Lean & Agile Performance Measurement

30 Metrics for Managing SAFe 4.5 Portfolios, Programs, & Teams

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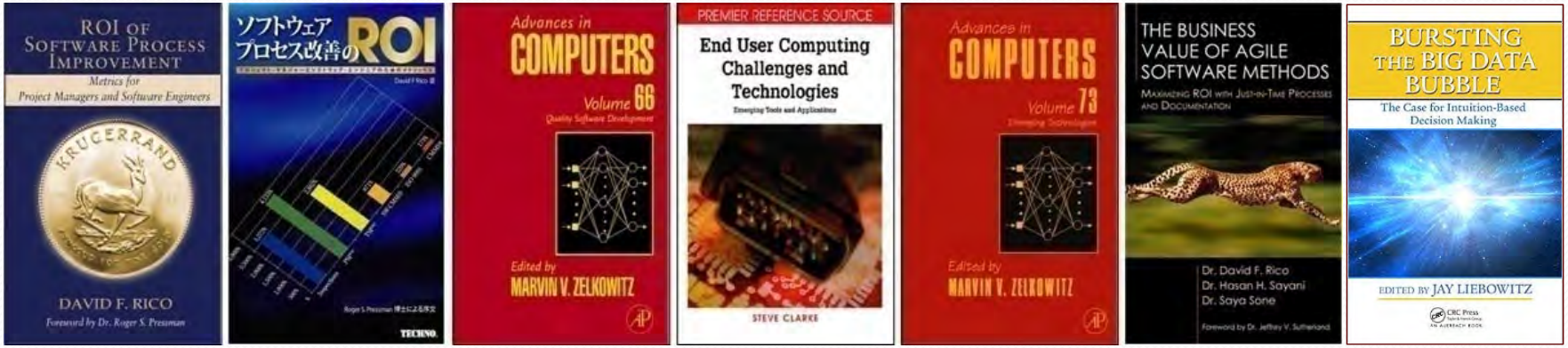
Agile Cost of Quality: http://www.davidfrico.com/agile-vs-trad-coq.pdf
DevOps Return on Investment (ROI): http://davidfrico.com/rico-devops-roi.pdf
Dave's NEW Business Agility Video: http://www.youtube.com/watch?v=hTvtsAkL8xU
Dave's NEWER Scaled Agile Framework SAFe 4.5 Video: http://youtu.be/1TAuCRq5a34
Dave's NEWEST Development Operations Security Video: http://youtu.be/X22kJAvx44A
DoD Fighter Jets versus Amazon Web Services: http://davidfrico.com/dod-agile-principles.pdf

Author Background

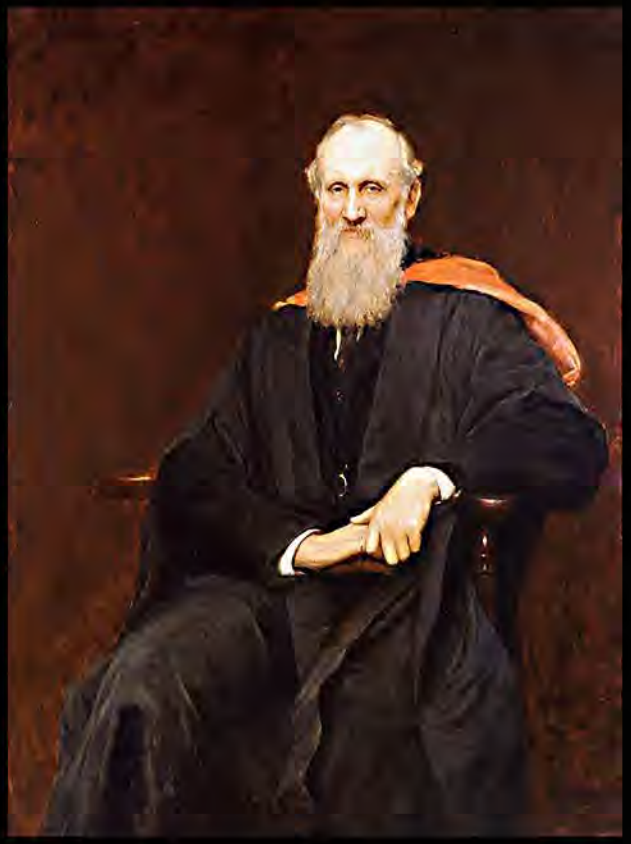
- Gov't contractor with 35+ years of IT experience
- B.S. Comp. Sci., M.S. Soft. Eng., & D.M. Info. Sys.
- ☞ Large gov't projects in U.S., Far/Mid-East, & Europe



→ ***Career systems & software engineering methodologist***
→ *Lean-Agile, Six Sigma, CMMI, ISO 9001, DoD 5000*
→ *NASA, USAF, Navy, Army, DISA, & DARPA projects*
→ *Published seven books & numerous journal articles*
→ *Intn'l keynote speaker, 245+ talks to 95,400 people*
→ *Specializes in metrics, models, & cost engineering*
→ *Cloud Computing, SOA, Web Services, FOSS, etc.*
→ *Professor at 7 Washington, DC-area universities*

On Metrics—Lord Kelvin

Lord Kelvin on quantification and scientific knowledge



I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be.

