

estimate

estimate • analyze • plan • control

Improving Estimate Maturity For More Successful Projects

SEER / Tracer Alliance Presentation March 2010

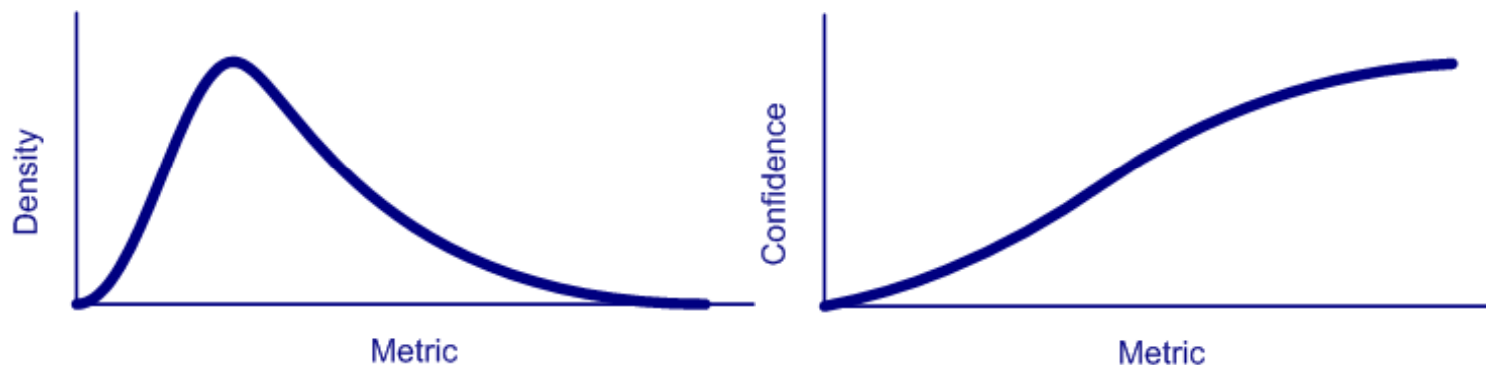
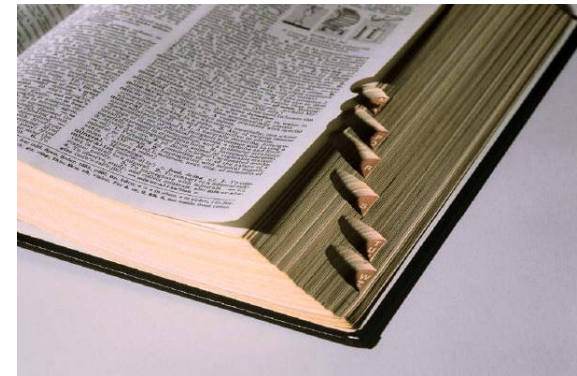
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An Estimate Defined

- 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***



Delusions of Success: How Optimism Undermines Executives' Decisions (Source: Richard Hartley, HBR)

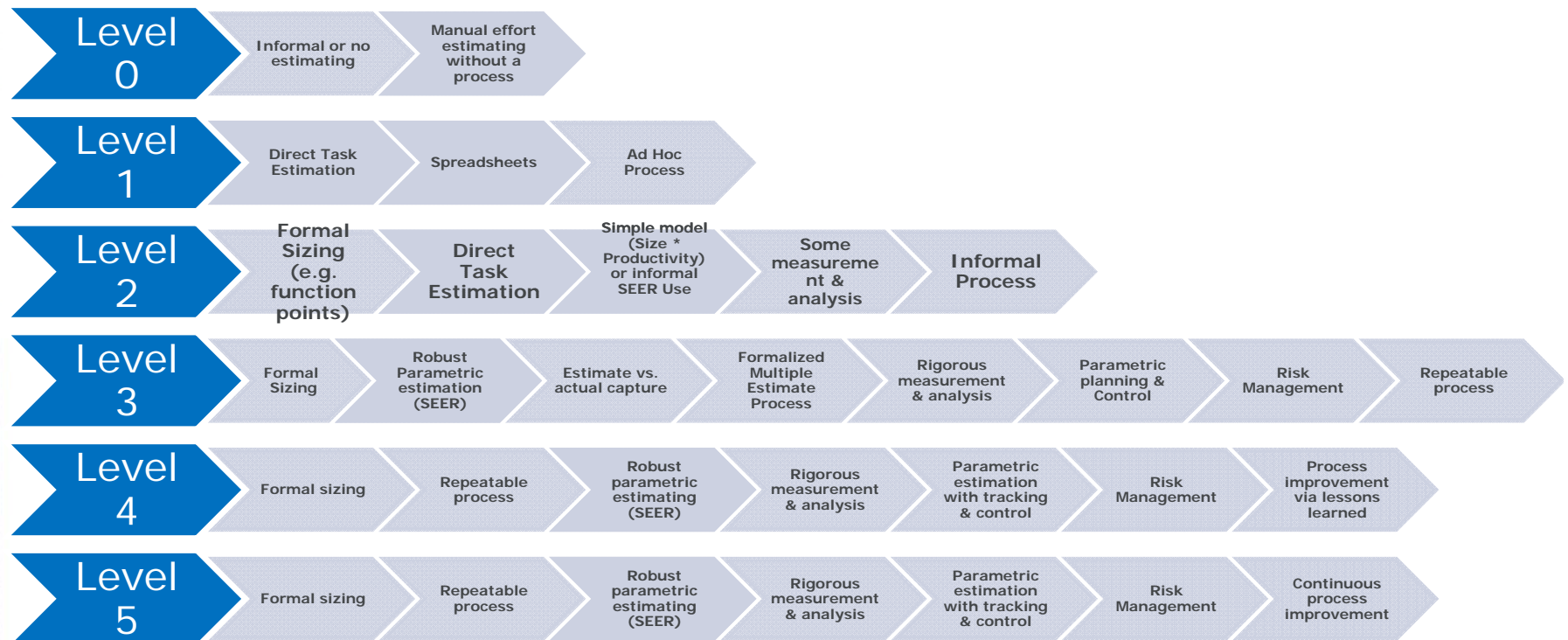


Problem: Humans seem hardwired to be optimists

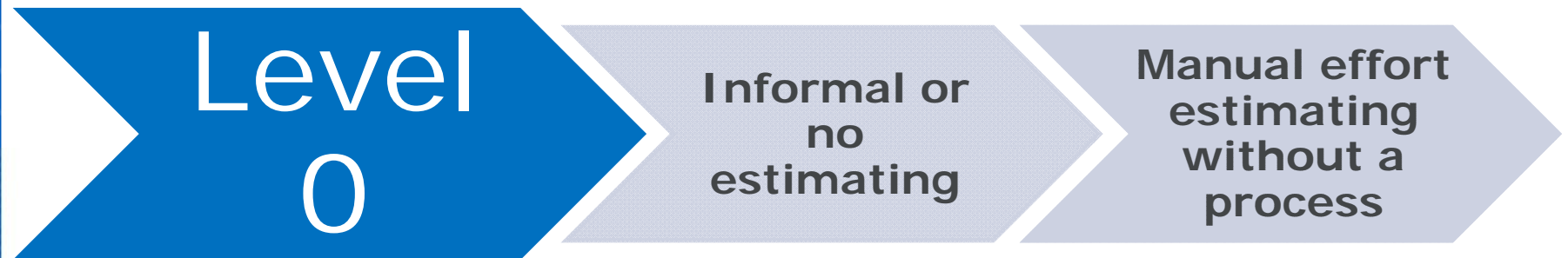
- Routinely exaggerate benefits & discount costs
- Optimism from cognitive biases & organizational pressures
 - Exaggerate talents & degree of control
 - Attribute negative consequences to external factors
- Anchoring (relying too heavily on one piece of information) magnifies optimism
 - Most pronounced for new initiatives
- Solution: Temper with “outside view”
 - Supplements traditional forecasting w/ statistical analysis of analogous efforts
 - Don't remove optimism, but balance optimism & realism

