Five Sigma® Project Management
Emerging Best Practices to Achieve Better Bottom Line Results

Advancing the Theory and Practice of Project Management®

Presented For

Boston Chapter of SPIN

By John M. Nevison

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Definition: Five Sigma® Project Management

- Five Sigma® Project Management is an innovative business approach to projects that
  - Focuses on building economic value
  - Incorporates realistic variation in robust plans
  - Encourages creative and flexible management
  - Enables data-driven continual improvement
  - Builds better businesses
- Five Sigma® PM builds on:
  - Quality management (TQM and "six-sigma")
  - Improvements to "critical chain"
  - PMI PMBOK Guide

Five Sigma® Elements

- Start with economic value
- Protect your people by managing the portfolio
- Focus on robust planning
  - Range-based effort estimation
  - Normal (yellow, red) buffers
- Measure objectively
- Respond creatively and flexibly
- Evolve through practice development

Project Charter: Start With First Questions

- What is the cost of not doing it?
- What is the cost of postponing it?
- What are its benefits compared to its cost? (See Search List)
- Can I prove it to management?
- Can I prove it to stockholders?

(IT) Project Charter: Start With Quick Value Check

Rate each project's value by answering the following questions using the relative scales. (More is better)

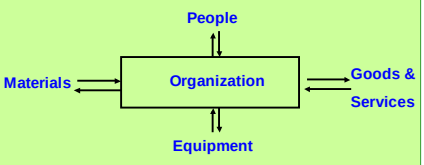
1. How many people will use the result? (1-10, 10 high))
2. How often will people use the result? (More frequently is better, 1-10, 10 high)
3. How much will the result save? (1-5, 5 high)
4. How many people will collaborate when using the result? (1-5, 5 high)
5. How much key information will the result involve? (1-5, 5 high)

Adapted from work by Nucleus Research Inc.

Start With a Business Model: New Product Development

	Years				
	0	1	2	3	4
Benefit: Sales		143	463	375	168
Cost: Costs		105	369	339	165
Project Cost	70				
Net Bnft: Profit	(70)	38	93	36	3
Cumulative Net Bnft: Profit	(70)	(32)	61	97	100

Finding Costs and Benefits



Costs & Benefits: Search List

- Material
  - Buy
  - Store
  - Sell
- People and Equipment
  - Hire
  - Maintain
  - Retire
- One-time and recurring!

Calculating Benefits: Examples

1. Saved material or saved time?
   - $.30 / item
   - 20 minutes / week / person
2. The dollar value of the saving?
   - $.30 / item x 50,000 items = $15,000.
   - 20/ 2400 minutes / week x $1,350 weekly salary = $11.25
   - x 200 people / week = $2,250 / week
3. One-time or recurring?
   1. In what time period does the one-time occur?
      - Purchased in the second quarter
   2. How much per time period is the recurring amount?
      - 2,250 x 13 weeks = $29,250 / every quarter

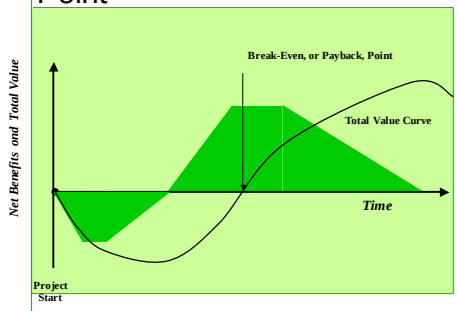
Exercise: Business Model

1. Individually, you should: (5 minutes)
   - Think of a recent project and estimate its cost.
   - Identify the big costs and benefits of the project. (For help, see the Search List, and Cost Benefit Calculation)
   - Rough out the product's future stream of benefits and costs. Calculate the net, and net cumulative benefits
2. When you are done, pair up and, taking turns: (5 minutes)
   - Explain your estimate to your partner.
   - Explain what additional information you would need before you presented your model to your management.

Net Benefit Economics

Do the positive projects, all the positive projects, and nothing but the positive projects.

