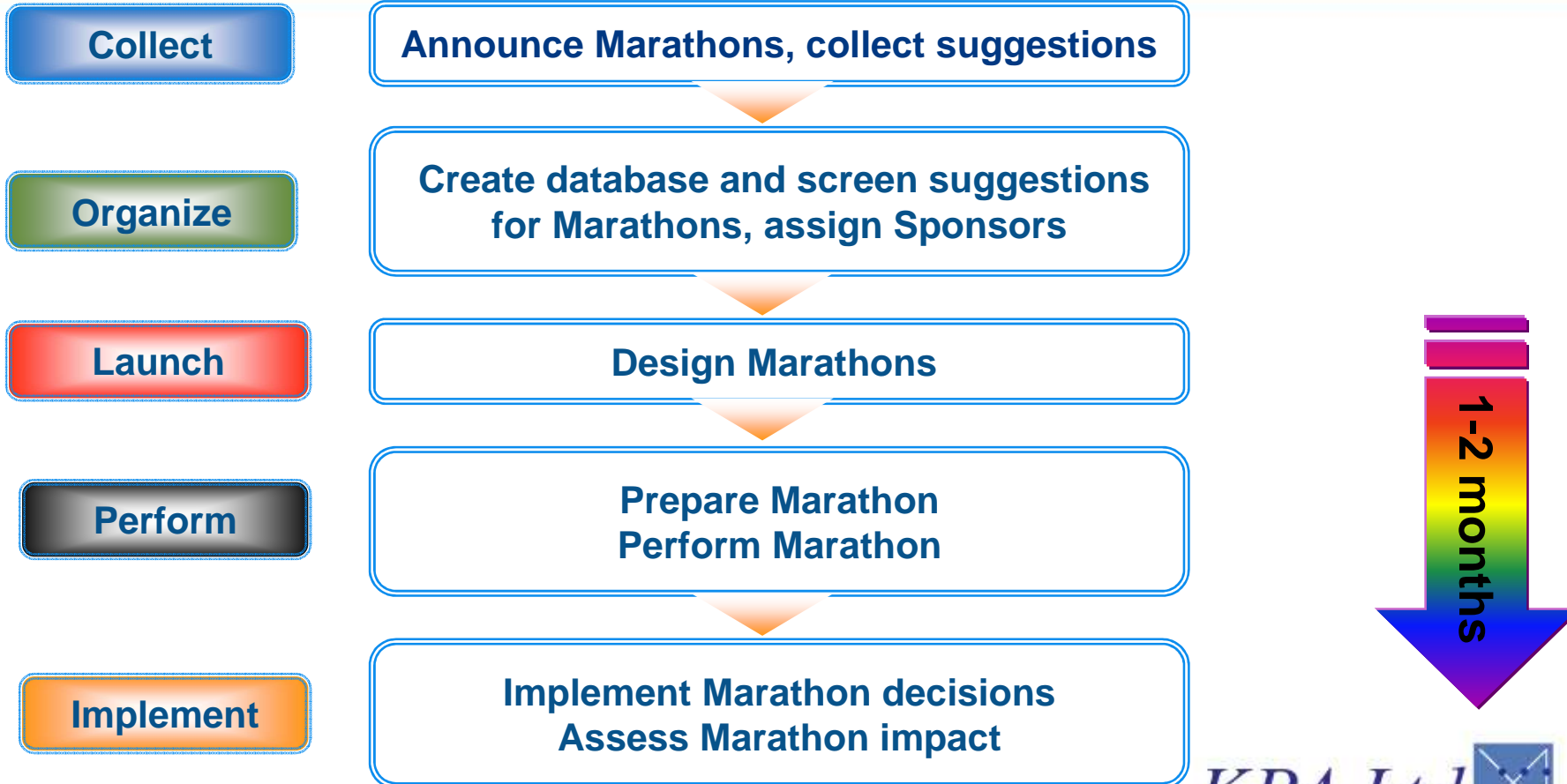


Six Sigma Methodology



D M A I C

Marathon Methodology



COLPI

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Matrix Criteria Ranking

- List criteria to assess projects – brainstorming, eg
 - Impact on customer satisfaction
 - Required investment
 - Ability to implement etc.
- Select top 3 – voting
- Voters place their votes for each criterion
- Add up votes for each project
 - Scale by 1 (low), 2 (medium) or 3 (high)
- Select projects