“When pessimistic opinions are suppressed, while optimistic ones are rewarded, an organizations ability to think critically is undermined”

Estimation Organizational Maturity V1.7



Estimation Organizational Maturity Level 0



Guessing is the most widely used estimation technique

Poor Estimates Effects on Projects



- Inaccurate estimates can reduce project success:
 - Poor implementations
 - Critical processes don't scale
 - Emergency staffing
 - Cost overruns caused by underestimating project needs
- Scope creep from lack of well defined objectives, requirements, & specifications
 - Forever changing project goals
 - Frustration
 - Customer dissatisfaction
 - Cost overruns and missed schedules
 - Project Failures
- Poor estimates & plans are root cause of program risk

And important project business decisions made early
with *minimum knowledge & maximum uncertainty*

"Run IT Like a Business"



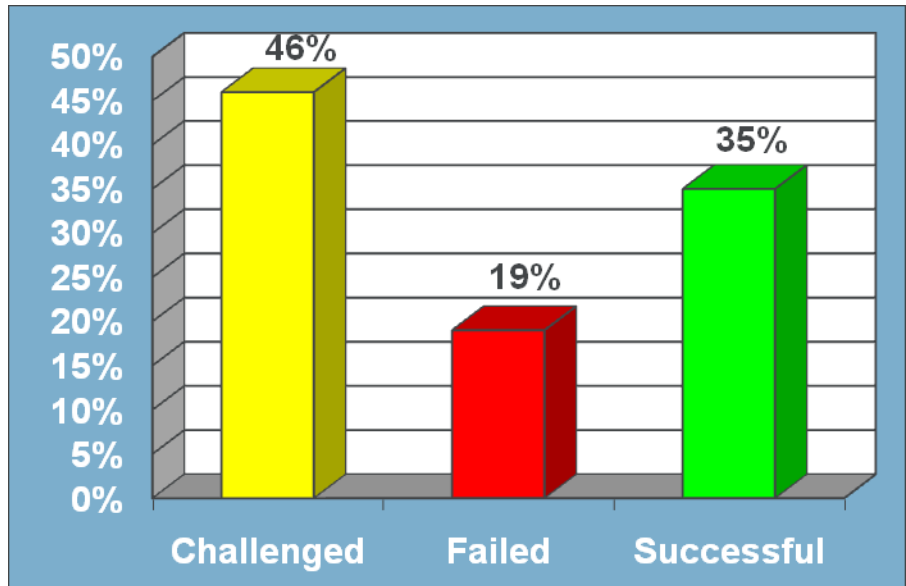
- **Cutter Consortium Software Project Survey:**

- 62% overran original schedule by more than 50%
- 64% more than 50% over budget;
- 70% had critical product quality defects after release

- **Standish Group CHAOS Report**

- 46% challenged
- 19% failed
- 35% successful

~\$875 billion spent on IT
~\$300 billion spent on IT projects
~\$57 billion wasted annually



Estimation Organizational Maturity Level 1



Basic Estimation Tribes (Adapted from DCG/Galorath Webinar)

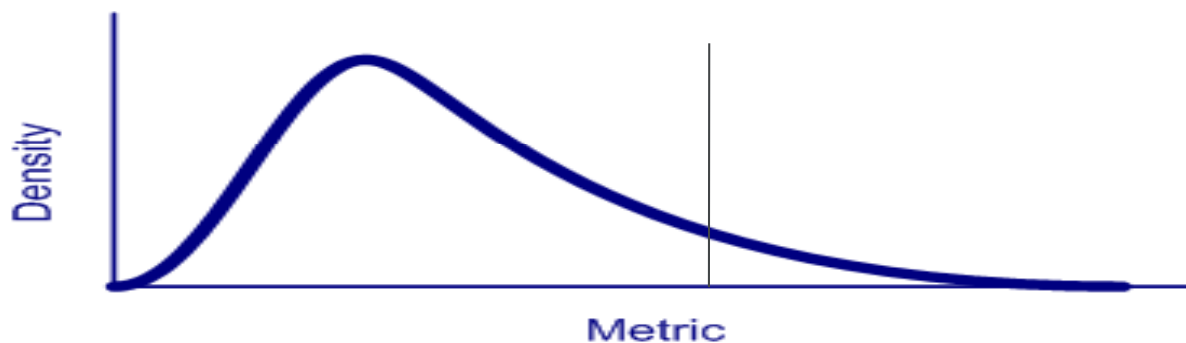


1. **Napkins** – Ad-hoc, hero driven estimators ...past successes are legendary... napkin scribbling taken as gospel
2. **Guts** – Feeling /experience oriented project managers...years of experience, good and bad...trusted regardless of actual results (tenure benefits of being a survivor)
3. **Spreadsheets** – Former Napkins and Guts translating tribal knowledge onto spreadsheets
 - Bestows mathematical accuracy and empirical integrity on home-grown estimation algorithms
 - Tribal estimation knowledge can and does work
 - However, it comes with high risk and cost
 - Rarely repeatable
 - Consistency is sporadic
 - Heroic energy is kept in reserve used to mitigate risk
 - Knowledge almost never institutionalized outside of personal knowledge and desktop PC files
 - Knowledge lost when heroes retire or leave

Manual Estimates: Human Reasons For Error (Metrics Can Help)



- Manual Task estimates yield **SIGNIFICANT** error
- Desire for “credibility” motivates overestimate behavior (80% probability?)
 - So must spend all the time to be “reliable”
 - Better approach force 50% probability & have “buffer” for overruns
- Technical pride sometimes causes underestimates



Estimation Organizational Maturity Level 2



Gartner says even Level 2 reduces estimate vs actual variance by 50% (Source "Why Galorath Matters", Gartner)

Many Viable Size Metrics: Depends On Organization & Goals



Software type in this column...	... is best characterized by...				
	Lines	Functions	SEER-FBS	Use Cases	COTS
Traditional Information Technology	X	X	X	X (ROM)	
Algorithmic Processing	X	X	X	X (ROM)	
Auto-gen Code		X	X	X (ROM)	
COTS Integration			X	X (ROM)	X
Non-Line Based		X	X	X (ROM)	X