Lecture on "Electrical Units of Measurement" (3 May 1883), published in Popular Lectures

Definition of Portfolio Management

- **Portfolio**. Subportfolio, program, project, operations
- **Portfolio Mgt**. Manage these to achieve strategic obj.
- **Objectives**. Includes efficiency, effectiveness, & value

Skrabak, J. L. (2013). *The standard for portfolio management* (*Third Edition*). Newtown Square: PA: Project Management Institute.

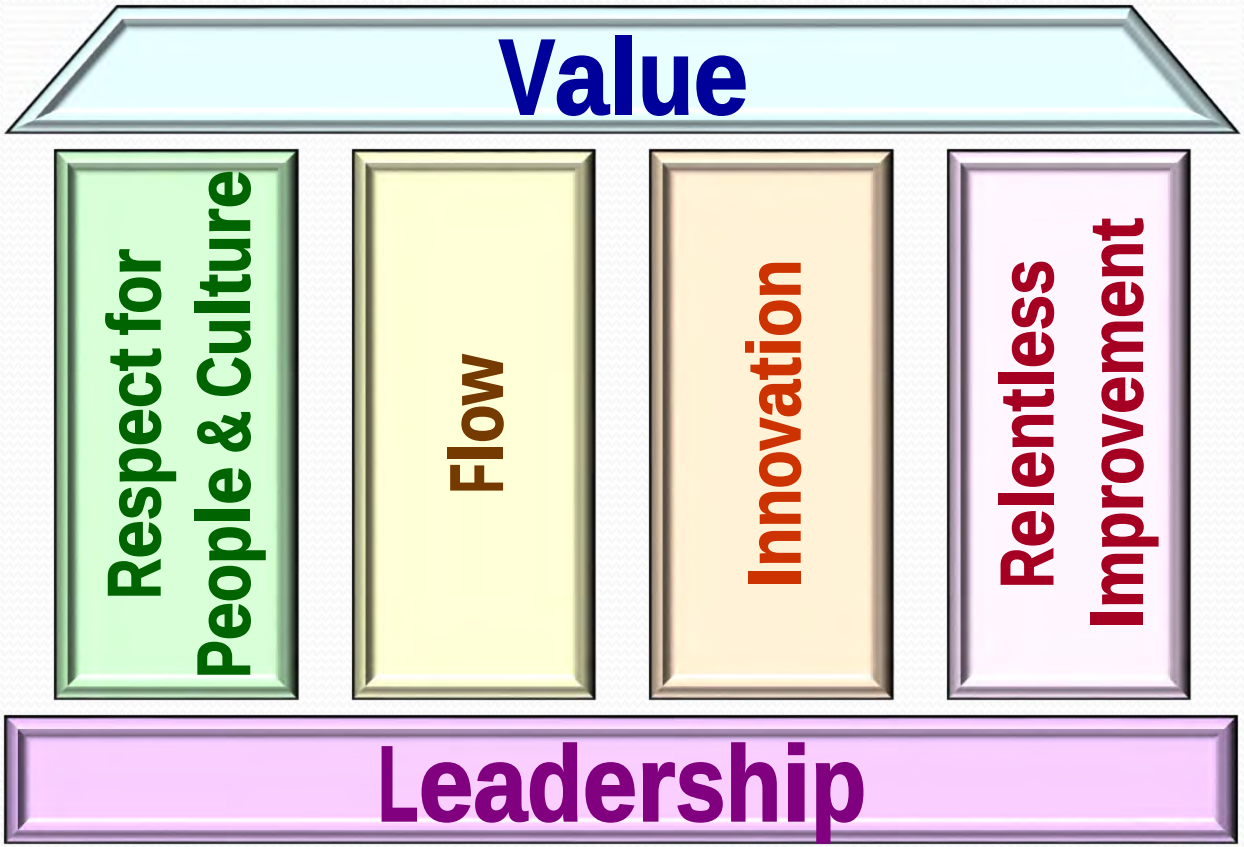
Lean & Agile FRAMEWORK?

- Frame-work (frām'wûrk') A support structure, skeletal enclosure, or scaffolding platform; Hypothetical model
  - *A multi-tiered framework for using* lean & agile methods *at the* enterprise, portfolio, program, & project *levels*
  - *An approach embracing values and principles of* lean thinking, product development flow, & agile methods
  - *Adaptable framework for* collaboration, prioritizing work, iterative development, & responding to change
  - *Tools for agile* scaling, *rigorous and disciplined* planning & architecture, *and a sharp focus on* product quality
  - *Maximizes* **BUSINESS VALUE** *of organizations, programs, & projects with lean-agile values, principles, & practices*

Leffingwell, D. (2011). *Agile software requirements*: *Lean requirements practices for teams, programs, and the enterprise*. Boston, MA: Pearson Education.

What are Lean Values?