The Value Curve and Payback Point



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People Constraints and Project Portfolio Choice

Project	Cost	Benefit	Net Benefit	Needed People
Able	200	230	30	20
Baker	125	141	16	23
Charlie	175	194	19	8
Delta	150	162	12	15
Echo	150	167	17	15

Available Investment Capital (cost) = 300
Available People = 34
Which project(s) do you pick?

Derived from Copeland and Weston

Exercise: Portfolio Choice

1. Individually, you should: (5 minutes)
   - Examine the choices and decide what the best combination of projects.
2. When you are done, pair up and, taking turns: (5 minutes)
   - Explain your estimate to your partner.

Net Benefit Portfolio Economics

Within the constraints, choose the portfolio of projects that yields the most benefit.

Overscheduling Destroys Productivity

Projects per Engineer

From *Wheelwright and Clark* (1992) Fig 4-2.

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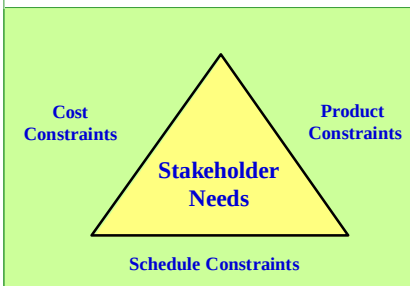
The "Triple" Constraint



Project Plan Contents

Executive summary
- ✔ Scope statement
- ✔ Cost estimate
- ✔ Major milestones (bar chart)
- ✔ Critical risks
- ✔ Pending issues/decisions

Supporting detail
- ✔ Team list and roles
- ✔ Product description
- ✔ Work Breakdown Structure
- ✔ Network diagram and schedule
- ✔ Accountability matrix
- ✔ Communication plan
- ✔ Risk response plans

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Deming Process Uncertainty

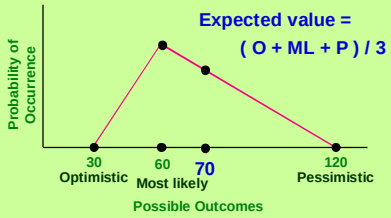
- Common Cause – (estimation)
  (process random variation)
  Small often unexplainable causes
  Affects activity effort and especially duration
- Special Cause – (risk analysis)
  (outside of process random variation)
  Known or unknown, but assignable, causes
  Large impact on schedules or budgets

What Is a Good Estimate?

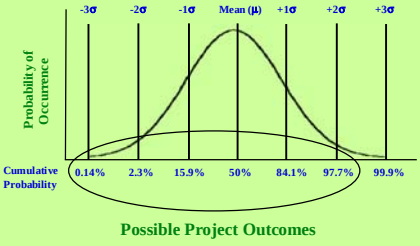
- It is a *range* of likely results:
  - Based on *experience*
  - *Not* a guess, *not* a single price, *not* a guarantee

Capture the Uncertainty…

…with a range estimate



The Clipped Normal Curve and the Five Sigma® Target



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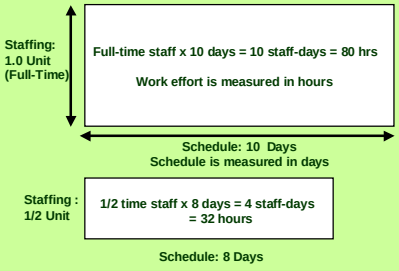
Critical Chain--What is it?

- A novel by Eliyahu M. Goldratt
- An assumption about estimation (*padding*, *focus on full time*)
- A clever name for a resource-leveled critical path (*critical chain*)
- A "crashed" critical path, managed by its path slack (*path buffer*)
- Related to a "theory of constraints" (*TOC*)
- A very rough set of rules of thumb

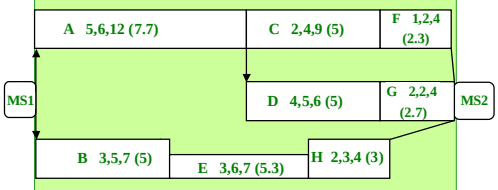
Five Sigma® Improves Critical Chain

- Range-based estimation
- Correct calculation of path buffers (slack)
- Better diagrams
- Better buffer management
- Resource management with manual scheduling
- Robust schedules that balance resources and economic value