Estimate a range to best quantify size early

Estimation Should Use More Than Simple Productivity Measures



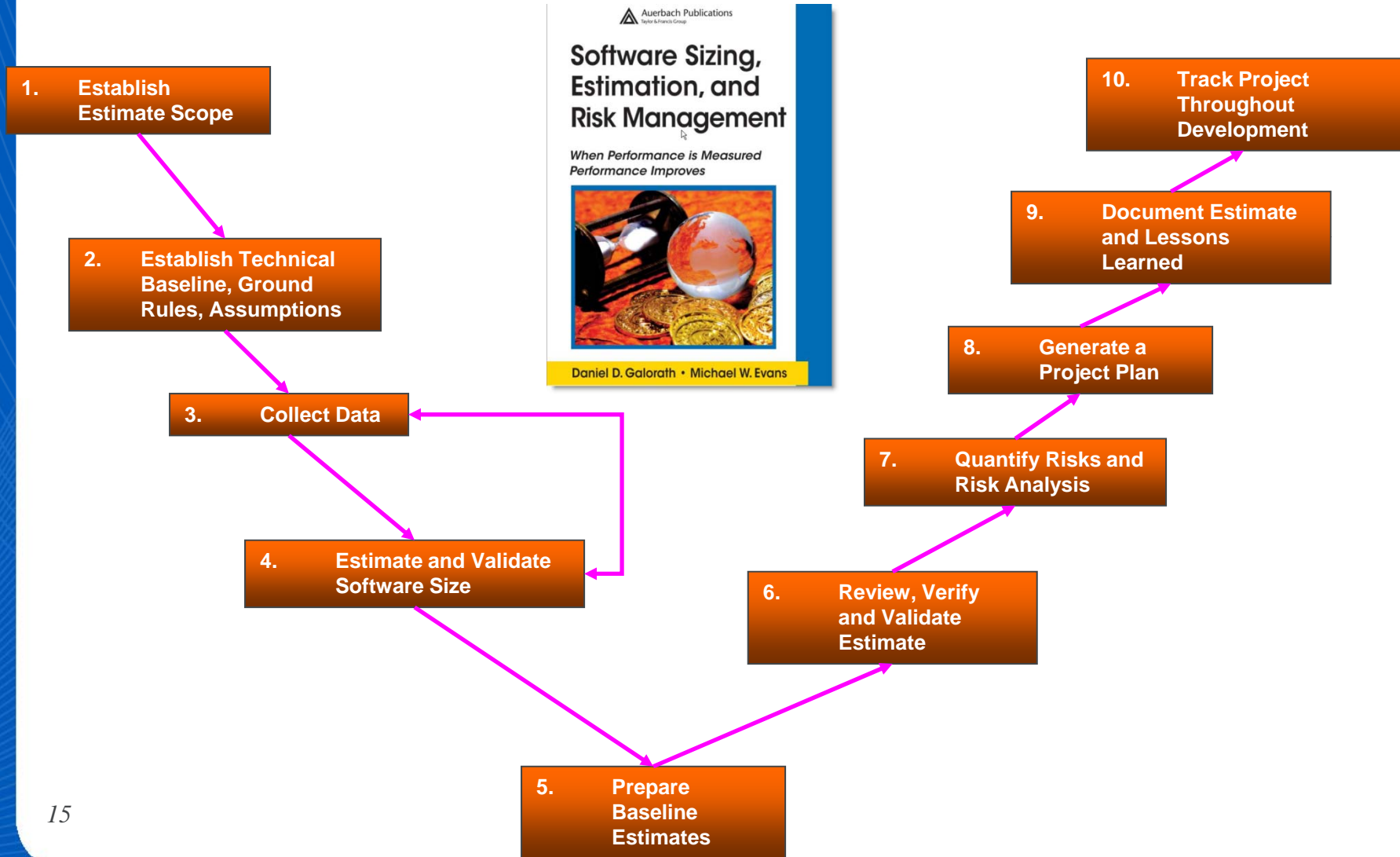
- Just simple size over productivity measures may not adequately project the effort for a new system
 - Unless the system is VERY similar
- Additional estimation parameters are required to describe the situation
 - Quality
 - Reuse
 - Retest
 - Staffing
 - Technology & Environment (e.g. requirements volatility)

And productivity measures are generally based on Size... so low maturity organizations may lag there too

Estimation Organizational Maturity Level 3



10 Step Software Estimation Process: Consistent Processes = Reliable Estimates



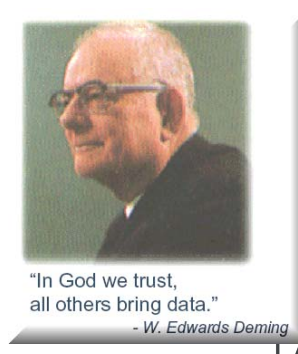
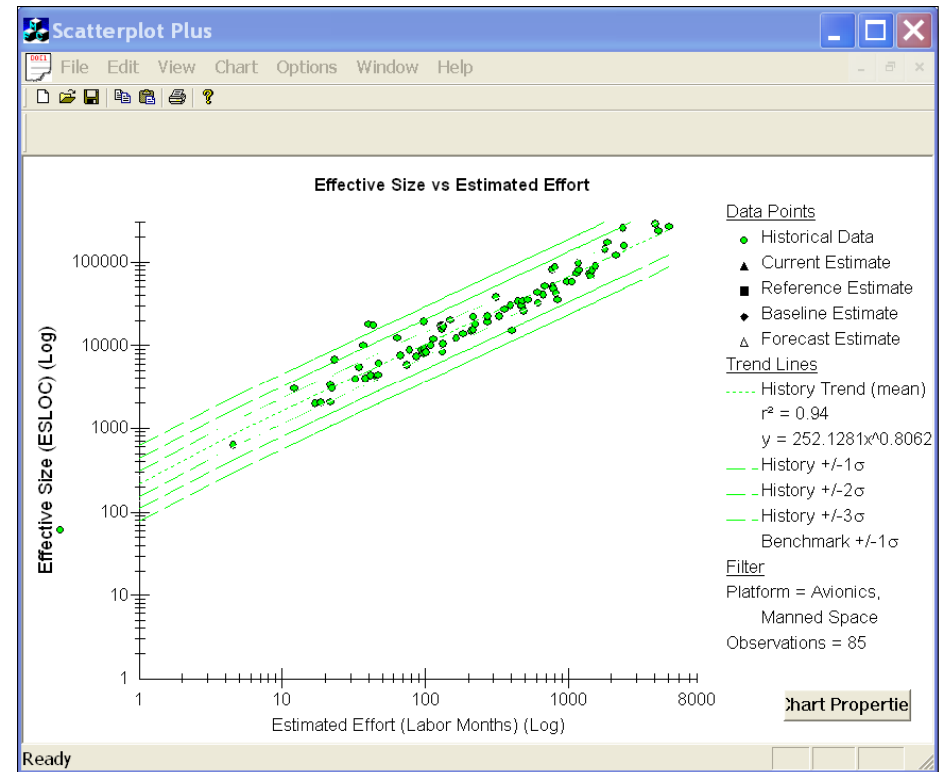
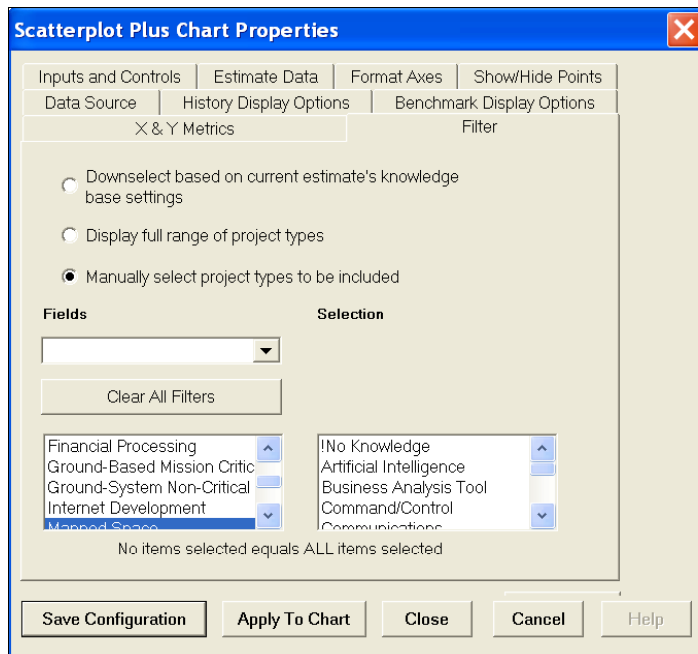
Fundamental Metrics For Estimation, Planning & Control



