



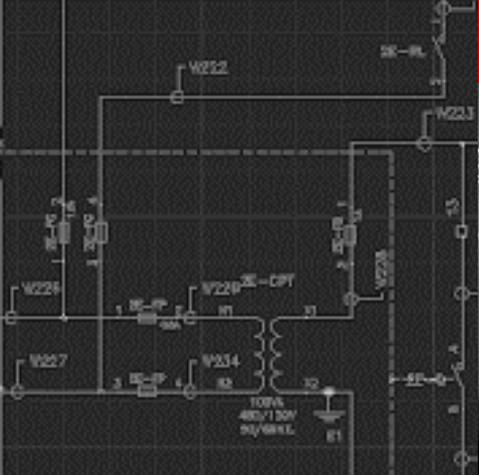
# Keynote for SOCAL ICEAA 2019

GALORATH





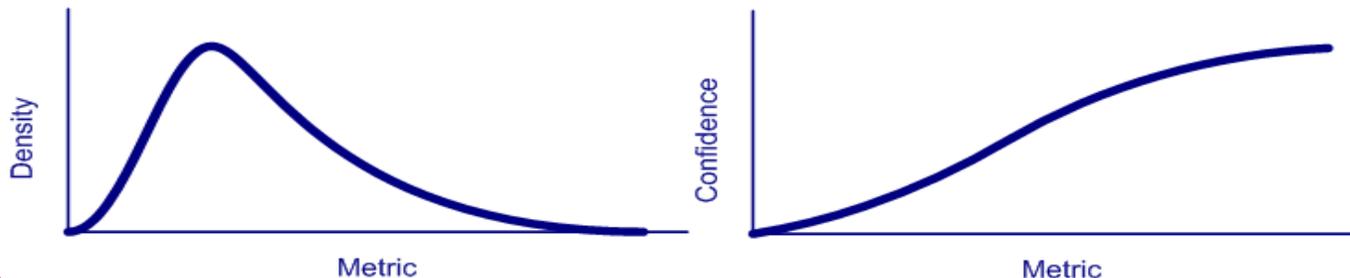
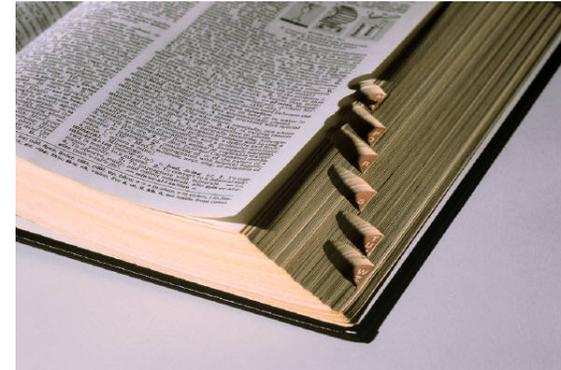
**Over 30 years of empowering informed decision making so that organizations can achieve their goals with greater confidence.**



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# Bad Estimates Are A Root Cause of Project Failure

- An **estimate** is the most knowledgeable statement you can make **at a particular point in time** regarding:
  - Effort / Cost
  - Schedule
  - Staffing
  - Risk
  - Reliability
- Estimates more precise with progress
- ***A WELL FORMED ESTIMATE IS A DISTRIBUTION***



# Vision of Parametrics Over the Next 20 Years Presented 2002



- Parametrics will be integrated into engineering processes and engineering decision making
  - For example: Cost of a system derived from simulation models of that system



- Parametrics will lose its “magic” reputation
  - Improved processes will yield better data
    - Augmentation of parametrics with more data will increase believability among engineers and management
  - The nay-sayers who say that can make parametric models say anything they want will be replaced with belief



- More dynamic parametrics based on both historical and real time data

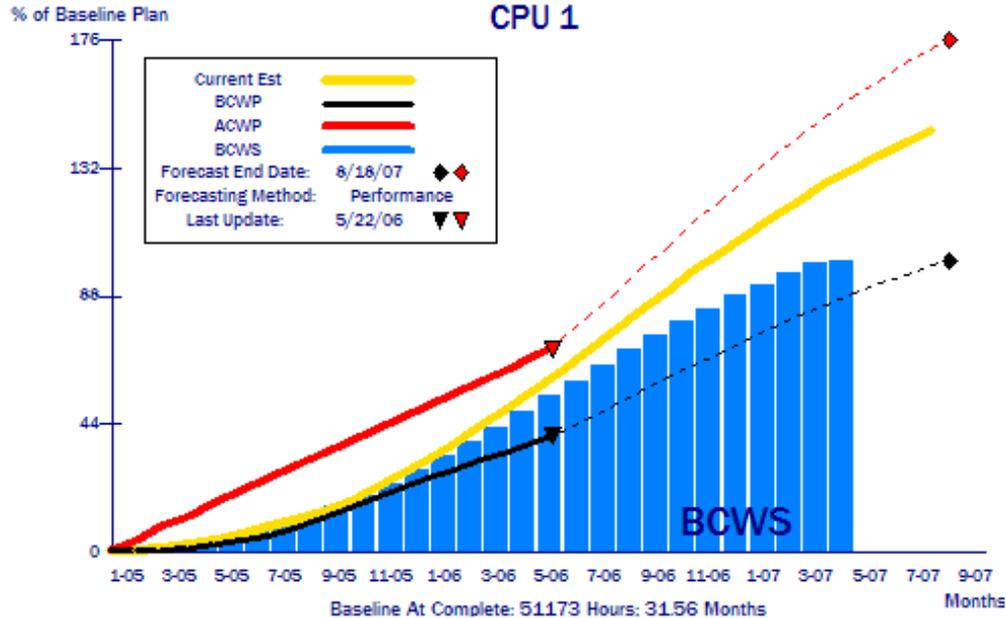


- Parametric models will be available to use as “objects” in financial and engineering analysis

# SEER PROJECT MONITOR & CONTROL

Add Performance Measurement (Enhanced Earned Value) methods to your toolbox

## SEE Big Picture



## Understand the Why

Schedule Variance	Time Variance	Cost Variance	Size Growth	Defects
BETTER	BETTER	BETTER	WORSE	WORSE
WORSE	WORSE	WORSE	WORSE	WORSE
BETTER	BETTER	WORSE	WORSE	BETTER
BETTER	WORSE	WORSE	NO CHANGE	WORSE
WORSE	WORSE	BETTER	WORSE	WORSE