The Work Estimation Rectangle



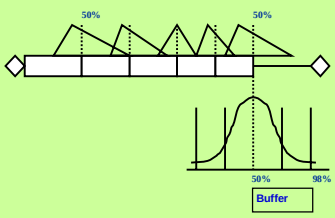
NTSN© Diagram



- **Task identifier: low, likely, high (mean) duration**
- **All dependencies FS**

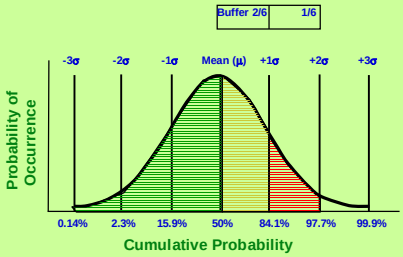
Nevison Time-Scaled Network (NTSN©) Diagram

Range-based durations lead to a "normal" buffer



Enhanced NTSN© Diagram

Five Sigma® (Yellow-Red) Buffer: Ignore green, watch yellow, manage red



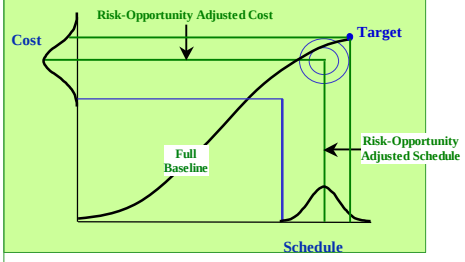
Exercise: Buffer Estimate

1. Estimate three-point durations for several activities on a critical path.
2. Add up the activity means and variances.
3. Calculate the path standard deviation as the square root of the total variances.
4. Identify the mean critical path, the 2-sigma buffer, and the 5-sigma target date.
5. Show your answers to a partner at your table.

Deming Process Uncertainty

- Common Cause – (estimation)
  - (process random variation)
  - Small often unexplainable causes
  - Affects activity effort and especially duration
- Special Cause – (risk analysis)
  - (outside of process random variation)
  - Known or unknown, but assignable, causes
  - Large impact on schedules or budgets

The 5σ Plan's Risk-Adjusted Cost, Schedule, and Full Baseline



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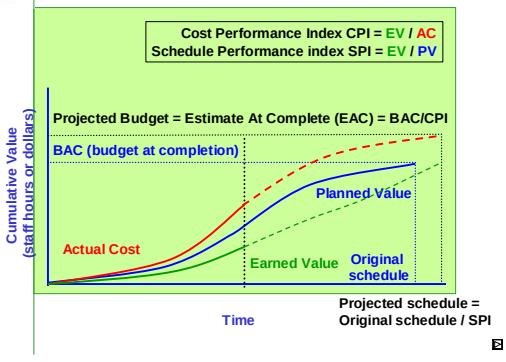
Navigate with Earned Value



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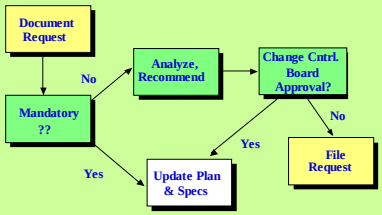
Respond with Trade-offs

- Product features with cost?
- Product features with schedule?
- Schedule with product features?
- Schedule with cost?
- Cost with schedule?
- Cost with produce features?
- *Stakeholder constraint value influences response planning tradeoffs*

Manual Scheduling

1. Start with each person's maximum availability
   - Typically 19 to 22 days/month
   - Can be as low as 15 days/month (December)
2. Subtract time off (vacation, holidays)
3. Subtract time out (training, trade-shows)
4. Subtract job work (system imposed dues)
5. Limit critical-path assignments to 80-85% (other work 15-20%)
6. For the next month, negotiate and agree on a schedule

Respond With Change Request Processing



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Practice Development: Input

- "Closeout begins with initiation"
- A project manager journal
- ***Lessons learned*** always a deliverable

Practice Development

- Every project creates opportunities to:
  - learn
  - build new capabilities
- *Individuals* learn naturally from experience, but *organizations* don't.
- *Organizational learning* requires collecting and analyzing individuals' experiences and using the analysis as a catalyst to improve.
- Capture **lessons learned** and deploy them to the organization.
- Through *practice development* lessons learned become standard operating procedures (SOP)