- **Size**
 - AKA Volume, Mass
 - Units: Source Lines of Code (SLOC); Function Points (FP) Use Cases
 - New versus rework
 - COTS & Packages
- **Effective Technology**
 - AKA Productivity Potential, Efficiency
 - Units: none
- **Time**
 - AKA Duration, Schedule
 - Units: Calendar Months, Calendar Weeks
- **Effort**
 - AKA Work, Labor
 - Units: Staff Months, Staff Hours
- **Cost**
 - AKA Budget, Money
 - Units: \$, other currencies
- **Staffing**
 - AKA Manpower Loading
 - Units: FTE People
- **Defects**
 - AKA Reliability, Quality
 - Units: Defect Count

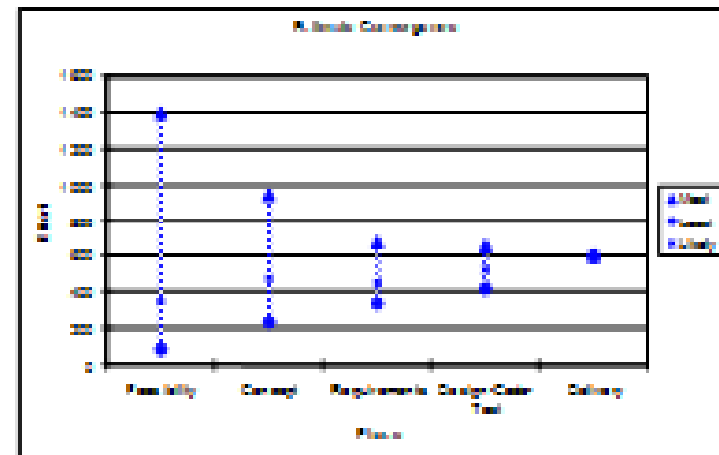
Learn & Improve With Metrics

- Shows actual data, ranges, and correlations
- Plots estimates and contrasts with data points
- Plots actual data and / or trends



When Do We Build Estimates

- Traditional Estimate Phases
 - During Feasibility
 - At Concept
 - After Requirements
 - After Design
 - After Drops if Incremental

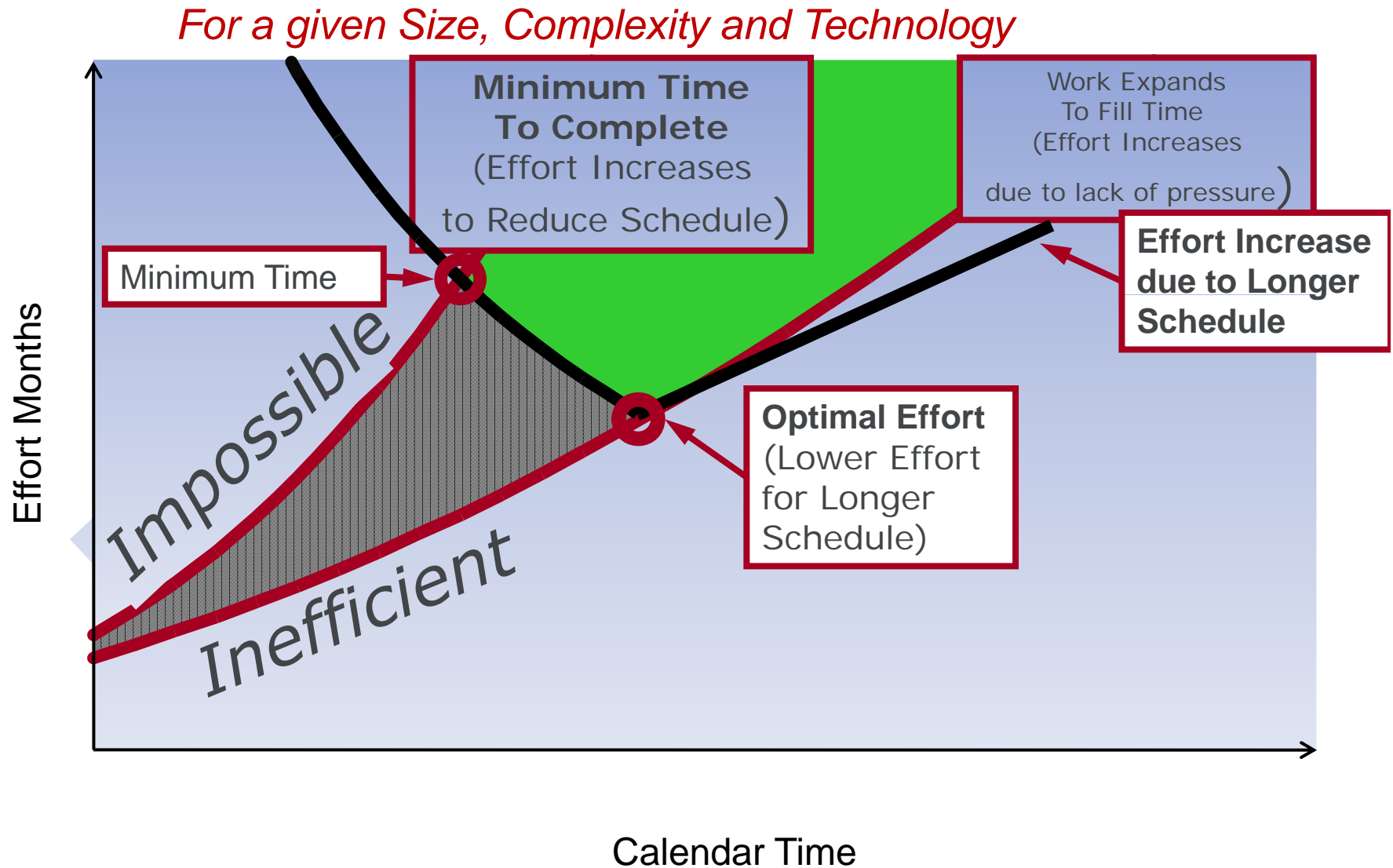


Estimates typically become more accurate and less uncertain as the project progresses...