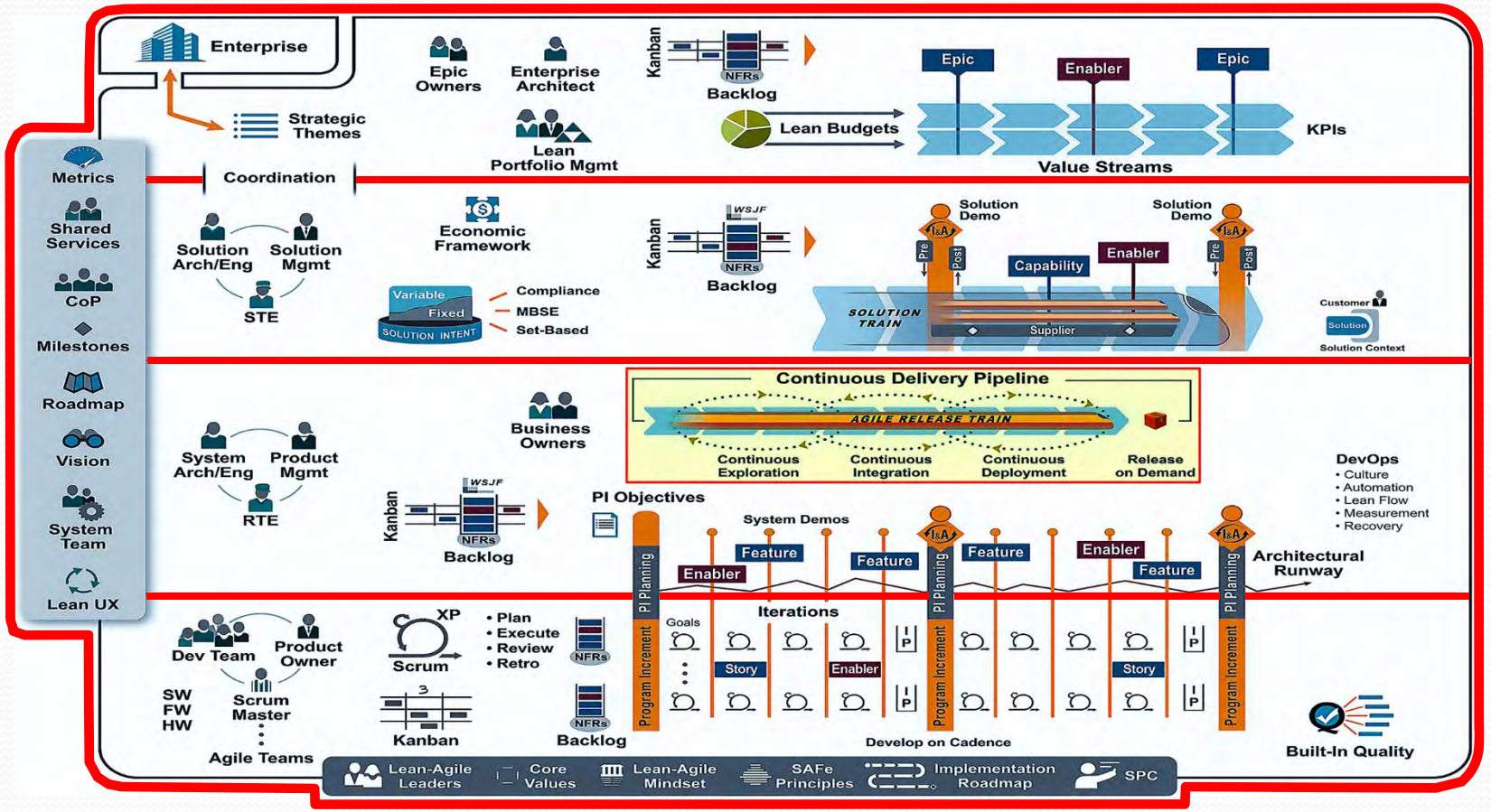
- Time-centric way to compete on speed & time
- Customer-centric model to optimize cost & quality
- Pull-centric alternative to wasteful mass production



Leffingwell, D. (2017). *The SAFe house of lean*. Retrieved February 19, 2018, from http://www.scaledagileframework.com

SAFe MODEL

- Proven, public well-defined F/W for scaling Lean-Agile
- Synchronizes alignment, collaboration, and deliveries
- Quality, execution, alignment, & transparency focus