Source: Oak Associates' practice data

Practice Development Improves…

- Individual manager's competence
- Business infrastructure
  - Project management is understood and supported
  - Organizational PM maturity grows
- Business performance
  - Higher quality products
  - Faster, cheaper projects
  - More productive people
  - More profitable business

Business Performance

For an Oak client who is a leading marketing and professional services company

- 100% of all projects delivered on budget, on scope and on time for largest corporate client within three months of new methods and management
- 50% cost reduction in execution across all initiatives for second largest corporate account within six months
- Doubled profitability on a multi-million dollar account in under six months
- 20% - 50% increase in revenues for key regional accounts from scope and change management
- Reduced costs by 20% per year on major ongoing initiatives

Source: Oak Associates' practice data

Business Performance: Industrial Data

- Improve people's productivity (35%/year)
- Speed time to market (15%-23% per year)
- Reduce post-release defects (39%/year)
- Increase profits (Average of $5 returned for every $1 invested)

Sources: Oak Associates research and Herbsleb, et. al., "Software Quality and the Capability Maturity Model," Communications of the ACM, June 1997.

Exercise: Lesson Learned

1. Note your most memorable *lesson learned* from a recent project. (1 minute)
2. Decide why it has (or has not) become *standard operating procedure (SOP)*.
3. If it has not, how could you help it become one?
4. Share your results with a colleague. (10 minutes)

Five Sigma® Elements (Reprise)

- Start with economic value
  - Build a business model
- Protect your people by managing the portfolio
  - Do less work in parallel
- Focus on robust planning
  - Range-based effort estimates
  - Normal (yellow, red) buffers
- Measure objectively
  - Navigate with earned value
- Respond creatively and flexibly
  - Manually schedule creative people
- Evolve through practice development
  - Turn lessons learned into SOP

References

- ----------., 2001, *Five Sigma Project Management: Program Notebook*, Maynard, MA: Oak Associates, Inc.
- Cooper, Robert G., 1993, *Winning at New Products: Accelerating the Process from Idea to Launch, Second Edition*, Perseus Books.
- Copeland, Thomas E. and J. Fred Weston, 1988, *Financial Theory and Corporate Policy, Third Edition* Reading, MA: Addison-Wesley
- Durrenberger, Mark, May 1999, "True Estimates Reduce Project Risk," *pmNetwork*, Vol. 13, No. 5
- Goldratt, Esiyahu M., 1997, *Critical Chain*, Great Barrington, MA: The North River Press
- Herbsleb, et. al., June 1997, "Software Quality and the Capability Maturity Model," *Communications of the ACM*,
- House, Charles and Price, January-February 1991, "The Return Map: Tracking Product Teams," *Harvard Business Review*
- Newbold, Robert C., 1998, *Project Management in the Fast Lane; Applying the Theory of Constraints*, New York, NY: St. Lucie Press

References (cont.)

- Nevison, John M., 1981, *Executive Computing: How to get it done on your own*, Reading, MA: Addison-Wesley
- Nevison, John M., 2000, *Embracing the Dragon's Tail: Range Estimation of Project Cost and Schedule*, White Paper, Maynard, MA: Oak Associates, Inc.
- Patterson, Marvin, 1999, *Leading Product Innovation: Accelerating Growth in a Product-Based Business*, John Wiley & Sons.
- Project Management Institute, 2000, *A Guide to the Project Management Body of Knowledge, 2000 Edition*, Newtown Square, PA: PMI Press
- Smith, Preston and Reinertsen, *Developing Products in Half the Time: New Rules, New Tools*, 1998, Van Nostrand Reinhold
- Wheelwright, Steven C., and Kim B. Clark, 1992, *Revolutionizing Product Development*, New York, NY:The Free Press
- Young, S. David, and Stephen F. O'Byrne, 2001, *EVA(R) and Value -Based Management: A Practical Guide to Implementation*, New York, NY:McGraw-Hill

References (on-line)

- **Jmn@oakinc.com**
- **www.oakinc.com**
  - **Articles**
  - **Tools at www.oakinc.com/studentfiles**
- **Project Management Institute (PMI) pmi.org**