system design & management

Applying Systems-Based Methods to Challenges in Product Development, Management, and Organizational Dynamics

MITsdm

15+ Years Later - SDM in the Real World.

Why Is This Topic Important?

THE STANDISH GROUP

MODERN RESOLUTION FOR ALL PROJECTS

	2011	2012	2013	2014	2015
SUCCESSFUL	29%	27%	31%	28%	29%
CHALLENGED	49%	56%	50%	55%	52%
FAILED	22%	17%	19%	17%	19%

The Modern Resolution (OnTime, OnBudget, with a satisfactory result) of all software projects from FY2011–2015 within the new CHAOS database. Please note that for the rest of this report CHAOS Resolution will refer to the Modern Resolution definition not the Traditional Resolution definition.

Standish Group 2015 Chaos Report
https://www.infoq.com/articles/standish-chaos-2015

THE STANDISH GROUP

CHAOS RESOLUTION BY AGILE VERSUS WATERFALL

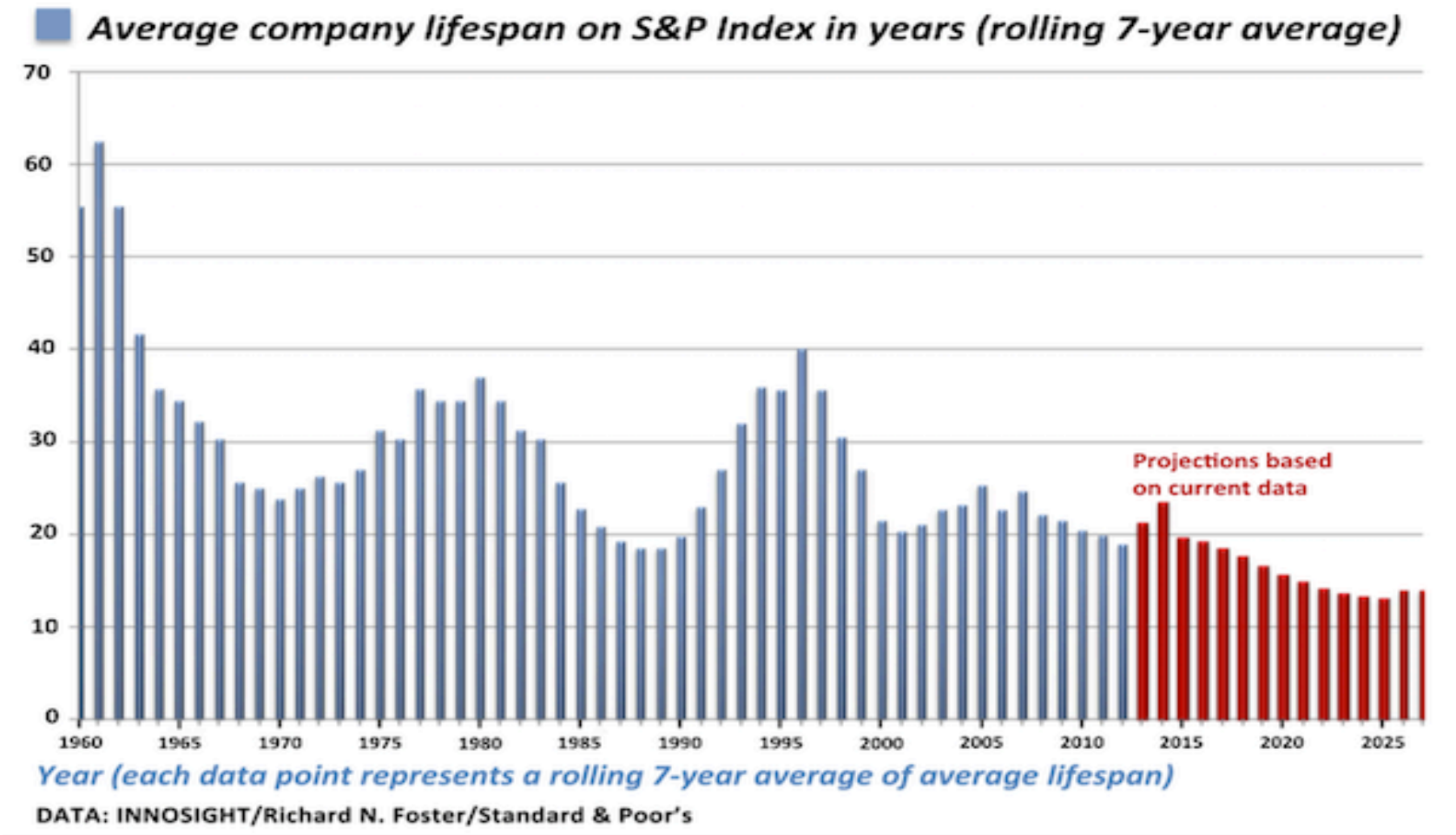
SIZE	METHOD	SUCCESSFUL	CHALLENGED	FAILED
All Size Projects	Agile	39%	52%	9%
	Waterfall	11%	60%	29%
Large Size Projects	Agile	18%	59%	23%
	Waterfall	3%	55%	42%
Medium Size Projects	Agile	27%	62%	11%
	Waterfall	7%	68%	25%
Small Size Projects	Agile	58%	38%	4%
	Waterfall	44%	45%	11%