- Agile Estimate Phases
 - At Requirements (Use Cases, User Stories, etc.)
 - Before Each Release

The Development Method Is Part Of The Solution Not The Problem

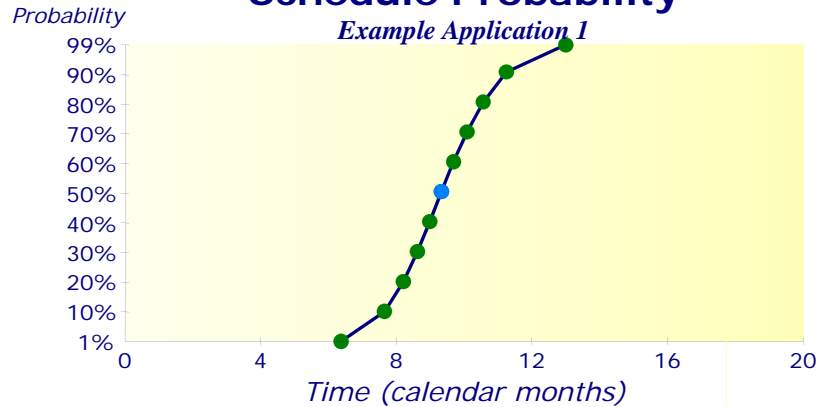
Balancing Resources & Schedule Is A Science



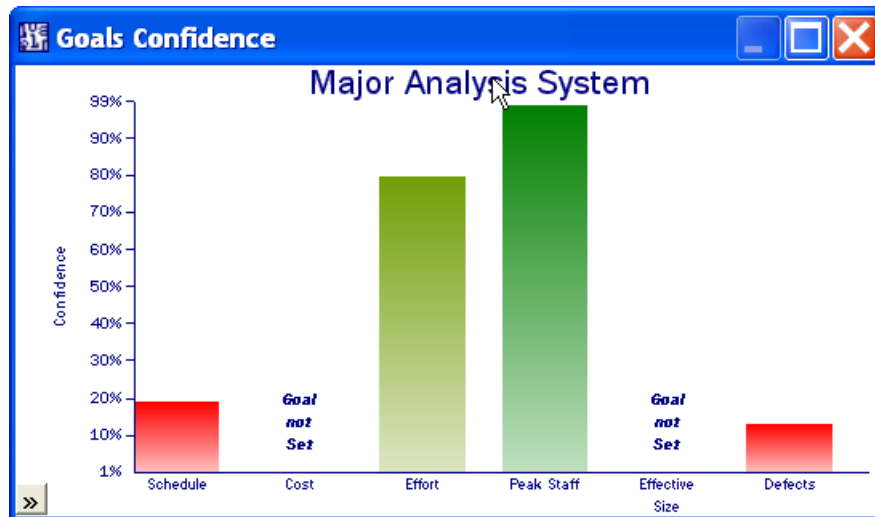
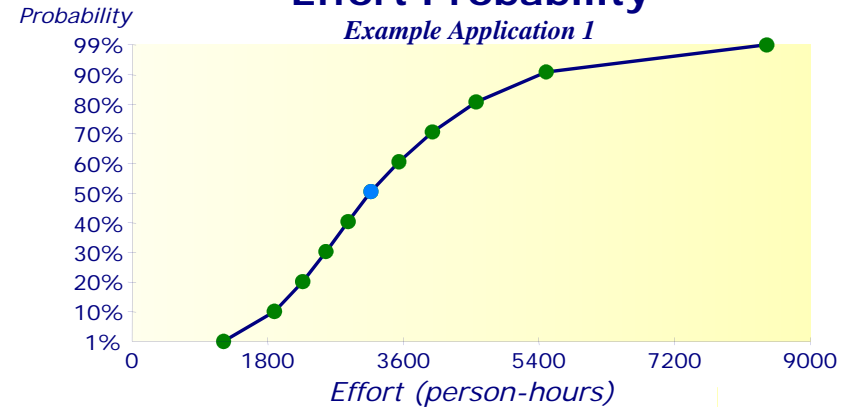
Understand Project Risks Include Them In Planning Decisions

(Example SEER-SEM Outputs)