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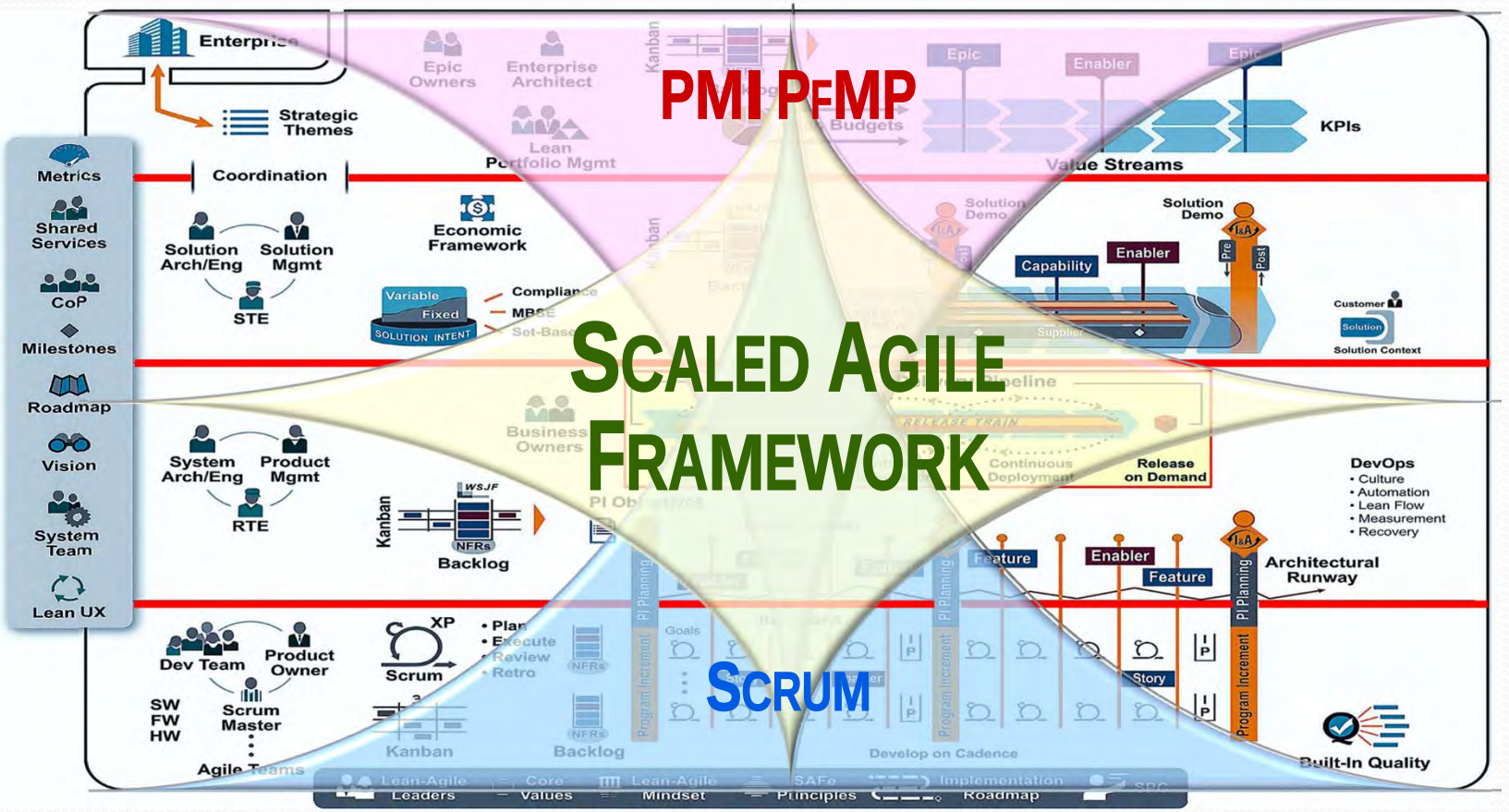
PfMP vs. SAFe vs. Scrum

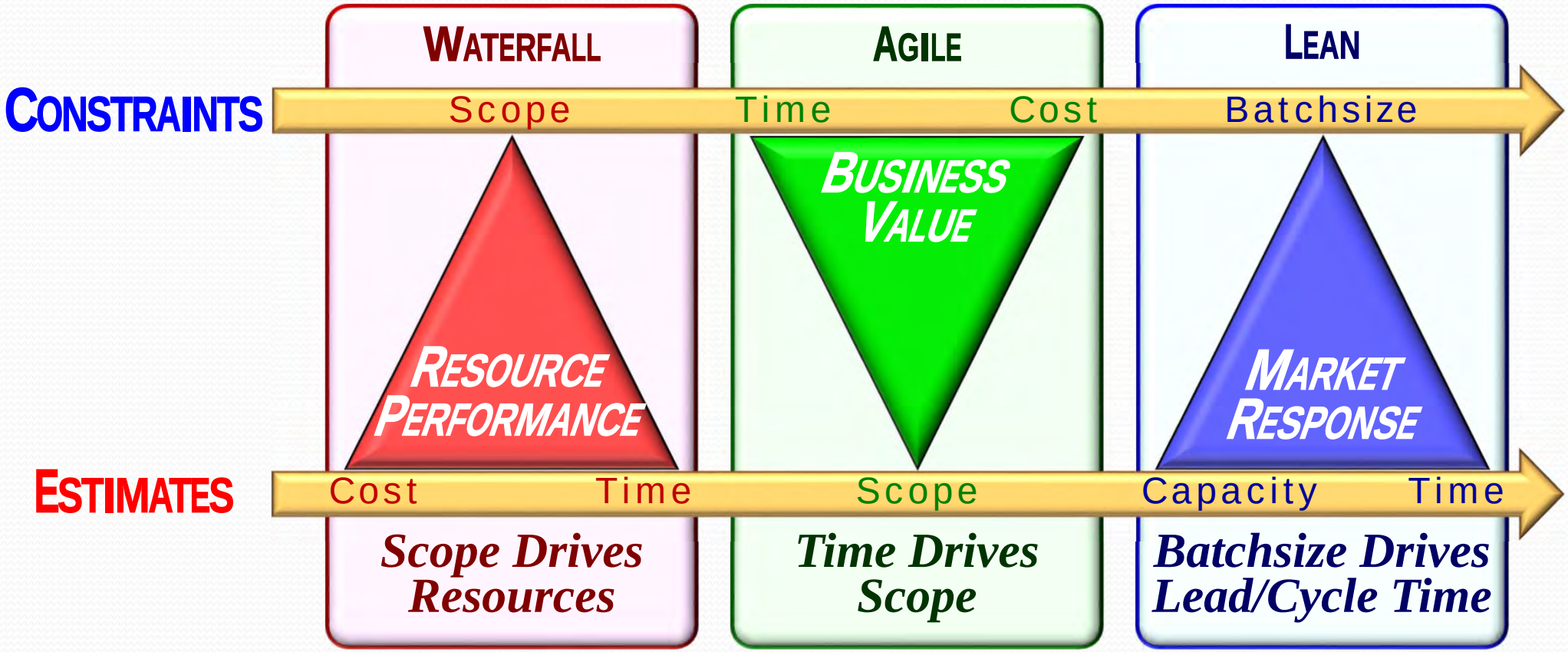
- Scrum created to address Agile team mgt.
- SAFe created to address Agile program mgt.
- PfMp created to address Portfolio management



Leffingwell, D. (2007). *Scaling software agility*: *Best practices for large enterprises*. Boston, MA: Pearson Education.