The resolution of all software projects from FY2011–2015 within the new CHAOS database, segmented by the agile process and waterfall method. The total number of software projects is over 10,000

THE STANDISH GROUP

FACTORS OF SUCCESS	POINTS	INVESTMENT
Executive Sponsorship	15	15%
Emotional Maturity	15	15%
User Involvement	15	15%
Optimization	15	15%
Skilled Resources	10	10%
Standard Architecture	8	8%
Agile Process	7	7%
Modest Execution	6	6%
Project Management Expertise	5	5%
Clear Business Objectives	4	4%

We are Running out of Time to Get it Right



http://www.onlydeadfish.co.uk/.a/6a00d8341d4dc653ef01b7c7c74037970b-popup

A Bad Combination

- Large Project Success Rate of Less Than 20%
- Average Fortune 500 Life Expectancy approaching 15 Years

"Would you like me to give you a formula for success? It's quite simple, really: Double your rate of failure. You are thinking of failure as the enemy of success. But it isn't at all. You can be discouraged by failure or you can learn from it, so go ahead and make mistakes. Make all you can. Because remember that's where you will find success." **Thomas J. Watson**

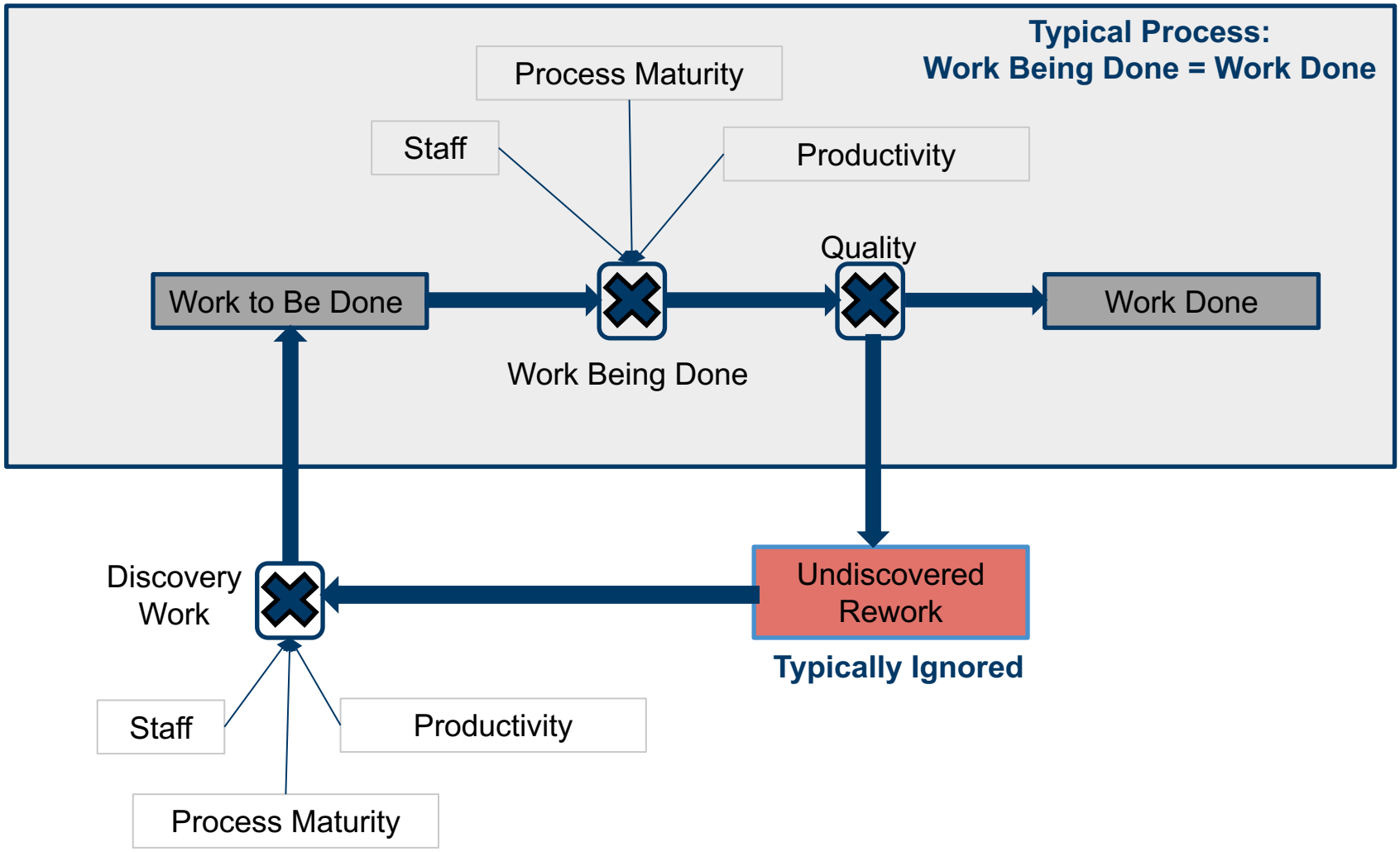
My Goals for Today

- Present Relevant Foundational SDM Learnings that Helped Me to Successfully Deliver Projects that Met or Exceeded Business Expectations
- Motivate you to learn more about the Tools.
- Share my Experience and Lessons Learned.