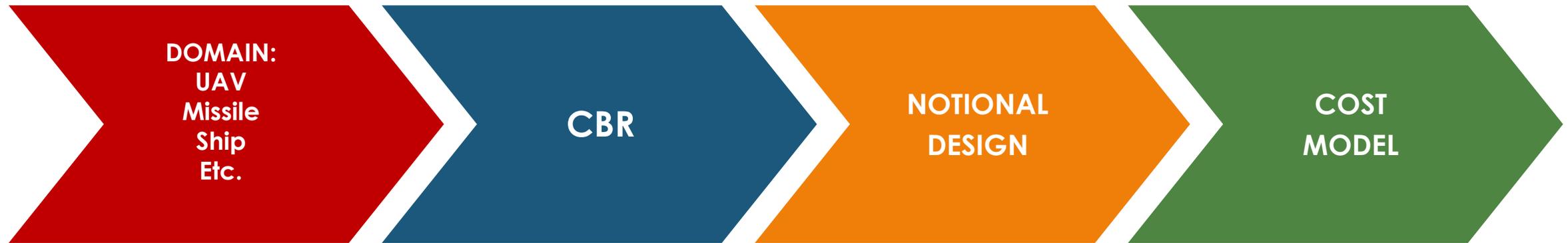


More dynamic parametrics based on both historical and real time data



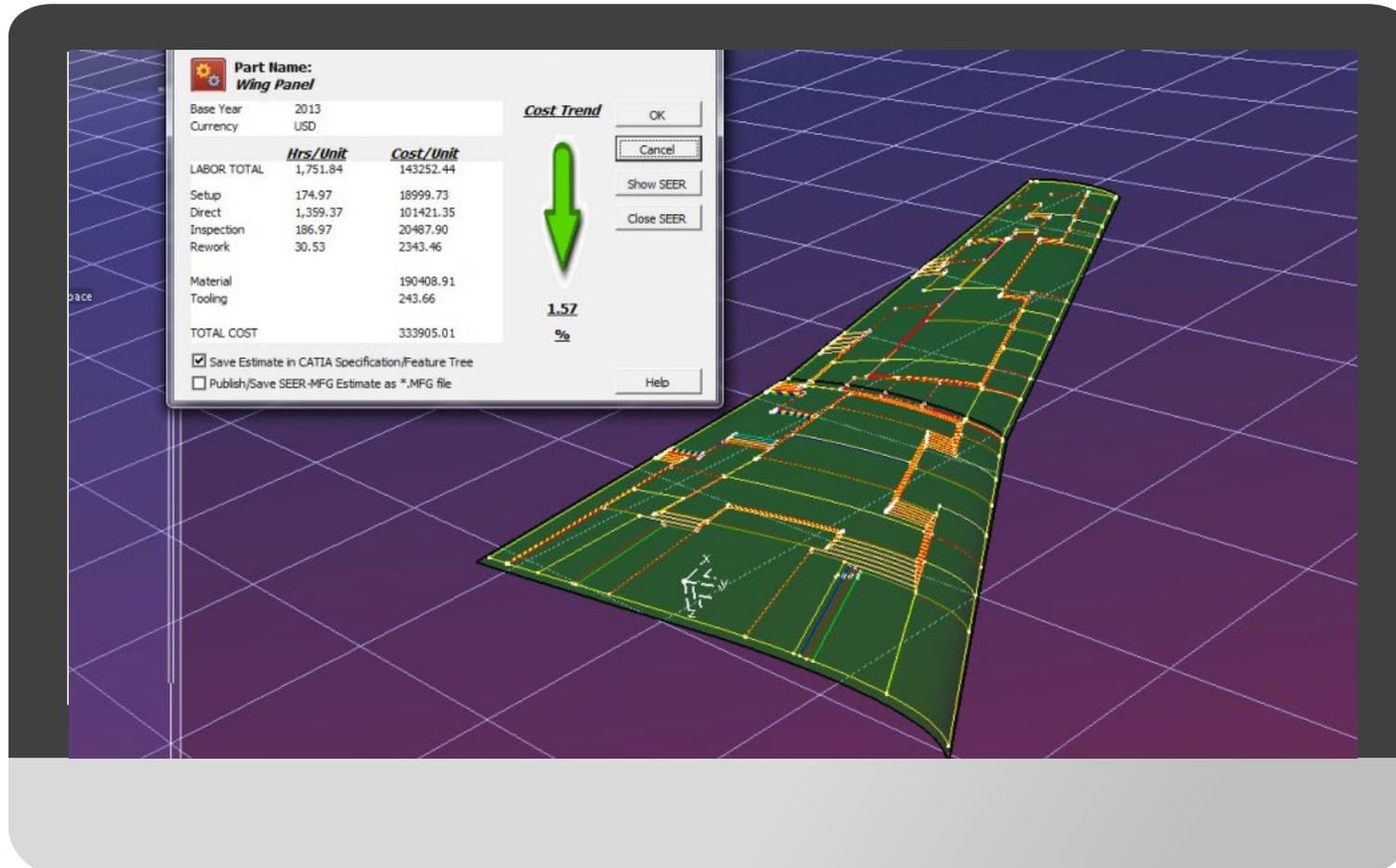
# COST IQ - OBTAINING COST FROM REQUIREMENTS

A Case Based Reasoning system that can transform high level requirements and specifications into a cost modeling workup within a sophisticated cost estimating model