SAFe GOLDILOCKS Zone

- Traditional project management is scope-based
- Agile project management is primarily time-based
- Batchsize, capacity, & time key to market response



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Sylvester, T. (2013). *Waterfall, agile, and the triple constraint*. Retrieved December 16, 2017, from http://tom-sylvester.com/lean-agile/waterfall-agile-the-triple-constraint

Pound, E. S., Bell, J. H., Spearman, M. L. (2014). *Factory physics*: *How leaders improve performance in a post-lean six sigma world*. New York, NY: McGraw-Hill Education.

What are Agile Metrics?

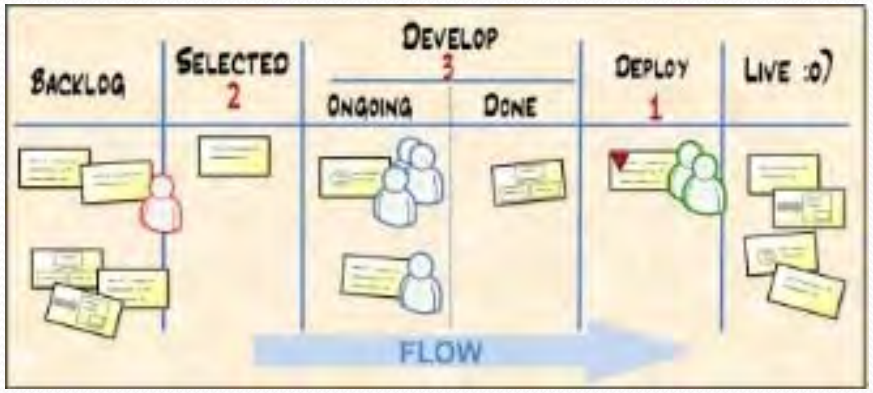
- Met-ric (mĕt′rĭk) A standard of measurement; system of related measures; quantification of a characteristic
  - Quantitative measure *of a degree to which agile project* processes *or resulting* systems *possess some property*
  - Numerical ratings *to measure the* size, cost, complexity, *or* quality *of software produced using agile methods*
  - Measurement *of a particular characteristic of an agile project's* scope, time, cost, progress, *or* technical perf.
  - *Measure of the degree of* customer collaboration, team-work, iterative development, *or* adaptability *to change*
  - *Ensuring* **BUSINESS VALUE** *by measuring operational and team performance, customer satisfaction, and ROI*

Rico, D. F., Sayani, H. H., & Sone, S. (2009). *The business value of agile software methods*. Ft. Lauderdale, FL: J. Ross Publishing.

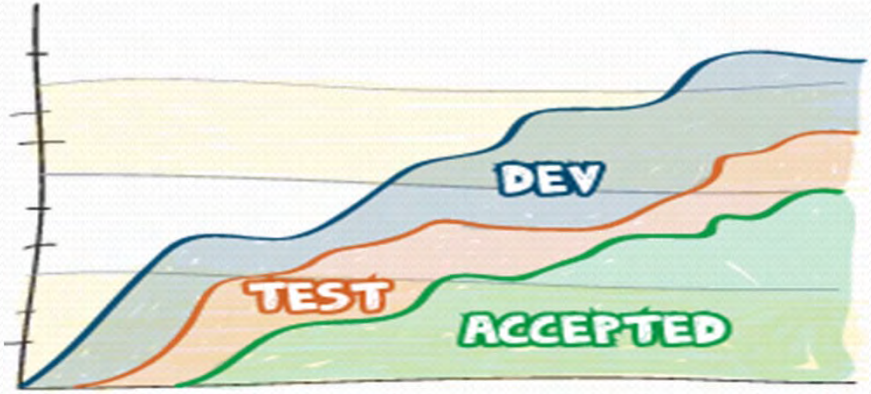
Agile Lean Metrics

- Late big bang integration increases WIP backlog
- Agile testing early and often reduces WIP backlog
- CI/CD/DevOps lower WIP, Cycle Time, & Lead Time