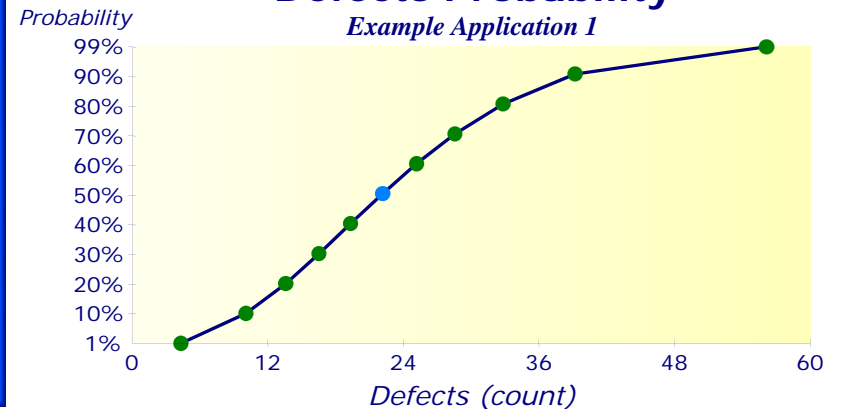
Schedule Probability



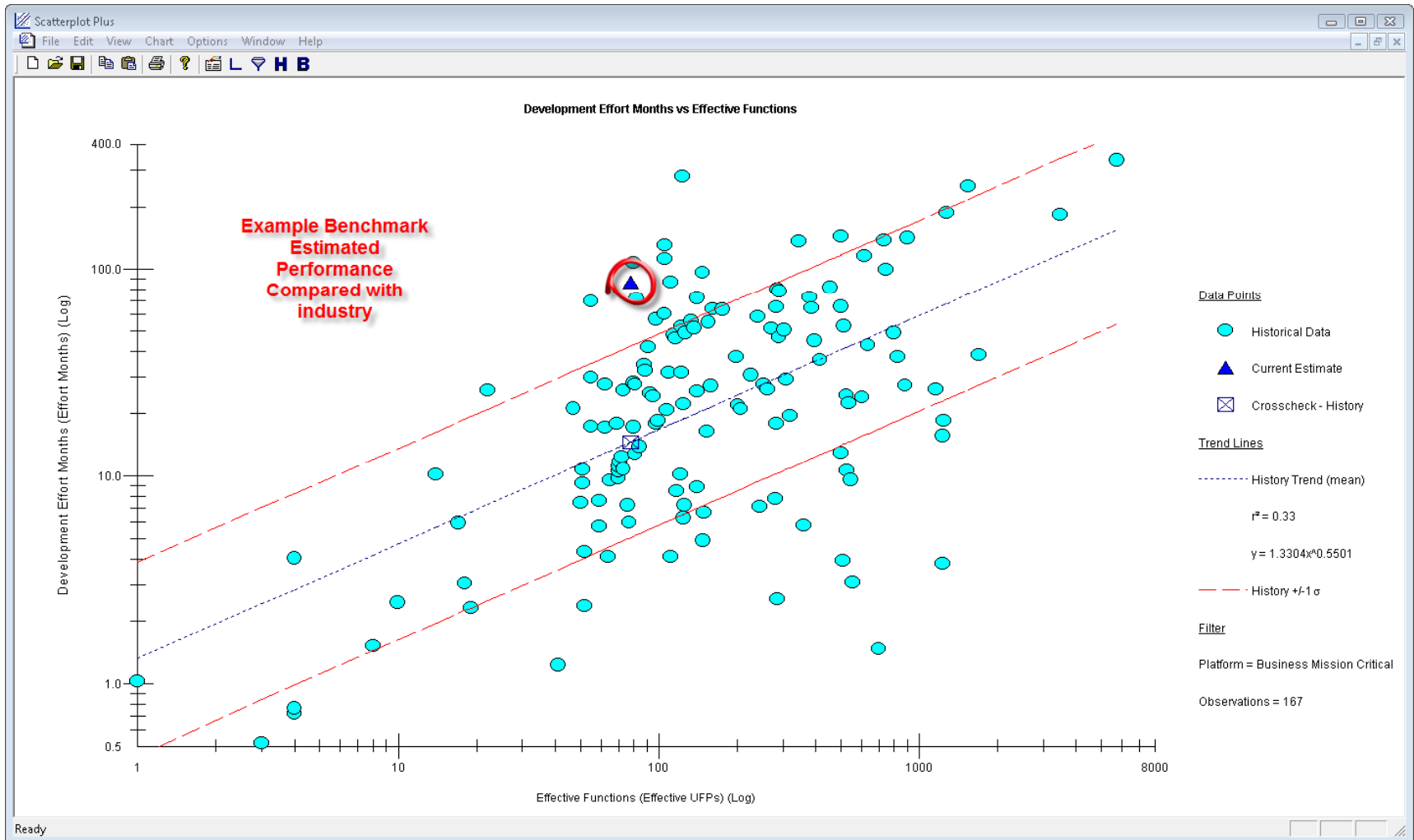
Effort Probability



Defects Probability



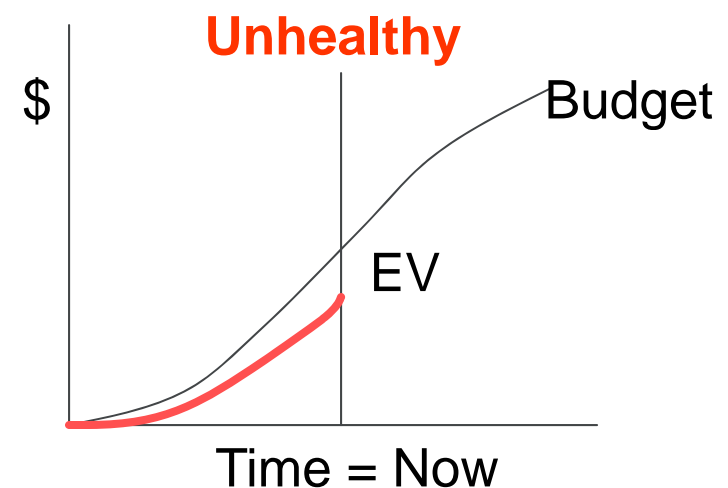
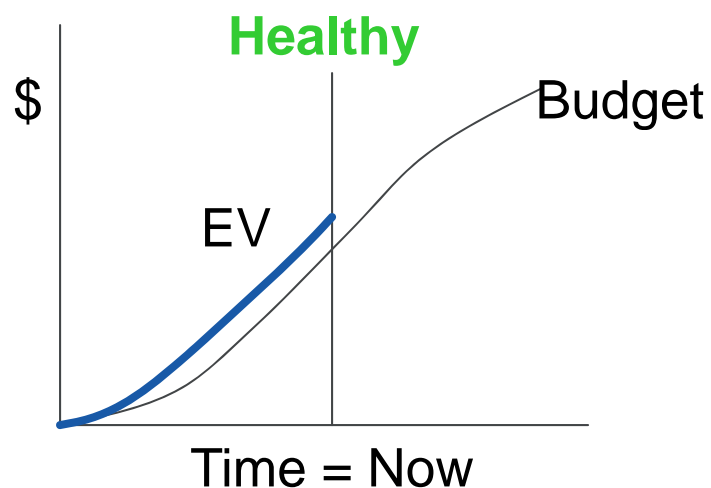
Example Benchmark Versus an Estimate.. Why Are We So Expensive?



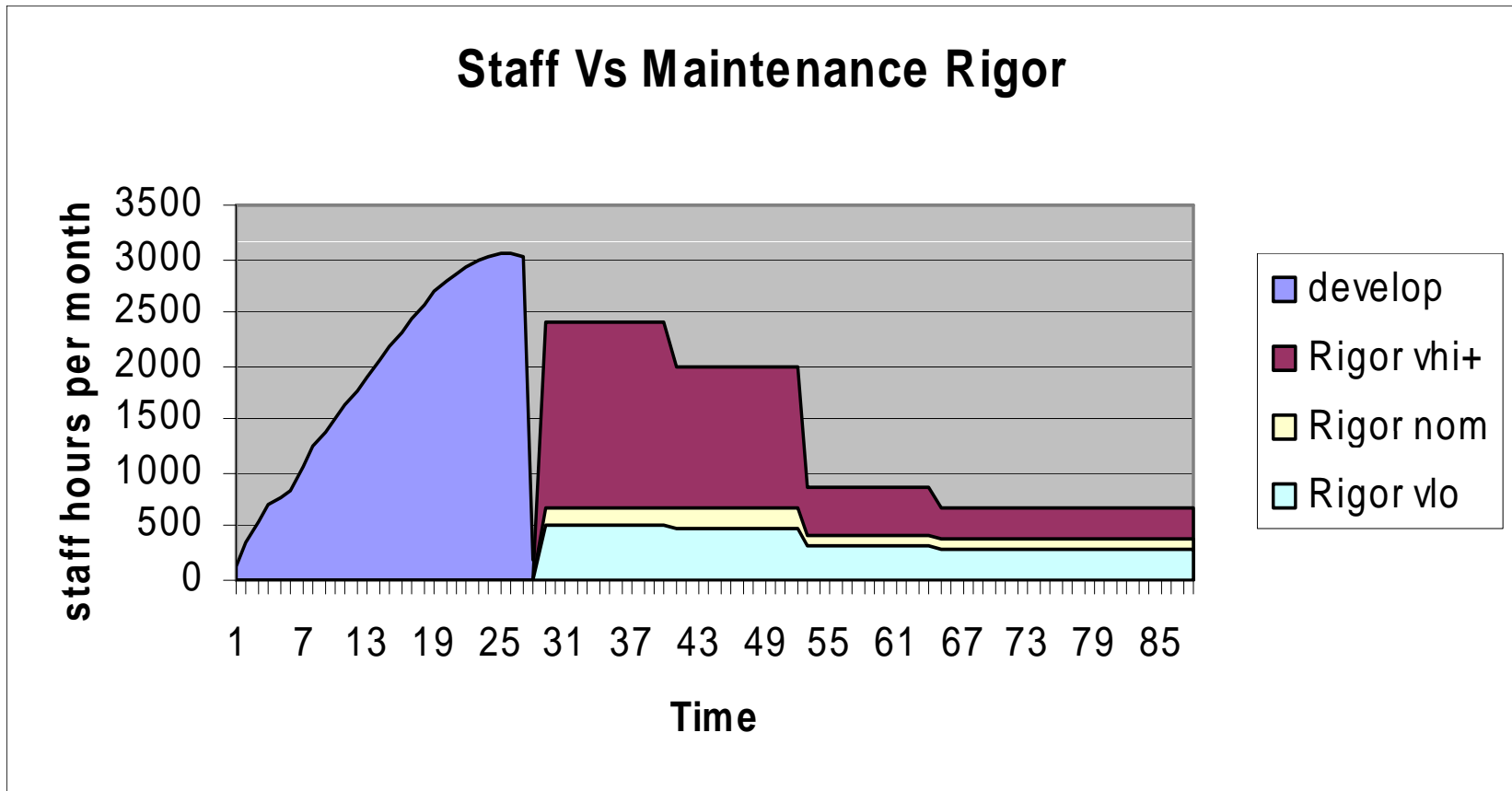
Use Earned Value To Quantify Progress Versus Effort FOR DEVELOPMENT AND MAINTENANCE