Parametrics will lose its "magic" reputation

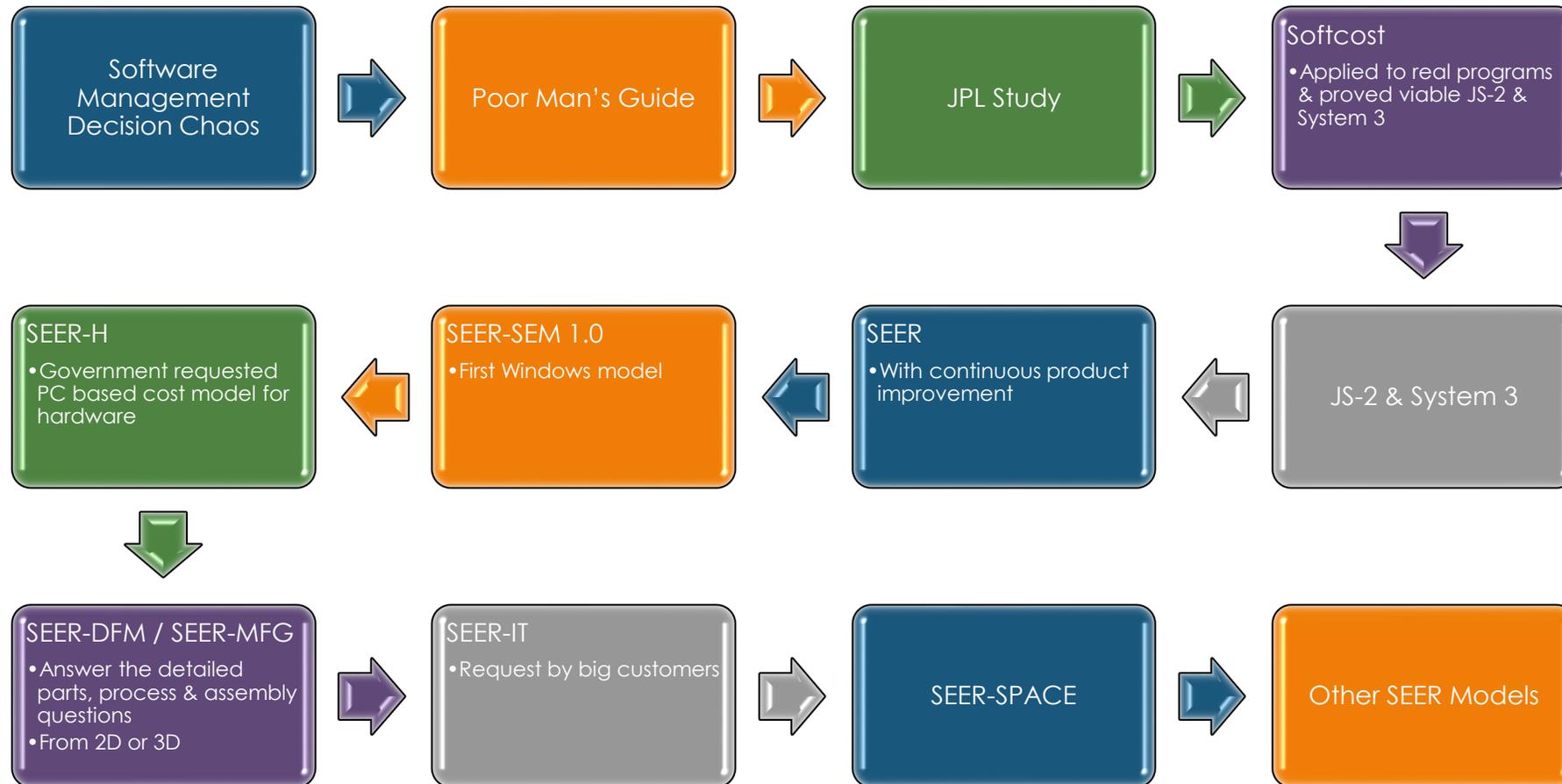
# CAD TO COST CAPABILITIES



Parametrics will be integrated into engineering processes and engineering decision making

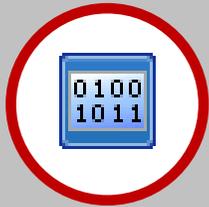


# Short History of SEER



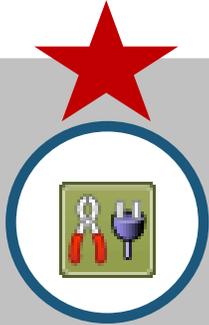
# COMPREHENSIVE SOLUTION SUITE

Predictive Analytics



## SEER-SEM

Software/application development, maintenance, integration and testing for Total Ownership Cost



## SEER-H

System, hardware and electronics development, production and support for Total Ownership Cost



## SEER-IT

Total Ownership Costing for IT services and digital ecosystem strategies



## SEER-MFG

Hardware manufacturing and assembly with automated CAD to Cost



## SEER-SYS

Systems Engineering cost estimation for systems of all sizes and complexities



## SEER-SPACE

Estimates lifecycle cost for key instruments and spacecraft subsystems

# SEER

# An Estimate... So What!!!

➤ **Businesses need to make decisions – either by Design or by Default**

➤ **Many believe “If scope and deadline are not defined at the start it is not a program but operations”**

**Agile is excellent when actually planned**

➤ **An Estimate is part of a plan, not a work product in itself**



# Human Nature: YOUR PEOPLE Are Optimism Biased

***Harvard Business Review explains this Nobel Prize Winning Phenomenon:***

- Humans seem hardwired to be optimists
- Routinely exaggerate benefits and discount costs
- Bias permeates opinions & decisions & causes waste & cost

**Solution - Temper with “outside view”:  
Past Measurement Results, traditional forecasting, risk analysis  
and statistical parametrics can help**

**Don't remove optimism, but balance optimism and realism**

Articles | [Dan Lovallo](#), [Daniel](#)

# Anchoring Biases Estimates

(Source: myweb.liu.edu/~uroy/eco23psy23/ppt/04-anchoring.pptx)



**Result : Giving a number creates biases**

those given higher numbers on the wheel guessed bigger numbers in



# Averages Gone Wrong Example



## Averages Caused Disaster

**Weather Service forecast North Dakota's rising Red River would crest at 49 feet.**

**Made flood management plans based on that average**

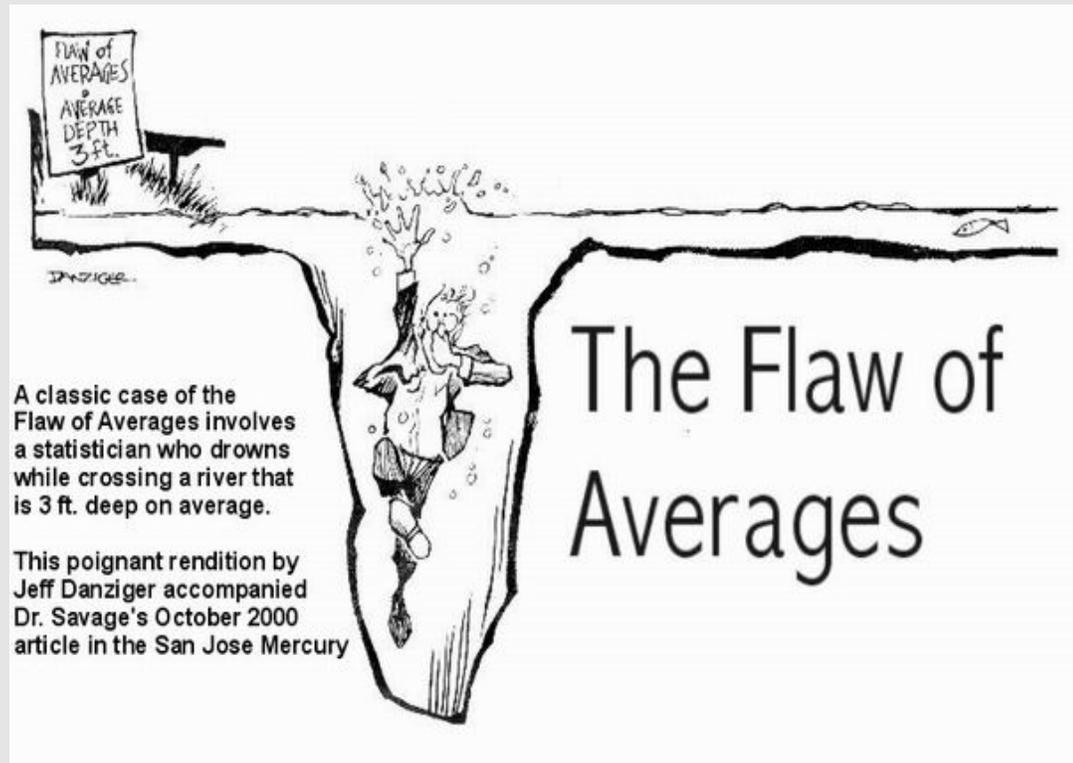
**Actual Crest above 50 feet**

**Dikes breached flood forced 50,000 people to evacuate**

**\$2 billion property damage**



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# Gunning for Models (Adapted from Hubbard)



Many try to substitute biased opinions for viable models

## Be careful of red herring arguments against models

"We cannot model that...it is too complex."