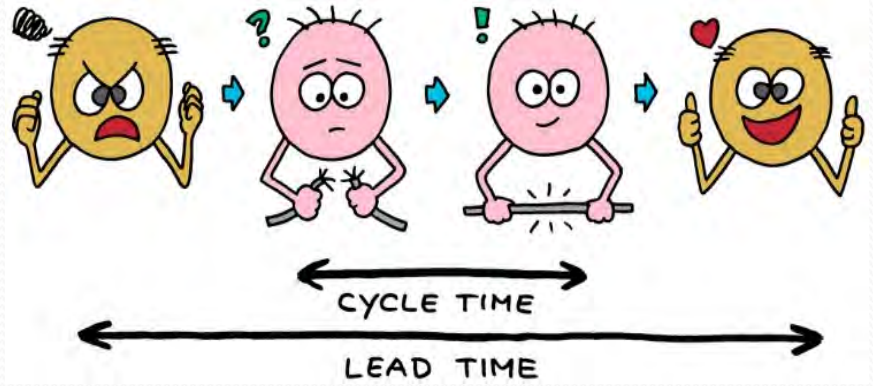
Kanban Board



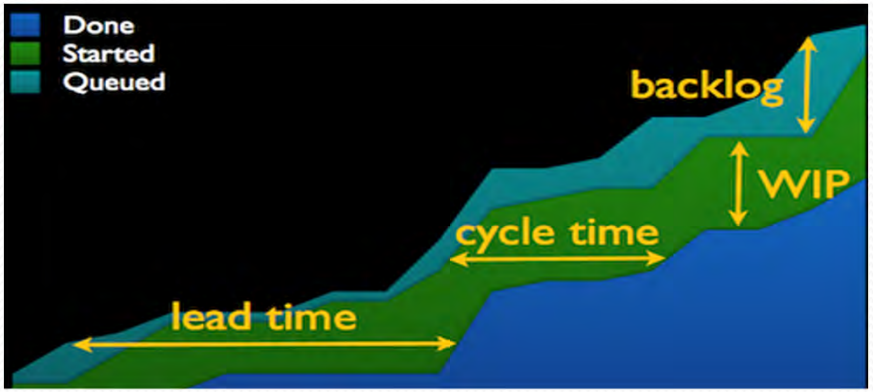
Cumulative Flow Diagram



Lead Time & Cycle Time



Putting it All Together



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Agile SAFe Metrics

- Basic SAFe metrics & assessments at all levels
- Many are rollups of burndown, velocity, & bus. value
- Multi-level kanbans, backlogs, & performance tracking

Portfolio	Lean Portfolio Metrics	Comprehensive but Lean set of metrics that can be used to assess internal and external progress for an entire portfolio.
	Portfolio Kanban	Ensures Epics and Enablers are reasoned and analyzed prior to a PI boundary, prioritized, and have acceptance criteria.
	Epic Burn-up Chart	Tracks progress toward epic completion, i.e., Initial estimate, Work completed, and Cumulative work completed.
	Epic Progress Measure	At-a-glance view of the status of all epics in a portfolio, i.e., Epic X, progress, and current vs. initial est. story points.
	Enterprise Scorecard	Four perspectives to measure performance for each portfolio, i.e., Efficiency, Value delivery, Quality, and Agility.
	LPM Self Assessment	Structured, periodic self-assessment to continuously measure and improve portfolio processes.
	Value Stream KPIs	Set of criteria or KPIs to evaluate value stream investments, i.e., revenues, innovation, intangibles, and lean metrics.
Large Solution	Solution Kanban Board	Ensures Capabilities and Enablers are reasoned and analyzed prior to PI boundary, prioritized, and have acc. criteria.
	Solution Predictability	Aggregation of individual predictability measures for ARTs to assess the overall predictability of Solution Trains.
	Solution Performance	Aggregation of individual performance measures for ARTs to assess the overall performance of Solution Trains.
	Economic Framework	Decision rules to align work to financial objectives of Solution and guide economic decision-making process.
	WSJF	Prioritization model used to sequence jobs (e.g., Features, Capabilities, and Epics) to maximize economic benefit.
	Cost of Delay	A way of communicating the impact of time on the outcomes we hope to achieve, i.e., combining urgency and value.
	Duration (Job Size)	Length of time required to complete an epic, enabler, capability, or feature, i.e., size or complexity in story points.
Program	Feature Progress	Tracks feature and enabler status during PI and indicates which features are on track or behind, i.e., plan vs. actual.
	Program Kanban	Ensures Features are reasoned and analyzed prior to a PI boundary, prioritized, and have acceptance criteria.
	Program Predictability	Aggregation of Team PI Performance Reports to assess the predictability of ART, i.e., planned vs. actual business value.
	Program Performance	Aggregation of team metrics collected at end of PI, i.e., functionality (velocity, etc.) and quality (tests, defects, etc.).
	PI Burn-down Chart	Shows progress toward PI timebox to track work planned for PI against work accepted, i.e., iterations vs. story points.
	Cumulative Flow	Graph to visualize amount of work waiting to be done (backlog), work in progress (started), and completed (validated).
	Art Self Assessment	Structured, periodic self-assessment to continuously measure and improve program processes.
Team	CD Pipeline Efficiency	Measures efficiency of steps in terms of touch and wait time, i.e., analysis, backlog, build, validate, deploy, release, etc.
	Deployments and Releases	Deployment and release frequency progress as a ratio of deployment to production vs. product release frequency.
	Recovery over time	How often physical or logical rollbacks performed by overlaying points in time for deployment, release, and rollbacks.
	Innovation Indicators	Hypothesis measures of MMF and MVP business outcomes based upon actionable innovation accounting measures.
	Hypotheses Tested	Number of successful vs. unsuccessful hypothesis tests (with goal of increasing the number, frequency, and success).
	Team Performance	Individual team metrics collected at end of PI, i.e., functionality (velocity, etc.) and quality (tests, defects, etc.).
	Team Kanban	Ensures Stories and tasks are reasoned and analyzed prior to a PI boundary, prioritized, and have acceptance criteria.
	Team Business Value	Estimate of actual business value achieved for each team's PI objectives during a PI demo by customer and agile team.
	Team Self-Assessment	Structured, periodic self-assessment to continuously measure and improve team processes.