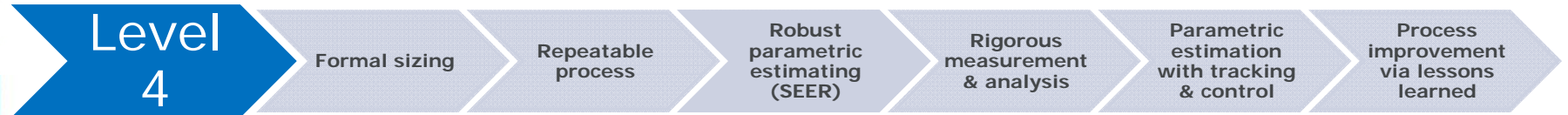
- Main concern of EVM: what has been accomplished in a given time and budget, versus what was planned for the same time and budget
 - A project is generally healthy if what has been accomplished is what was planned, or more
 - Project unhealthy if accomplishment lags expectations
- Definition: Earned value = budgeted value for the work accomplished (what you got for what it cost you)



Considering Maintenance During Planning Can Yield More Successful Long Term Results



Estimation Organizational Maturity Level 4



What To Measure: Multiplicity of Metrics

1. Obvious: Status / Trend Metrics

- E.g. productivity, defects removal rate, cost, schedule

2. Most important for improvement: Effectiveness (5 max)

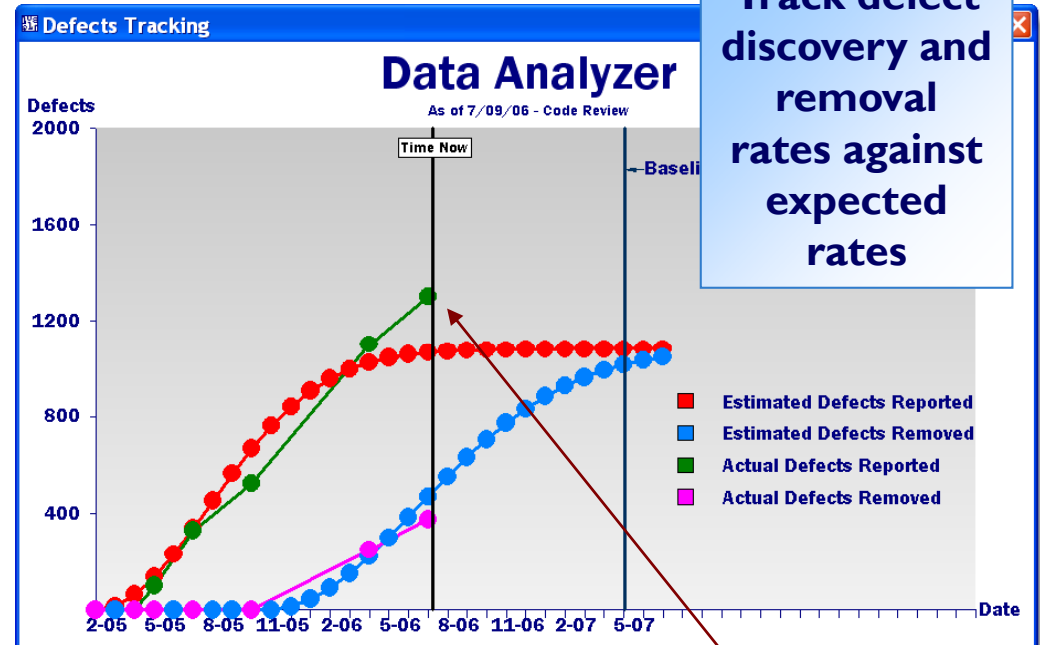
- “What we are doing that we should not do”
e.g. number of delivered critical defects
- “What we are not doing that we should do”
e.g. number of defects that got past inspections
- These metrics may change over time as we improve

Understanding & Tracking Defects, Growth And Other Metrics



Health and Status Indicator shows status and trends from the previous snapshot

- Including Size Growth and Defect Discovery/Removal Rate
- User defined control limits to control the transition between **red-yellow-green**



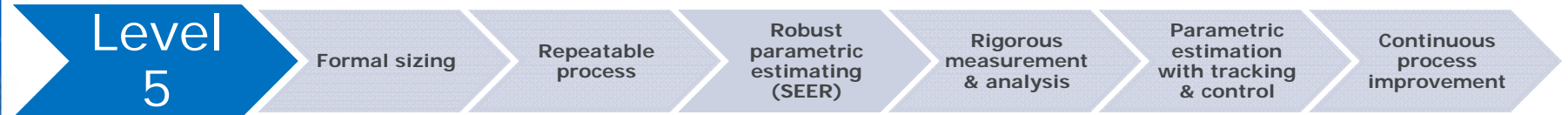
Track defect discovery and removal rates against expected rates

Health & Status Indicator					
	Schedule Variance	Time Variance	Cost Variance	Size Growth	Defects
Data Analyzer	WORSE	WORSE	WORSE	WORSE	WORSE

Increased defect reporting rate shows a worsening trend

Track software size growth

Estimation Organizational Maturity Level 5



Making Business Decisions Via Estimating Total Ownership Cost & ROI



Determine &
Quantify Benefits
over time

Determine total
ownership costs
against schedule

Determine if
project
worthwhile
(sufficient ROI)
on its own or as
part of a portfolio