"Models will have error and therefore we should not attempt it."

"We don't have sufficient data to use for a model."

"It works but we can't see all data so we should not use it"

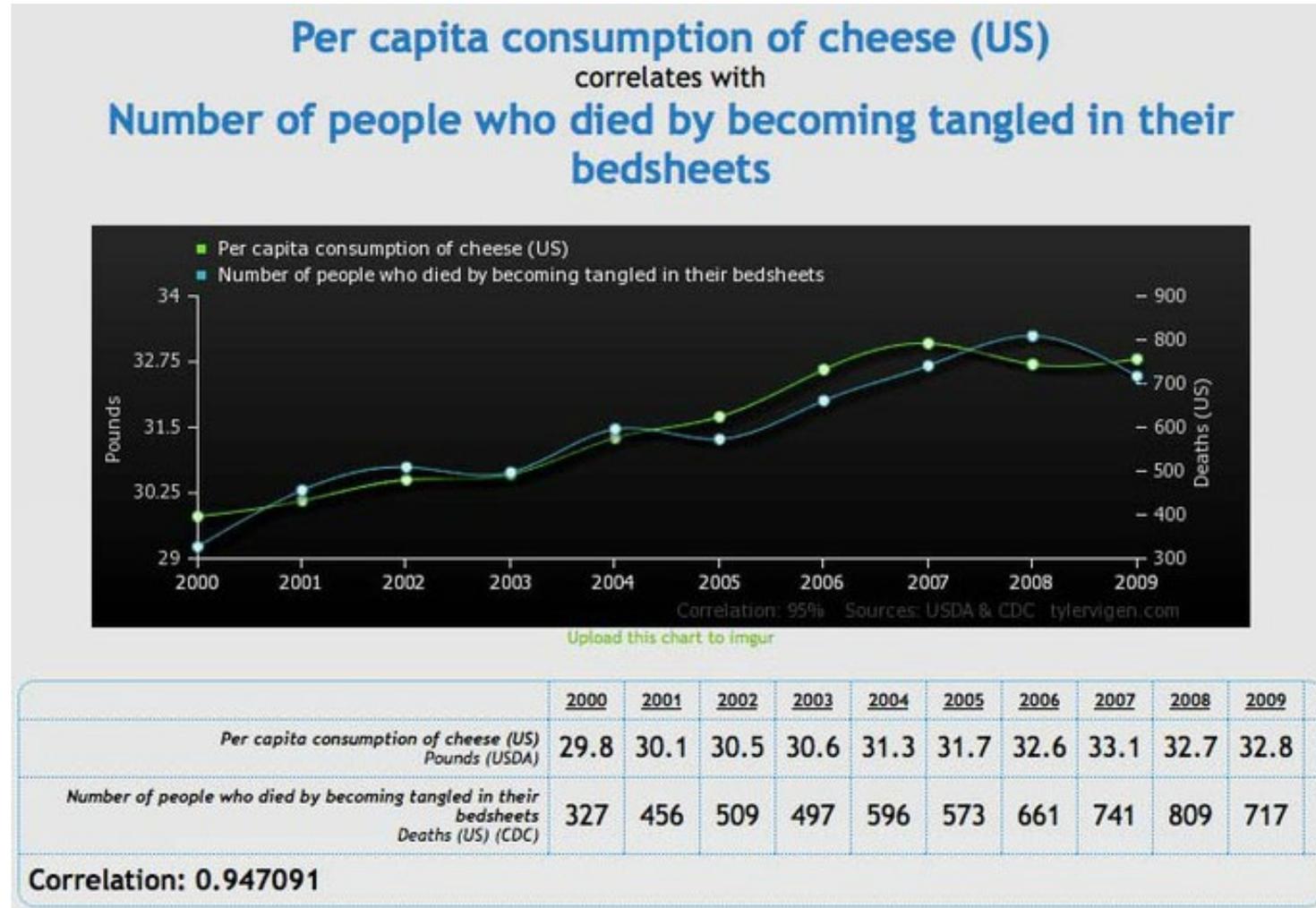
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**George E. P. Box: "Essentially, all models are wrong, but some are useful."**



# Correlation Doesn't Always Mean Causation

(Source: www.memolition.com)



# Galorath Cyber Security Cost Data Collection In 5<sup>th</sup> Year

Category	Sub Category	Application	Human/Technical/Both (0/1/2)	Identify	Protect	Detect	Respond	Recover	Least	Likely	Most	Unit (cost per)	Least	Likely	Most	
Data Security	Data Encryption	Portable Encrypting Hard Drive 10TB		1	0	1	0	0	0	N/A	N/A	N/A	N/A	\$818.00	\$1,105.50	\$1,300.00
Email Security	Email Encryption	DomainKeys Identified Mail (DKIM)		1	0	1	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Email Security	Email Encryption	Integrated Data Protection		1	0	1	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Email Security	Email Encryption	SaaS Delivery and Integrations		1	0	1	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Email Security	Email Encryption	Secure Email Gateway (SEG)		1	1	1	0	0	0	N/A	N/A	N/A	N/A	\$35,869.02	-	\$91,400.00
Endpoint Security	Application Control	Anti-Spam		1	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Application Control	Anti-Virus		1	1	1	1	1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Biometric (Biological)	Fingerprint		2	0	1	1	0	0	\$39.99	\$637.50	\$2,250.00	machine	N/A	N/A	N/A
Endpoint Security	Biometric (Biological)	Iris		2	0	1	1	0	0	\$190.00	\$1,259.67	\$2,275.00	machine	N/A	N/A	N/A
Endpoint Security	Biometric (Biological)	Palm		2	0	1	1	0	0	\$369.99	\$7,900.00	\$13,770.35	machine	N/A	N/A	N/A
Endpoint Security	Endpoint Protection	EDR (Endpoint Detection and R		2	1	1	1	1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Endpoint Protection	Endpoint encryption		1	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Endpoint Protection	Whitelist		2	1	1	1	0	0	N/A	N/A	N/A	N/A	\$0.00	\$3,500.00	\$650,000.00
Endpoint Security	Host Intrusion Prevention	HIPS PCU		1	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Host Intrusion Prevention	HIPS server-side		1	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Password Management	Access Management		2	1	1	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Endpoint Security	Password Management	Password Control		2	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Identity Governance	Federated Identity	Single Sign on Service		1	1	1	1	0	0	N/A	N/A	N/A	N/A	N/A	32 1 - 100 seats - 1001 seats 952.64 1001	N/A