4 Foundational SDM Learnings that have Survived the Test of Time

- The Rework Cycle and a Balanced Process
- Disruptive Technology and The Innovator Dilemma
- Principles of Systems Architecture
- The Critical Chain – The Theory of Constraints

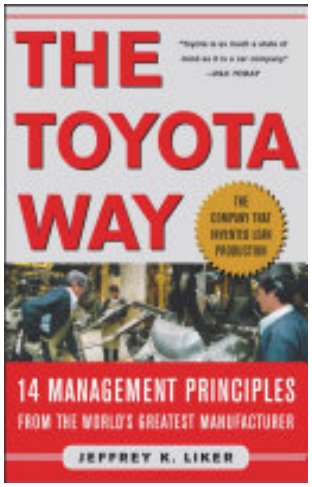
The Rework Cycle

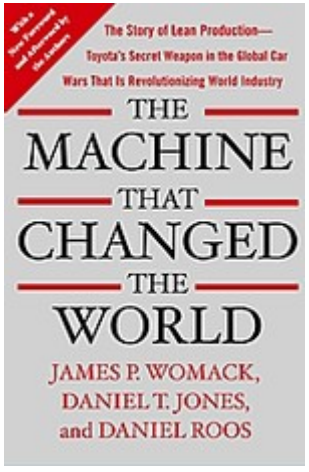


Rework Cycle – Lessons Learned

- Undiscovered Rework is Real and can not be ignored
- Undiscovered Rework drives the 90% Done Syndrome
- Shorter Development Cycles speed the Rework Discovery Cycle(s) – Agile SPRINTS
- Measuring, Analyzing and Root Cause Analysis on the Undiscovered Rework results in robust process improvements
- Investing in Techniques to Discover Rework faster pays high dividends. The Discovered Defects provide hints into the Undiscovered Defects.