Core Metric: Value Provided By Software



- Concept: Spend where you obtain the most value
 - Value = savings to company or additional revenue due to the software
- Software Fails to add value much too often
 - Users enamored with concept
 - Concept deployed
 - Little to no value contributed to company...
 - Bad assumptions: E.g. assuming saving 1 minute per day of employees filling in their time card has a huge savings in a year
 - Many reasons... often no changes in business rules
- MRP is a classic example of software hyped but which did not provide value
- Up to 80% of projects never produce positive ROI

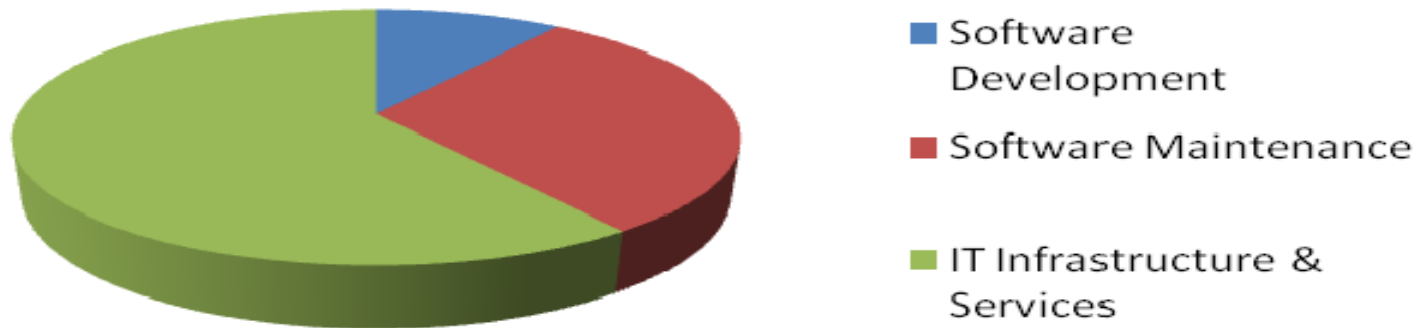
Lessons Learned Reviews

- Document upon estimate complete AND project complete
 - Records lessons learned
 - Provides evidence of process validity
 - Shows estimate generated in good faith
 - Captures actuals to substantiate / calibrate estimation models
- Document missing or incomplete information
- Capture risks, issues, & problems process addressed
- Document key decisions made during the estimate & results
- Document dynamics that occurred during the process e.g.
 - interactions of your estimation team
 - interfaces with stakeholders
 - trade-offs made to address issues identified during the process
- Conduct lessons-learned session ASAP while memories are fresh

Every software project is opportunity to improve the estimating process

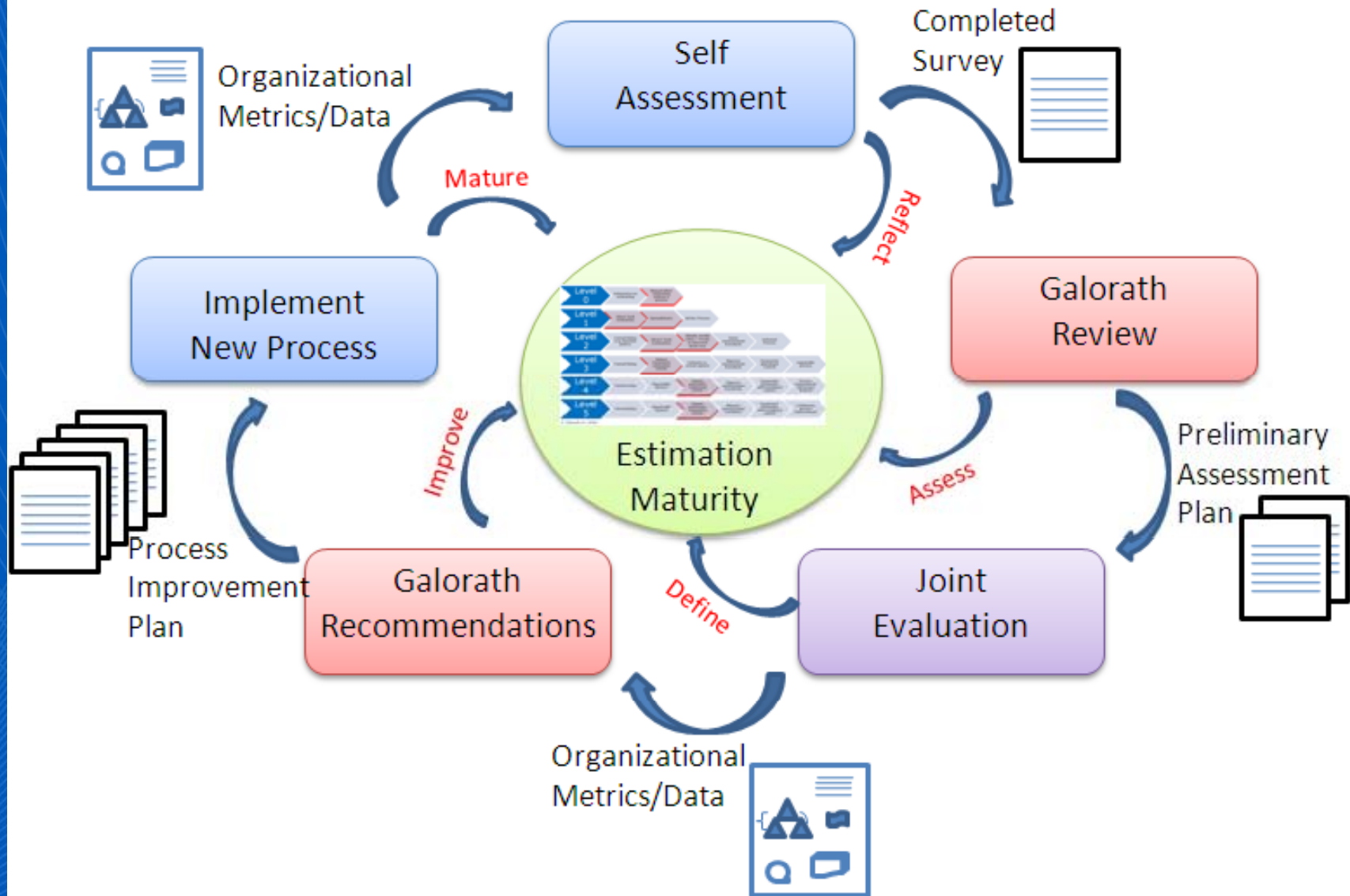
Estimate Total Ownership Costs; 60+% Can Be Infrastructure & Services

Total Ownership Cost: Typical Relative Cost By Activity



- Software Development
- Software Maintenance
- IT Infrastructure
- IT Services

Getting Started



Conclusions



- Estimation and estimation process are core for successful software projects
- Improving estimate maturity can improve your project success rate
- Gartner says even basic improvement using tool improves estimate vs. actual variance by 50%
- A good guess is not a substitute for a viable estimate
- Looking at total ownership cost can change project prospective
- Much of the industry is at level 1 in estimation maturity
- Process initiatives like CMMI require:
 - Estimation & planning, monitoring & control, measurement & analysis

Additional Information



- www.galorath.com
- Dan on estimating BLOG: www.galorath.com/wp
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