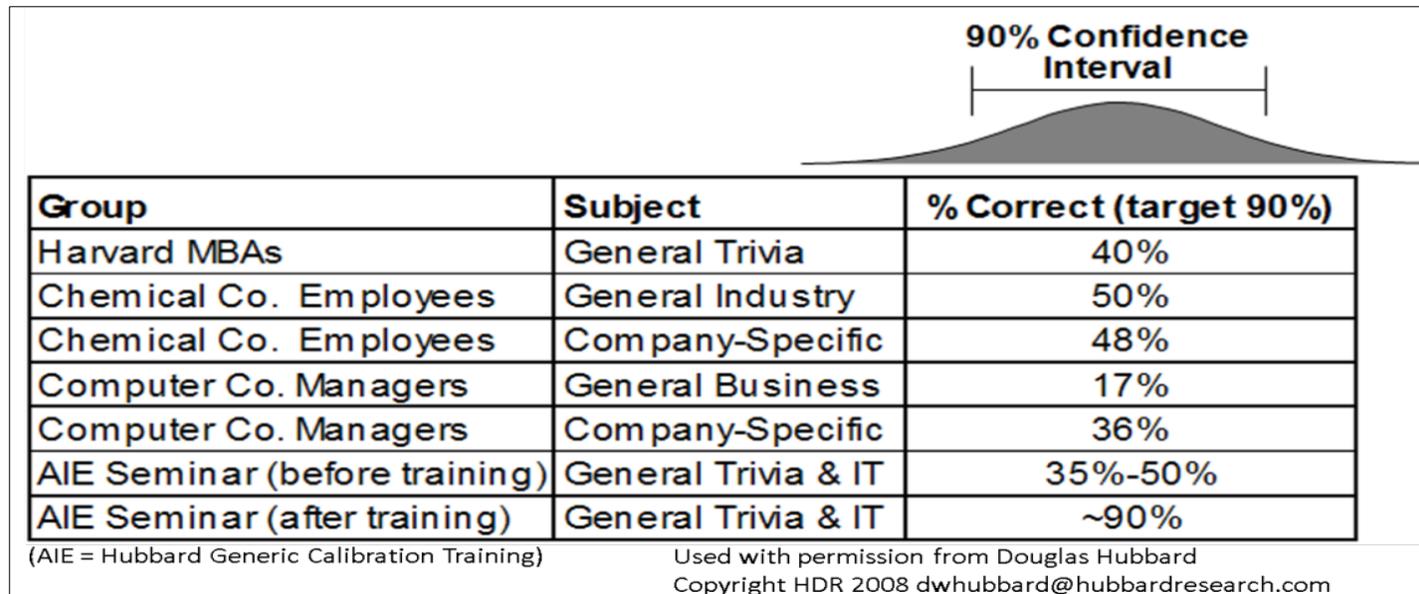
Category	Sub Category	Application	Protected Systems							Threats Addressed						
			Computer	Printer	Cloud	Phone	Tablet	Server	Embedded	Virus	Malware	Trojan Horse	Password Att	Phishing	Hacking	
Data Security	Data Encryption	Portable Encrypting Hard Drive 10TB	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Email Security	Email Encryption	DomainKeys Identified Mail (DKIM)	1	0	1	0	0	0	1	1	1	1	0	0	0	1
Email Security	Email Encryption	Integrated Data Protection	1	0	1	1	1	1	1	1	1	1	0	0	0	1
Email Security	Email Encryption	SaaS Delivery and Integrations	0	0	1	0	0	0	1	1	1	1	0	0	0	0
Email Security	Email Encryption	Secure Email Gateway (SEG)	1	1	1	0	0	1	1	1	1	1	0	1	0	
Endpoint Security	Application Control	Anti-Spam	1				1	1	0	1	1	1	1	1	0	
Endpoint Security	Application Control	Anti-Virus	1	1			1	1	1	1	1	1	1	1	1	
Endpoint Security	Biometric (Biological)	Fingerprint														
Endpoint Security	Biometric (Biological)	Iris														
Endpoint Security	Biometric (Biological)	Palm														
Endpoint Security	Endpoint Protection	EDR (Endpoint Detection and R														
Endpoint Security	Endpoint Protection	Endpoint encryption														
Endpoint Security	Endpoint Protection	Whitelist	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Endpoint Security	Host Intrusion Prevention	HIPS PCU	1	0	0	0	0	0	0	1	1	1	1	1	1	1
Endpoint Security	Host Intrusion Prevention	HIPS server-side	0	0	0	0	0	0	1							
Endpoint Security	Password Management	Access Management														
Endpoint Security	Password Management	Password Control														
Identity Governance	Federated Identity	Single Sign on Service	1	1	1	1	1	1	1	0	0	0	1	0	1	
Identity Governance	LDAP repository	LDAP Proxies	1	0	1	0	1	1	1	0	0	0	1	0	1	
Identity Governance	LDAP repository	Meta-Directories	1	0	1	0	1	1	1	0	0	0	1	0	1	
Identity Governance	LDAP repository	Virtual-Directories	1	0	1	0	1	1	1	0	0	0	1	0	1	
Identity Proofing S	Endpoint-centric	Caller ID	0	0	0	1	0	0	0	0	0	0	1	0	0	
Identity Proofing S	Endpoint-centric	Device fingerprint	1	0	1	1	1	1	1	1	1	1	1	1	0	
Identity Proofing S	Endpoint-centric	Geolocation analysis	1	0	1	0	1	1	1	1	1	1	1	1	0	
Identity Proofing S	Endpoint-centric	Mobile location services	0	0	0	1	1	1	0	0	0	0	0	0	0	
Identity Proofing S	Navigation	Centric S	1	1	1	1	1	1	1	1	1	1	1	1	0	



# Humans Can't Estimate Well: Assumptions, Change

Drivers & Expert Judgment Need Caution (Source: Hubbard)

Most people are significantly **overconfident** about their estimates ... especially educated professionals



# Example: Project Cost Alone Is not The Cost of IT Failure (Source: HBR)

- Case Study: Levi Strauss
  - \$5M ERP deployment contracted
  - Risks seemed small
  - Difficulty interfacing with customer's systems
  - Had to shut down production
  - Unable to fill orders for 3 weeks
  - \$192.5M charge against earnings on a \$5M IT project failure

“IT projects touch so many aspects of an organization they pose a new singular risk”

# AGILE ESTIMATES

Are they necessary?