A Balanced Process
LEAN Inventory Management

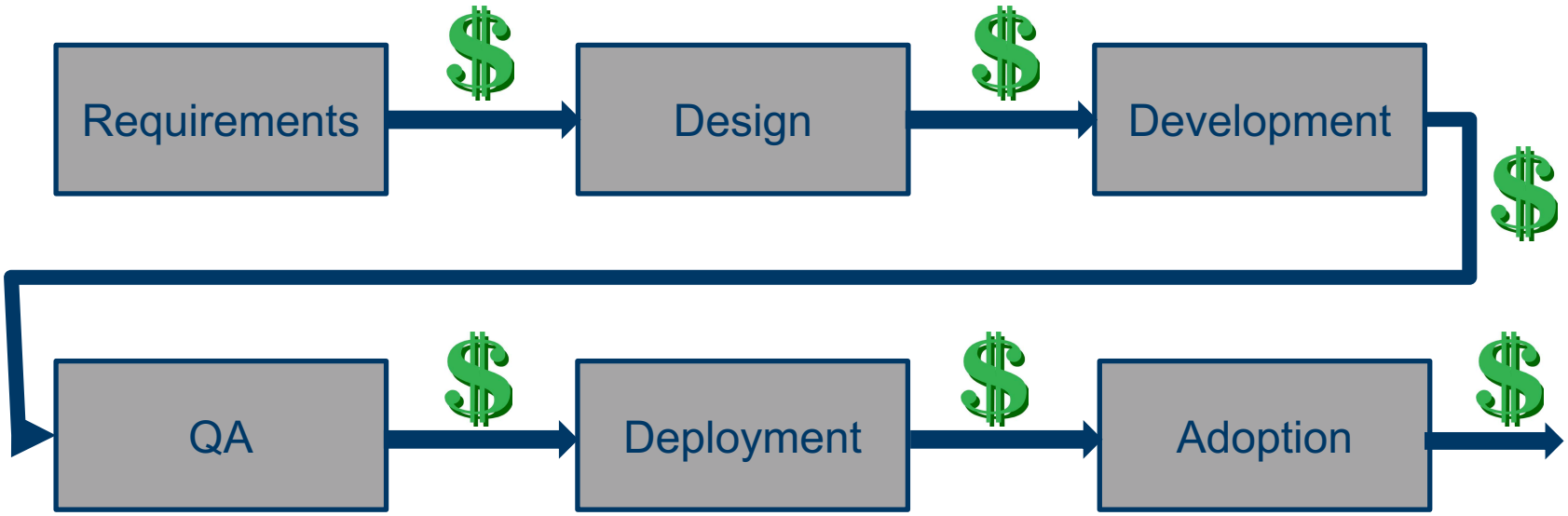


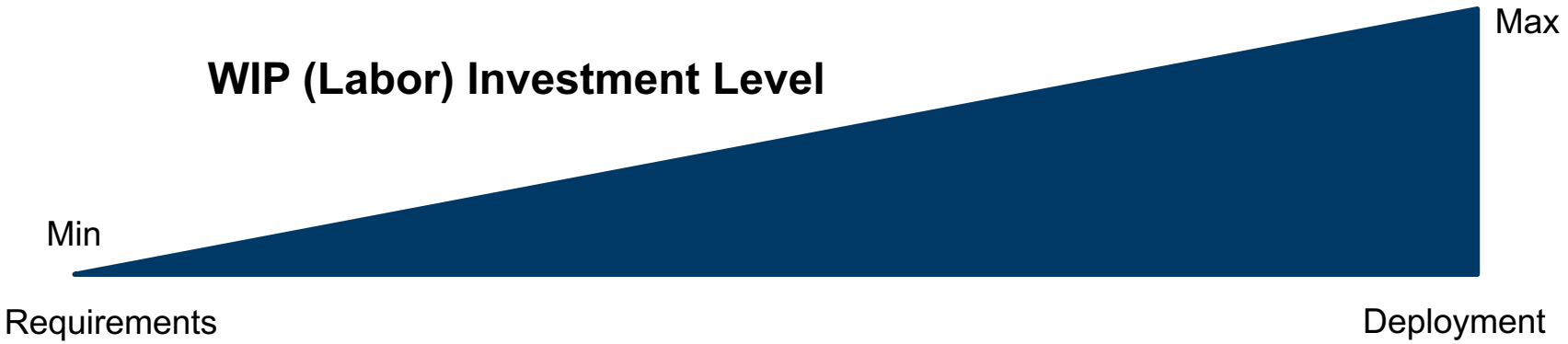


Toyota 14 Management Principles

1) Base Your Management Decisions on Long Term Philosophy
2) **Create Continuous Flow Process Flow to Bring Problems to the Surface**
3) **Use "Pull" System to Avoid Over Production**
4) **Level Out Workload**
5) Build a Culture of Stopping to Fix the Problem
6) Standardized Tasks are the Foundation for Continuous Improvement and Employee Empowerment
7) **Use Visual Controls So No Problems are Hidden**
8) Use Only Reliable, Thoroughly Tested Technology
9) Grow Leader Who Thoroughly Understand the Work, Live the Philosophy, and Teach it To Others
10) Develop Exceptional People and Teams Who Follow Your Company Philosophy
11) Respect Your Extended Network of Partners and Suppliers by Challenging Them and Helping Them to Improve
12) Go and See for Yourself to Thoroughly Understand the Situation
13) Make Decisions Slowly, Implement Decisions Rapidly
14) Become a Learning Organization Through Relentless Reflection and Continuous Improvement