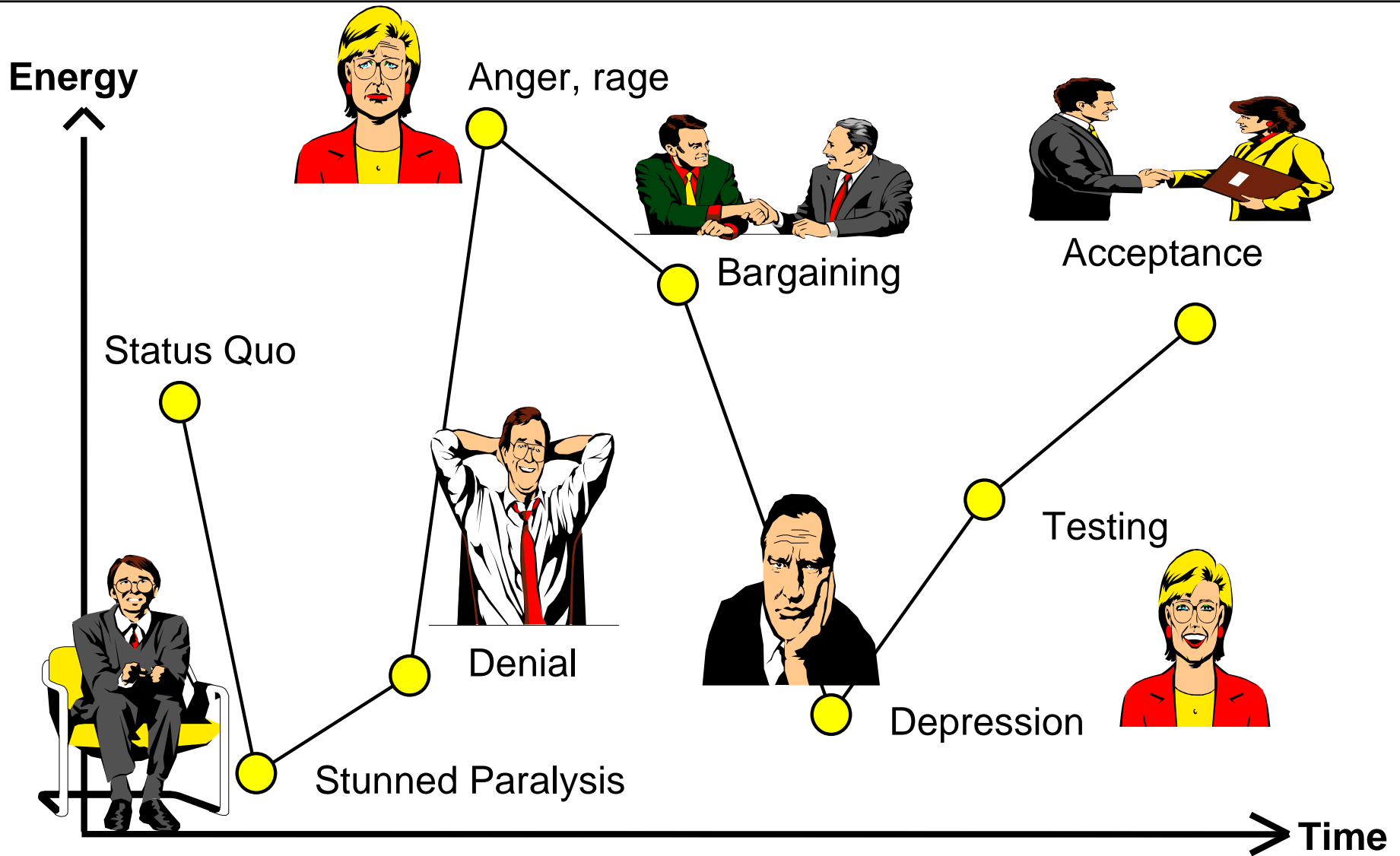
Six Sigma ROI

- In 1995 mandated each GE employee to work towards achieving 6 sigma
- In 1995 the average process at GE was 3 sigma
- In 1997 the average reached 3.5 sigma
- In 1998 investments in 6 sigma training and projects reached 45MUS\$, profits increased by 1.2BUS\$

“the most important initiative GE has ever undertaken”.

**Jack Welch
Chief Executive Officer
General Electric**

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Expect resistance to change!



Thank you for your
attention

and

good luck on your
improvement journey

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