## #NOESTIMATES

- Estimates are difficult to produce
- Provide little to no value
- Estimation is overhead and should be minimized

## #ESTIMATES

- Organizations need to do budget planning
- Estimates are needed to make informed decisions
- Managers need estimates for accountability to shareholders



## ➤ UNDERLYING TRUTHS

Software estimation is challenging, Agile developers see estimates as committing them to a schedule and therefore they are antithetical to the Agile Manifesto.

Software estimates drive decision making - they are not just for the developers

Total ownership cost should be considered for the immortal systems and as a result, more emphasis and research should be and is being applied to the area of software maintenance.

# #NoEstimates Makes Sense From Developer View



No Missed Deadlines, Hurray

**No missed deadlines**

**No cost overruns**

**Minimum Viable Product may reduce excess functionality**

**Some kind of progress made every few weeks**

**Do what the customer wants as they change their mind**



# Agile PMI View



“Agile management is a development method, not a project method”

- Agile methods deal with projects that are complex
- Involving many design unknowns
- Traditional project management requires a clear scope and defined parameters at the onset
- Traditional project management deals with uncertainty when the “how” is not defined
- Agile methods are meant to deal with both uncertainty and ambiguity, when the “what” is not defined



# DEFENSE SCIENCE BOARD\*

## Recommendation

**Recommendation 1:** Implement the “Software Factory”

**Recommendation 2:** Adopt continuous iterative development best practices (continuing through sustainment) for software.

**Recommendation 3:** Implement: Multiple vendors to begin work with down select; Service cost estimators should modernize cost/schedule estimation processes; Project manager should build program-appropriate frameworks for status metrics; examples include: sprint burndown, epic and release burndown, velocity trending, control chart, line of balance and cumulative flow diagrams.

**Recommendation 4:** Current and legacy programs should plan transition to a software factory and continuous iterative development

**Recommendation 5: Develop a modern software development expertise**

**Recommendation 6:** Software is Immortal

**Recommendation 7:** Implement Independent Validation and Verification (IV&V)

# Predictions for the next 20 years (2019)

- **Data Science will rule**  
We will learn from data but sometimes we will learn what is rather than what can be.
- **Artificial intelligence will make decisions**  
Some good, some really bad
- **There will be disasters**



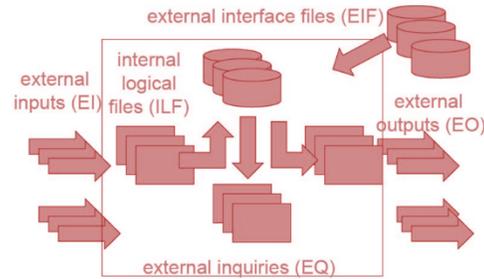


**[GALORATH.COM](http://GALORATH.COM)**

# SIZE CONTINUES TO BE MAIN DRIVER

Your Subtitle Will Go Here

## FUNCTION POINTS



## SLOC

```
static void Main(string[] args)
{
    Console.WriteLine("Starting C# driver");
    Console.WriteLine();
    Arrays.COBOLINTERFACE myArray = new Arrays.COBOLINTERFAC
    NetArray.BranchRec[] BranchArray = new NetArray.BranchRec[10];
    int ctr = 5;
    decimal Amt;
    Console.WriteLine("Ctr = 5");
    Console.WriteLine();
    string Name = " ";
    myArray.TRANSTESTIN(ref ctr, ref BranchArray);
}
```

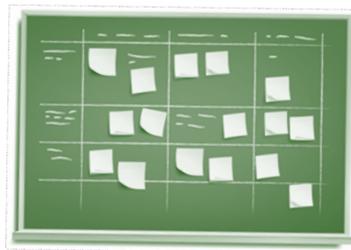


CHOOSE A METRIC AND BE CONSISTENT!

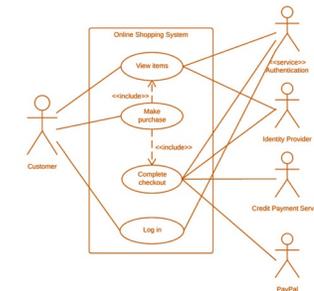
## STORY POINTS



## USER STORIES



## USE CASES



## T-SHIRT SIZING



# Parametric Estimation for Agile Projects

Features  
Project Characteristics  
Team Dynamics



**Description**  
Fraud Portal

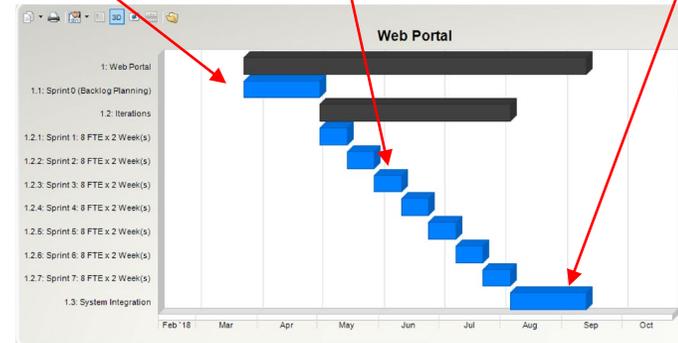
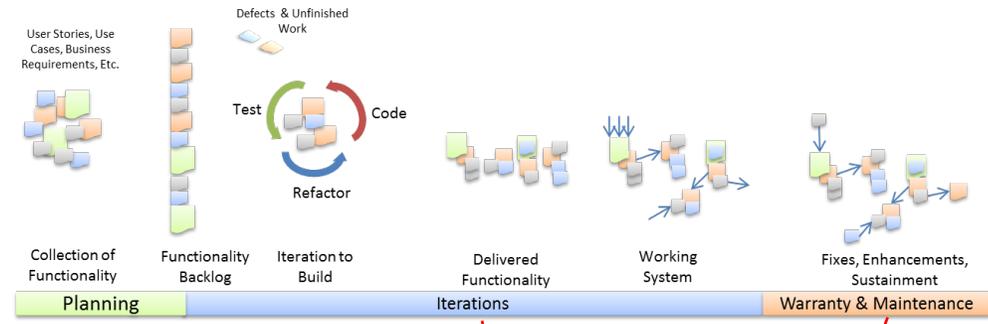
**Platform**  
Web Based Development