Dev Op's from and Inventory Perspective



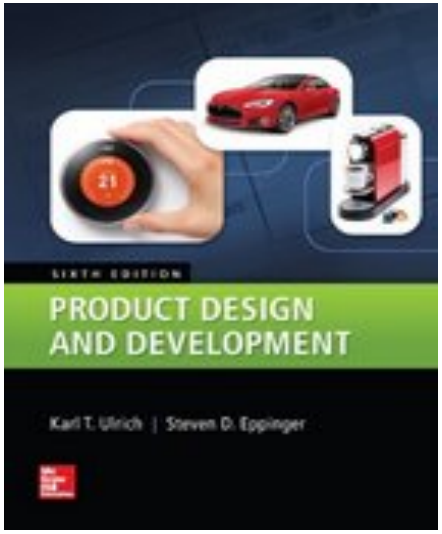


A Balanced Process – Lessons Learned

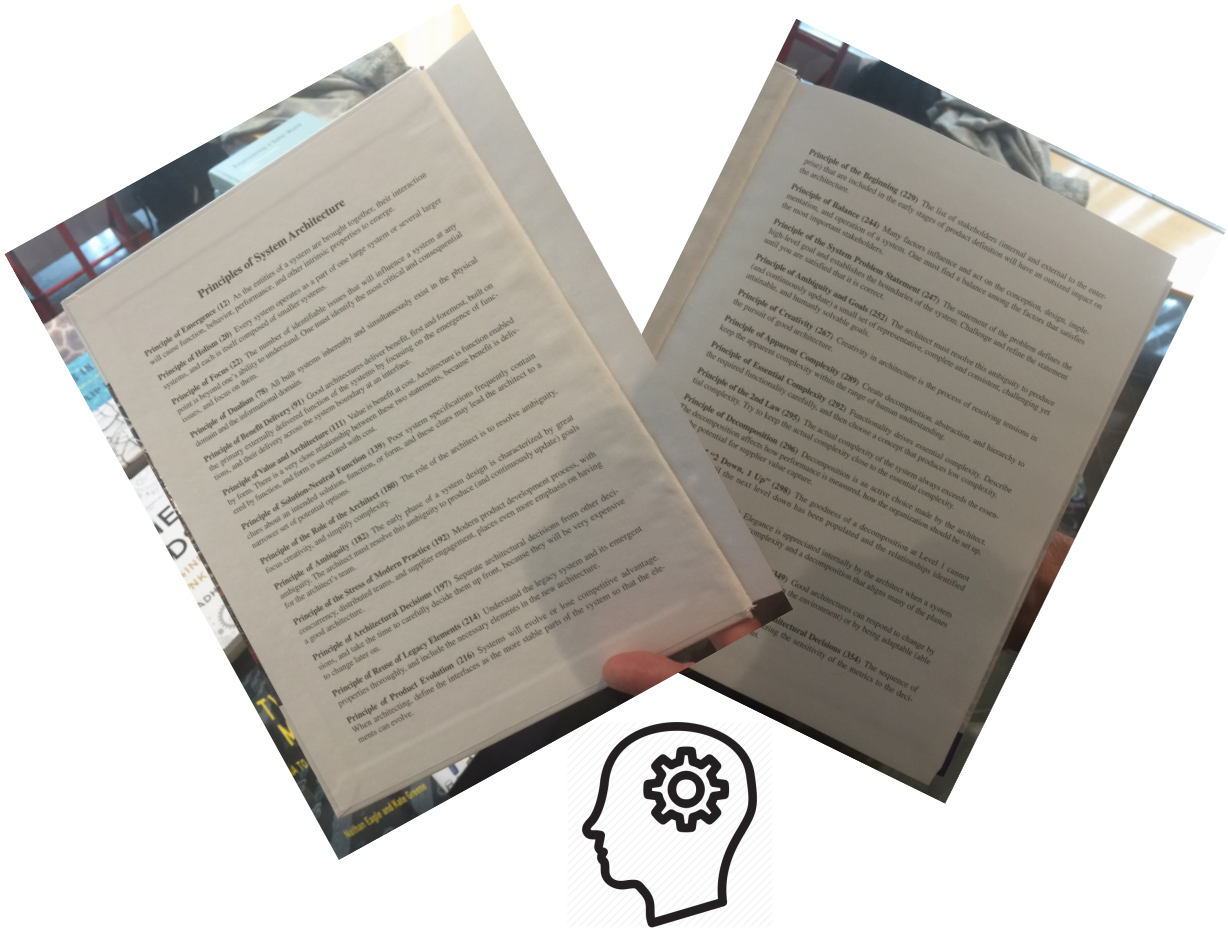
- Success is all about Adoption – Design a Pull System – Market Test Functionality Frequently
- Measure Inventory Amount and Turnover (aging) between each step. Inventory is Money, Labor is a Valuable Asset
- Build a Continuous Process System, avoid batching tasks before starting the next task – Make issues visible ASAP
- Staff the Process achieve a Balance Workflow.

1St Edition

6th Edition



Principles of System Architecture



Principles That I Retained after 15+ Years

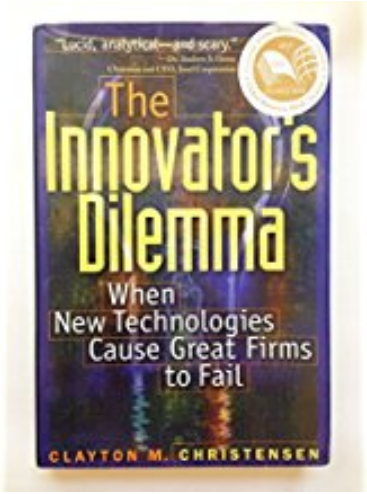
- **Principle of Holism:** **Every system operates as part of one large system or several larger systems, and each is composed of smaller systems**

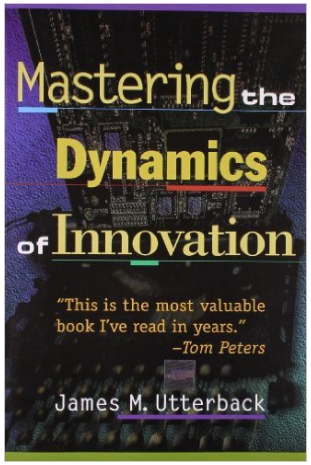
- **Principle of Essential Complexity**: Functionality Drives essential complexity. Describe the required functionality carefully, and then choose a concept that produces low complexity

- **Principle of Decomposition:** Decomposition is an active choice made by the architect. The decomposition affects how performance is measured, how organizations should be set up and the potential for supplier value capture

- **Principle of Product Evolution:** Systems will evolve or lose competitive advantage. When architecting, define the interfaces as the more stable parts of the system so that the elements can evolve.

Disruptive Technology and The Dynamics of Innovation





This is one of the innovator's dilemmas: Blindly following the maxim that good managers should keep close to their customers can sometimes be a fatal mistake."

— Clayton M. Christensen, The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail

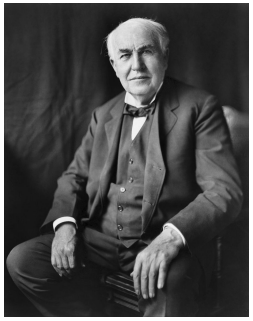
"Smart companies fail because they do everything right. They cater to high-profit-margin customers and ignore the low end of the market, where disruptive innovations emerge from." **Clayton Christensen**

"Those who study history and understand theory can make better predictions." **James M. Utterback,**

The Dynamics of Innovation

What do all of the below light bulbs have in common?

https://energy.gov/articles/history-light-bulb



Edison screw (ES) is a standard socket for light bulbs in the United States. It was developed by Thomas Edison and was licensed in 1909

https://en.wikipedia.org/wiki/Edison_screw

The Dynamics of Innovation – Impact on System Transformation

My experience : Legacy Systems are the “socket” that prevent unconstrained System Transformation.