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

Portfolio Metrics

- Metrics for value streams, programs, & teams
- Lean & agile metrics to evaluate an entire portfolio
- Metrics of economics, business value, & performance

LEAN PORTFOLIO METRICS	Comprehensive but Lean set of metrics that can be used to assess internal and external progress for an entire portfolio.
PORTFOLIO KANBAN	Ensures Epics and Enablers are reasoned and analyzed prior to reaching a PI boundary, prioritized, and have acceptance criteria to guide a high-fidelity implementation.
EPIC BURN-UP CHART	Tracks progress toward an epic's completion, i.e., Initial epic estimate line (blue), Work completed line (red), and Cumulative work completed line (green).
EPIC PROGRESS MEASURE	At-a-glance view of the status of all epics in a portfolio, i.e., Epic X, Bar length, Vertical red line, and current vs. initial estimated number of story points.
ENTERPRISE SCORECARD	Four perspectives to measure performance for each portfolio, i.e., Efficiency, Value delivery, Quality, and Agility.
LPM SELF ASSESSMENT	Periodic assessment to measure and improve portfolio processes, i.e., Lean portfolio management, strategy and investment funding, lean governance, agile program guidance, and portfolio metrics.
VALUE STREAM KPIS	Set of KPIs to evaluate ongoing value stream investments, i.e., revenues and profits, non-financial innovation indices, internal intangibles such as morale and customer satisfaction, and lean metrics.

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#1 • Lean Portfolio Metrics

- High-level measures of overall portfolio health
- Combo of tangible and intangible measurements
- ☞ Inc. morale, customer satisfaction, & leanness-agility

Benefit	Expected Result	Metric Used
Employee Engagement	Improved employee satisfaction; lower turnover	Employee survey; HR statistics
Customer Satisfaction	Improved Net Promoter Score	Net Promoter Score survey
Productivity	Reduced average feature cycle time	Feature cycle time
Agility	Continuous improvement in team and program measures	Team, Program, and Portfolio self-assessments; Release Predictability Measure
Time to Market	More frequent releases	Number of releases per year
Quality	Reduced defect counts and support call volume	Defect data and support call volume
Partner Health	Improving ecosystem relationships	Partner and vendor surveys

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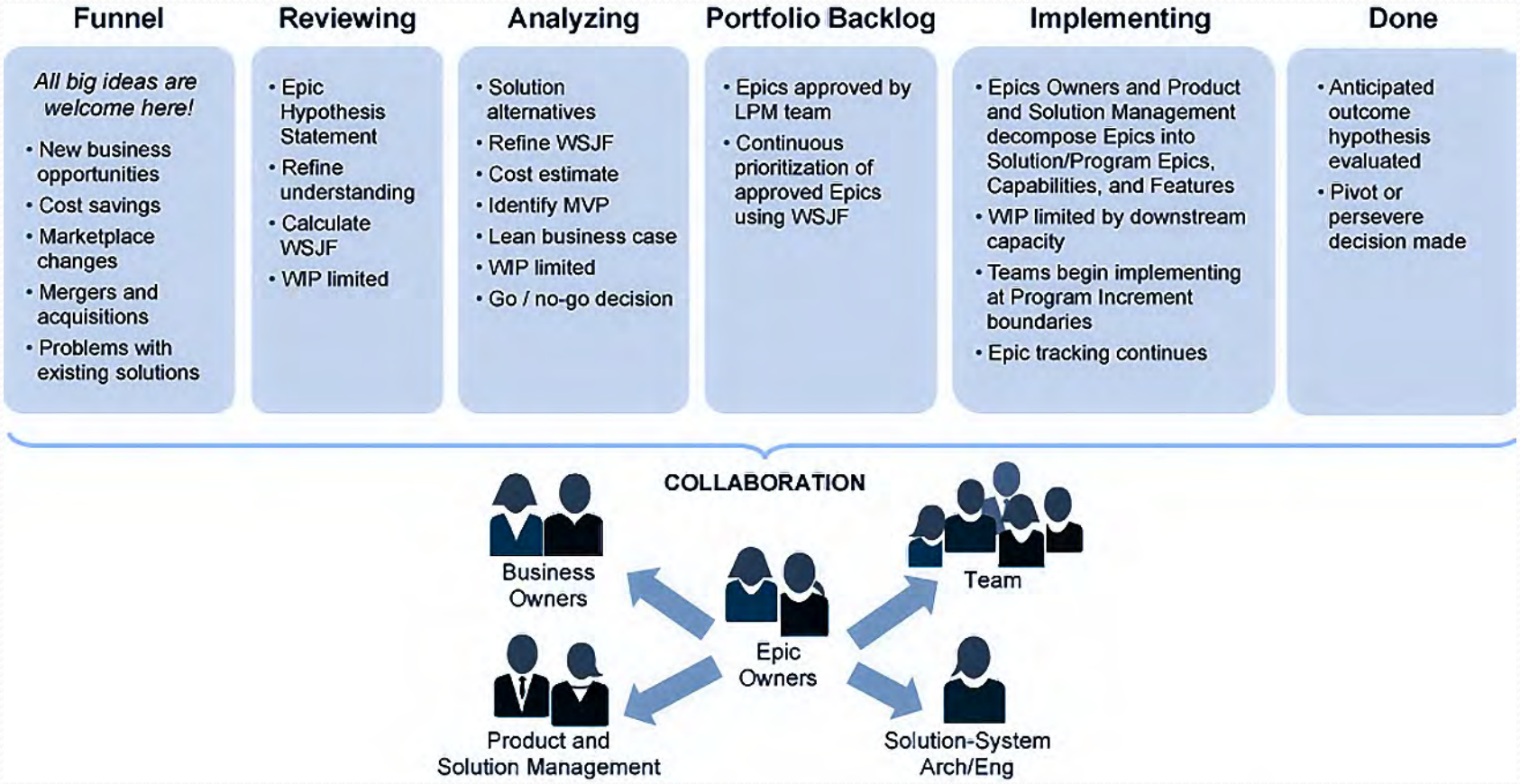
#2 • Portfolio Kanban