**Application**  
Customer Relationship Management

**Acquisition Method**  
New Development

**Agile Framework**  
Agile Full

**Development Standard**  
Commercial



Estimate	
TE x 4 Weeks	
Team A	
Sprint Number	1
Sprint Duration Months	0.92
Sprint Effort Months	6.46
Sprint Effort Hours	981
Sprint Labor Cost	134,290
Sprint Velocity (UFP)	103.00
Team Size	7.00
Start Date	12/27/2018
End Date	1/24/2019

# ESTIMATING METHODOLOGIES

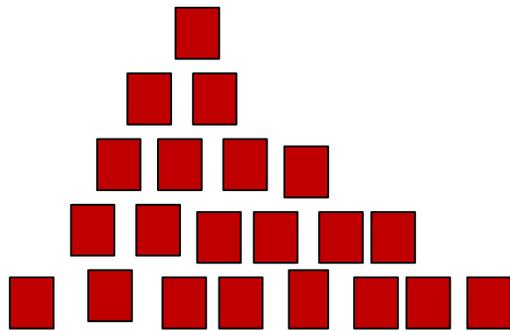
**Methodology 1: Many Agile programs are fixed price, it is often just a matter of labor rates times quantity**

**Methodology 2: Simple Build-up approach** based on averages can be defined as: Sprint Team Size (SS) x Sprint length (Sp time) x Number of Sprints (# Sprints)

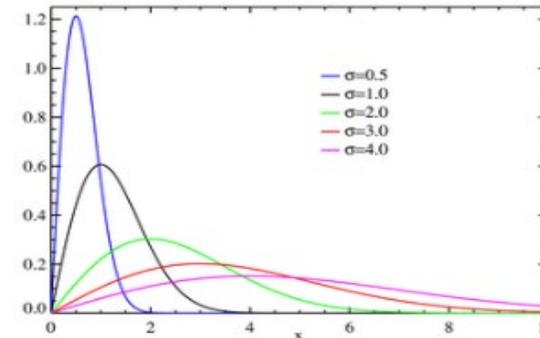
**Methodology 3: Structured approach** based on established “velocity” – most often used internally by the developer since detailed/sensitive data are available to them

**Methodology 4: Automated Models approach** based on a size metric – which may be difficult to quantify

- There is a fixed relationship between size and effort, e.g.  $(\text{Effort}^{**n}) * \text{Time} = \text{Size} / \text{Technology}$
- Results are then modified by current trends and analyses
- Total effort can be distributed by a mathematical model; e.g. Weibull, Rayleigh



The Sprint work projections often follow the Weibull or Rayleigh distribution



**Methodology 5: Factor/Complexity approach** based on data generated in early *iterations*

# SOFTWARE COST GROWTH

Significant Reasons for Software Cost Growth

01

Scope Creep  
Requirements Growth

05

Failure to Declare, Track  
& Reduce Risk & Uncertainties

02

Poor Input to Estimate

06

Lack of Internal Peer Review

03

Failure to Clearly Define  
the Initial Scope

07

Lack of Estimation Experience

09

Failure in the  
Estimation  
Tool/Process

04

Unrealistic Expectations  
and Assumption

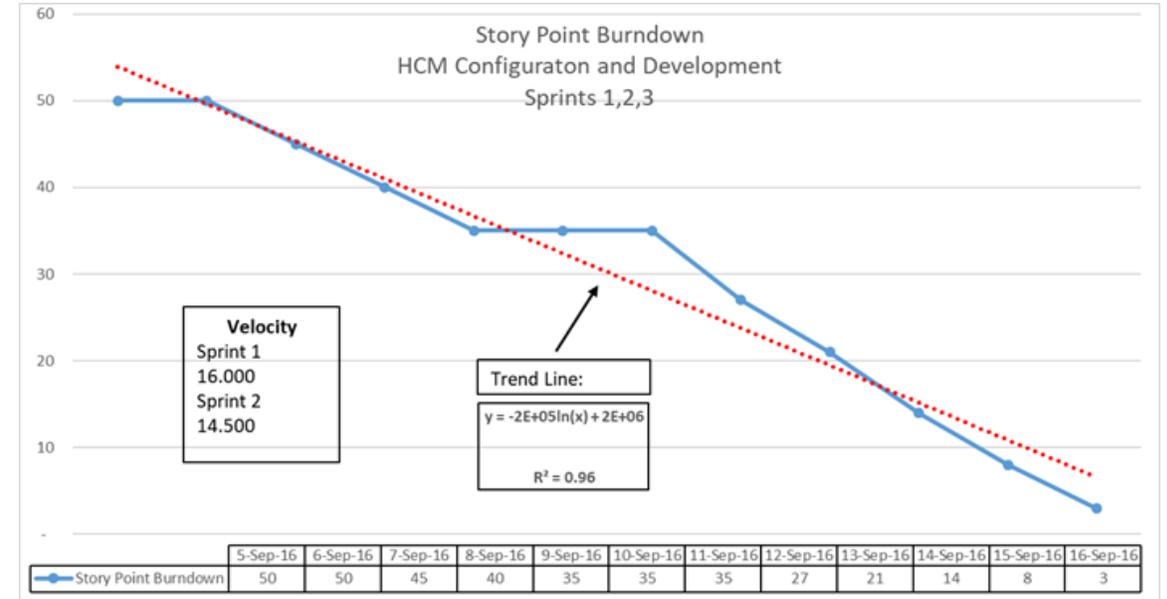
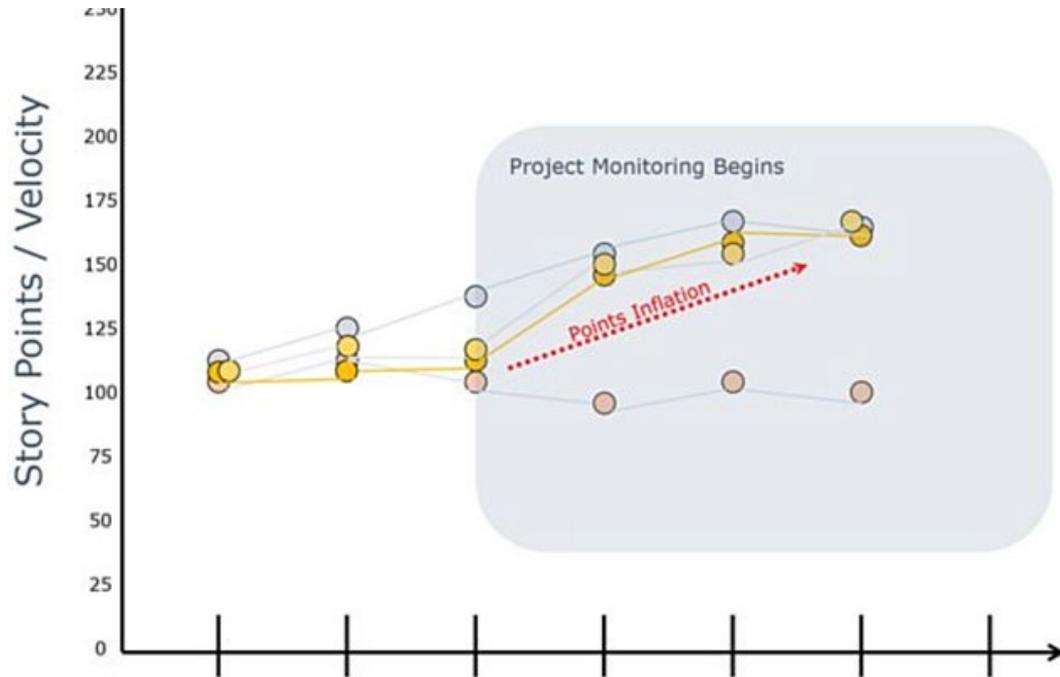
08