Reasons:

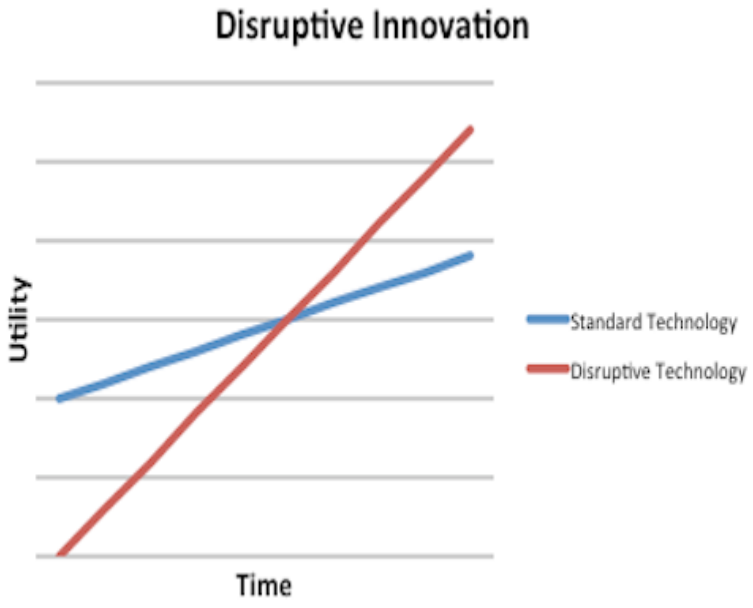
- Legacy Systems are at the Center of the Universe.
- The Legacy System is the System of Record
- Company Wide Processes, Training and Organizations have been optimized to align with the Legacy System

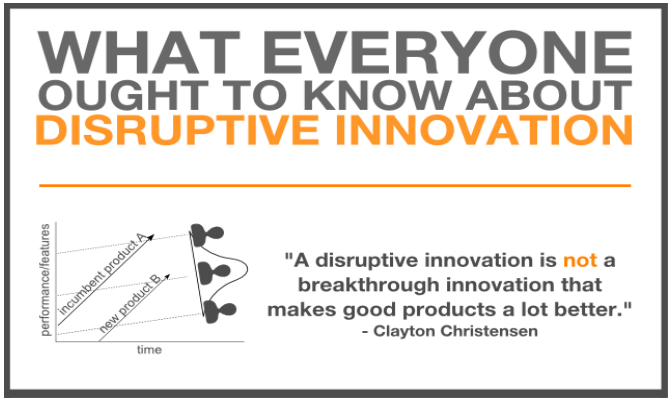
The Dynamics of Innovation – Lessons Learned

- **Move The Center of the Universe As Quickly as Possible**
- **Create the Desired Data Structure from the Start, manage the complexity during the transition**
- **Focus on Enterprise Wide Change Management**

Conway's Law: "Any organization that designs a system will inevitably produce a design whose structure is a copy of the organization's communication structure." **Melvin Conway**

Disruptive Innovation





http://hncnews.com/organizational-roots-disruptive-innovation

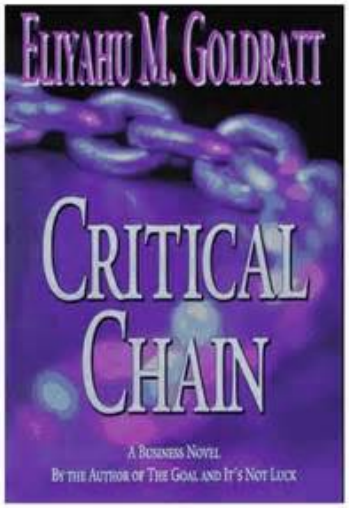
Because the Utility of New Innovations is less than the Legacy System:

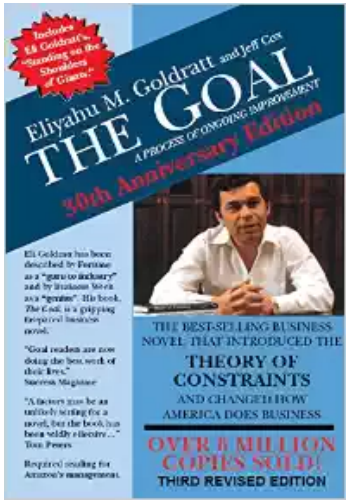
- Management rejects the Investment in technologies. The ROI does not make sense
- The Business Opportunities appear to be small with significant risk
- The functionality will get worse before it gets better
- Investment continues to flow into making the existing products better.

Disruptive Innovation – Lessons Learned when Making Technology Decisions

- **Factor in the Expected the Slope of Change when Developing Technology Strategies**
- **Study Emerging Technologies to Understand the Potential Impact the Technology can have on your Business.**
- **Run Test, Learn how to Fail Quickly and Fall Forward**

The Critical Chain - The Theory of Constraints





Food for thought

© Scott Adams, Inc./Dist. by UFS, Inc.