Failure to Consider  
Environmental Factors

10

Estimating to a  
Target Assumption

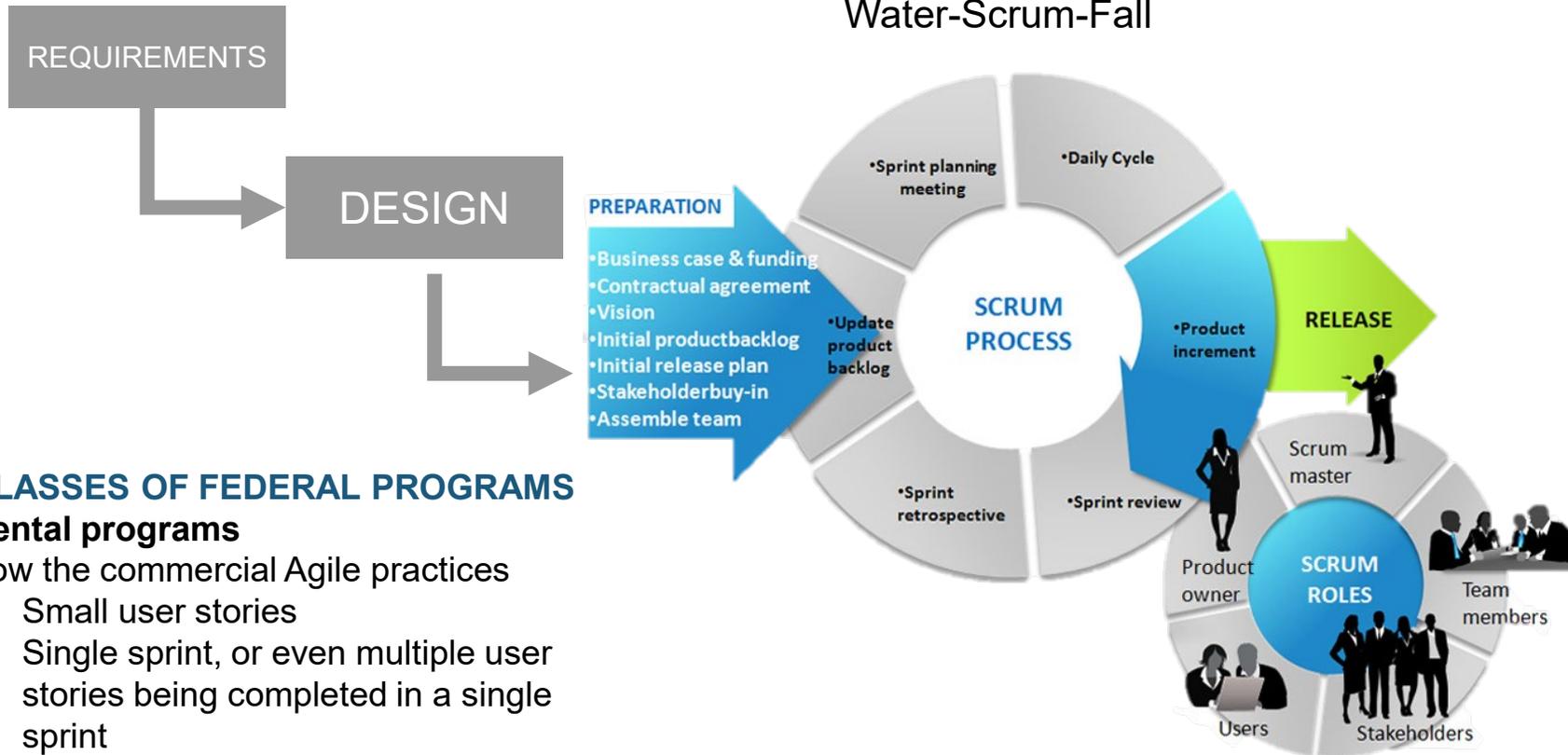
# MANAGING MODERN SOFTWARE DEVELOPMENT PROGRAMS



Measure the Right Thing – Backlog – Velocity – Burndown Charts  
 Manage Expectations / Set Realistic Time Frames  
 Align the Work Streams  
 Seek Objectivity

# TYPICAL HYBRID AGILE DEVELOPMENT

Water-Scrum-Fall



**SCRUM ROLES ARE CRITICAL**

## TWO CLASSES OF FEDERAL PROGRAMS

### Incremental programs

- Follow the commercial Agile practices
  - Small user stories
  - Single sprint, or even multiple user stories being completed in a single sprint
- Generally not applying a full EVM process

### Transformational programs

- Creating completely new capabilities
- “Hybrid-Agile” approach applied
  - Longer sprints
  - Larger conceptual stories/features
  - Full EVM process.

Testing and Sustainment (sometimes in the Sprint sometimes a separate activity)

# An ROI Analysis of A New System: Should We Fund This

	Initial Investment	Year 1	Year 2	Year 3
Investment	\$100,000			
Increase/ (dec.) in revenue		(\$40,000)	\$60,000	\$110,000
Increase/ (dec.) in op. exp.		\$90,000	\$70,000	\$70,000
Cash Flow	(\$100,000)	(\$130,000)	(\$10,000)	\$40,000
PV of Cash Flow	(\$100,000)	(\$120,370)	(\$8,572)	\$21,752
<b>NPV</b>	<b>60,563</b>			
<b>IRR</b>	<b>13.5%</b>			
<b>ROI</b>	<b>121%</b>			

Cost of capital

8.0%

- Can we do better?
- Will stakeholders tolerate a loss for 3 years?
- What is the risk?

# Dealing With the “Problem of Assumptions”

- Assumptions are essential but...
- Incorrect assumptions can drive an estimate to uselessness
- Use an assumption verification process