55

"I say an hour lost at a bottleneck is an hour out of the entire system. I say an hour saved at a non-bottleneck is worthless. Bottlenecks govern both throughput and inventory." **Eliyahu Moshe Goldratt**

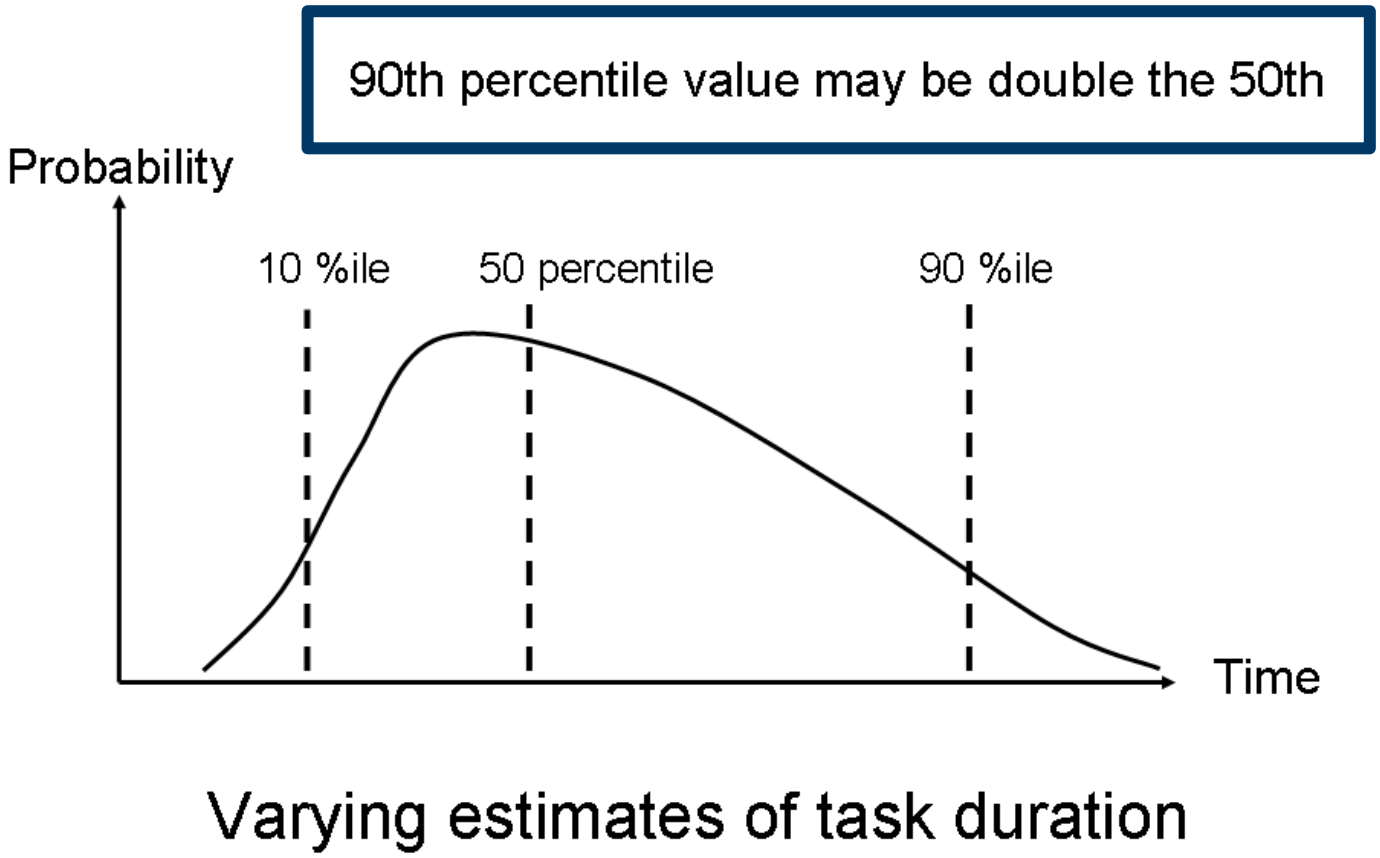
Typical Gantt Chart Method

- There is Uncertainty in All Task Estimations
- Tasks are Estimated at a 90% Certainty of Completion
- The Process Encourages Unproductive Behaviors

Unproductive Behaviors

- **Over Estimation**
- **The Student Syndrome**
- **Multitasking**
- **Tasks Never Finish Early**

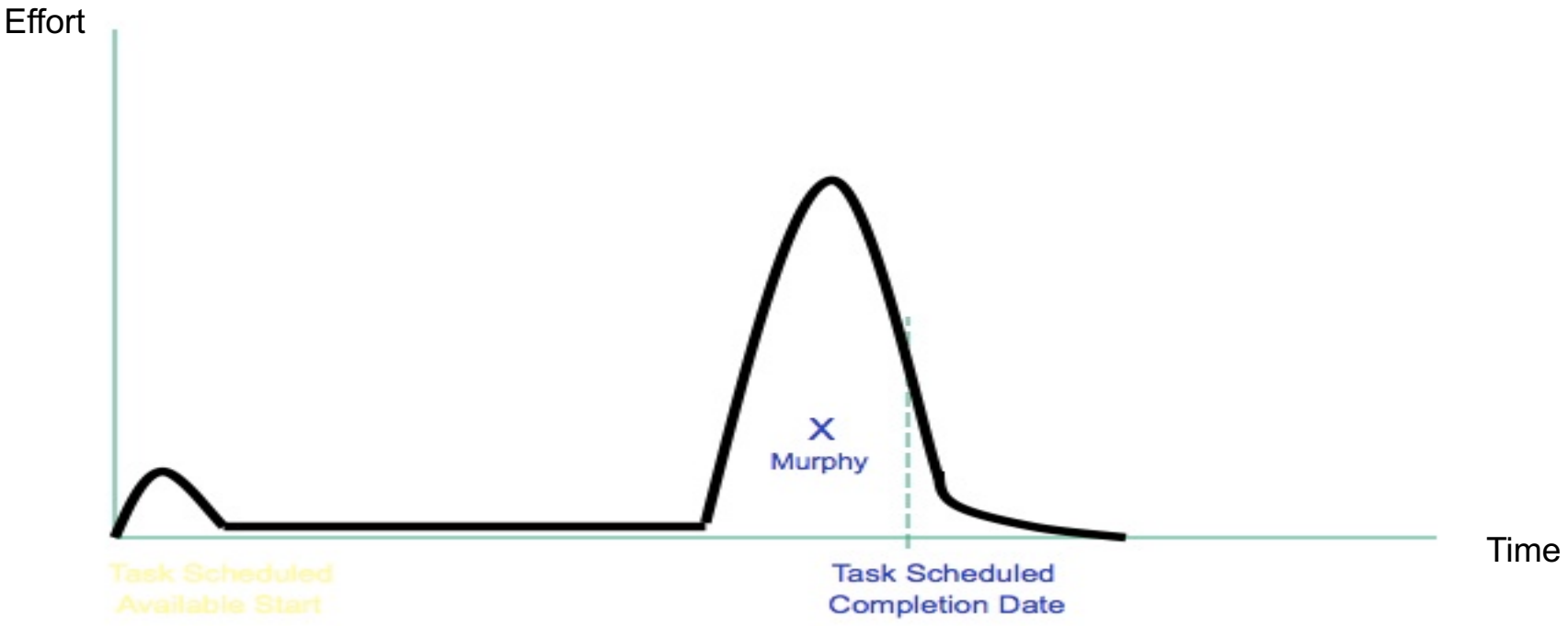
Over Estimation – Buffer In



Varying estimates of task duration

https://dw2blog.com/2008/10/01/the-student-syndrome/

The Student Syndrome – Buffer Out

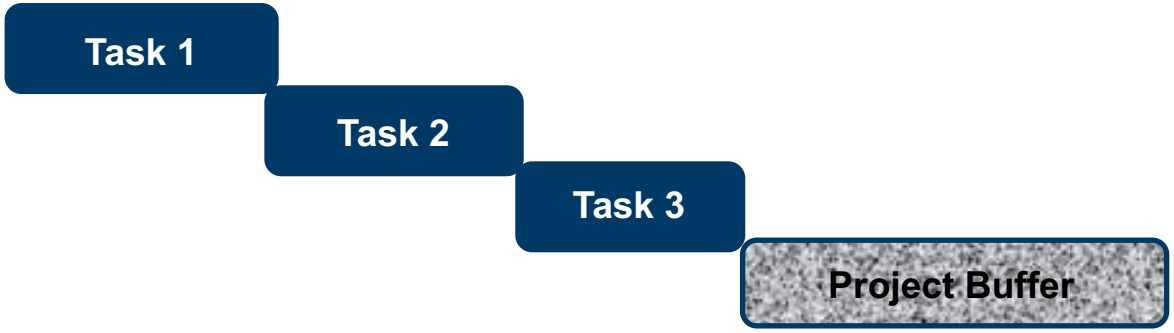


https://alexrogoventures.wordpress.com/2011/06/28/safety-safety-everywhere-but-still-not-finishing-projects-on-time/

Multitasking – Buffer Out

- **Switching Cost:** According to the American Psychological Association, shifting between tasks can cost you up to 40 percent productive time.
- **Less Effective :** A study by the University of Utah found that talking on even a hands-free mobile phone while driving can cause impairment similar to driving with a .08 blood-alcohol level
- **Slow Your Brain Down:** A study by Stanford researchers found the brains of people who multitask work less efficiently even when they're not multitasking.

Critical Chain Gantt Chart



- **Estimate Tasks at 50% Certainty Level (1/2 of 90% Estimate). To finish on time, the task needs to be started on time.**
- **Identify the Critical Path – One Day lost on the Critical Path = One Day Lost to the Project. No Multitasking on The Critical Chain**
- **Consolidate Individual Task Buffer into Project Buffer. Removing the Task Buffers enable Tasks to Finish Early**

Summary: Tools That Increase the Probability of Project Success.

- The Rework Cycle and a Balanced Process
- Disruptive Technology and The Innovator Dilemma
- Principles of Systems Architecture
- The Critical Chain – The Theory of Constraints

Thank You

Contact Information:

Ron.pepin@alum.mit.edu

linkedin.com/in/ronpepincio