- Visualization of high-level enterprise initiatives
- Instantly indicates what's in-work and its progress
- Includes prioritization, WIP limits, & work complete



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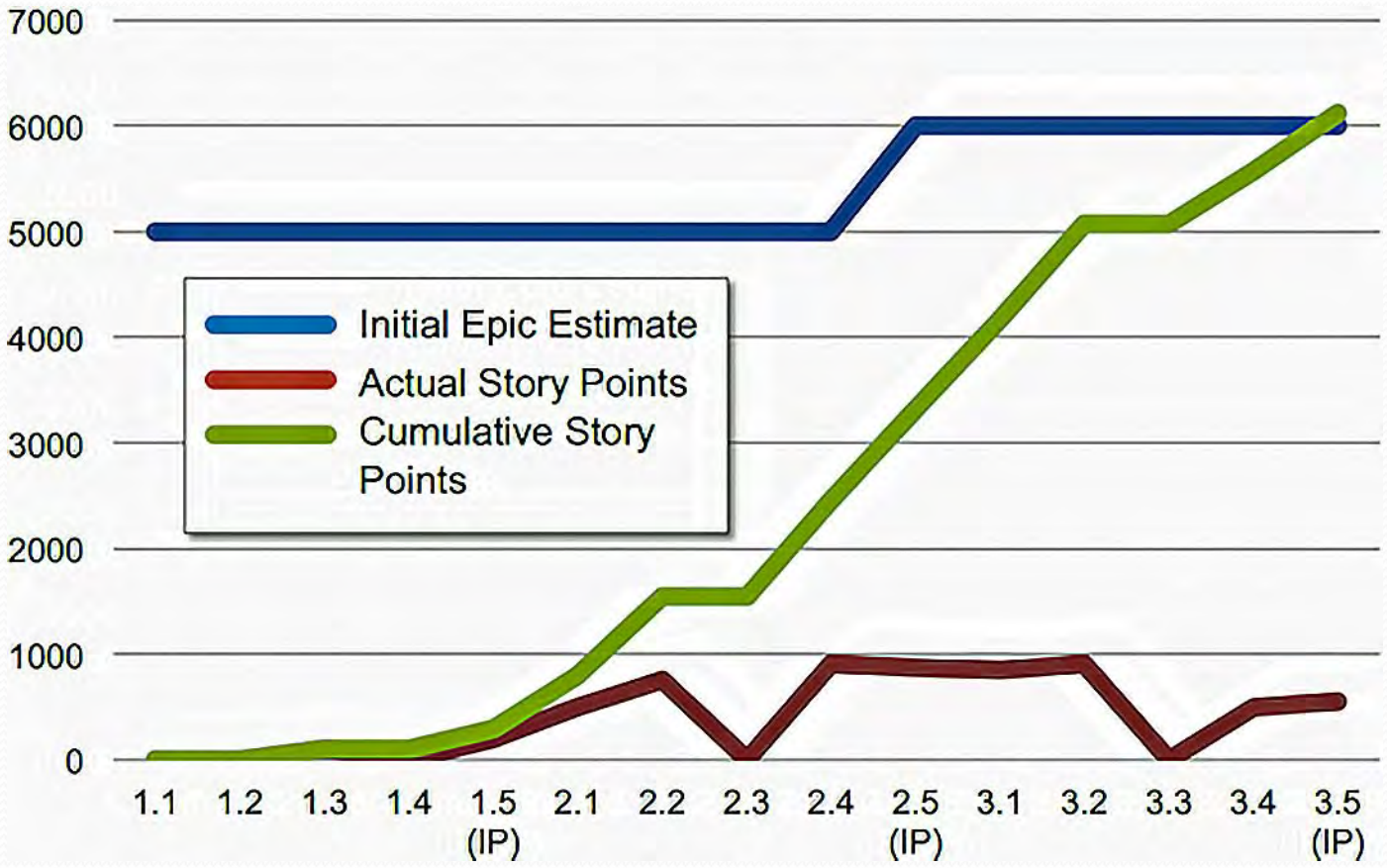
#3 • Epic Burn-Up Chart

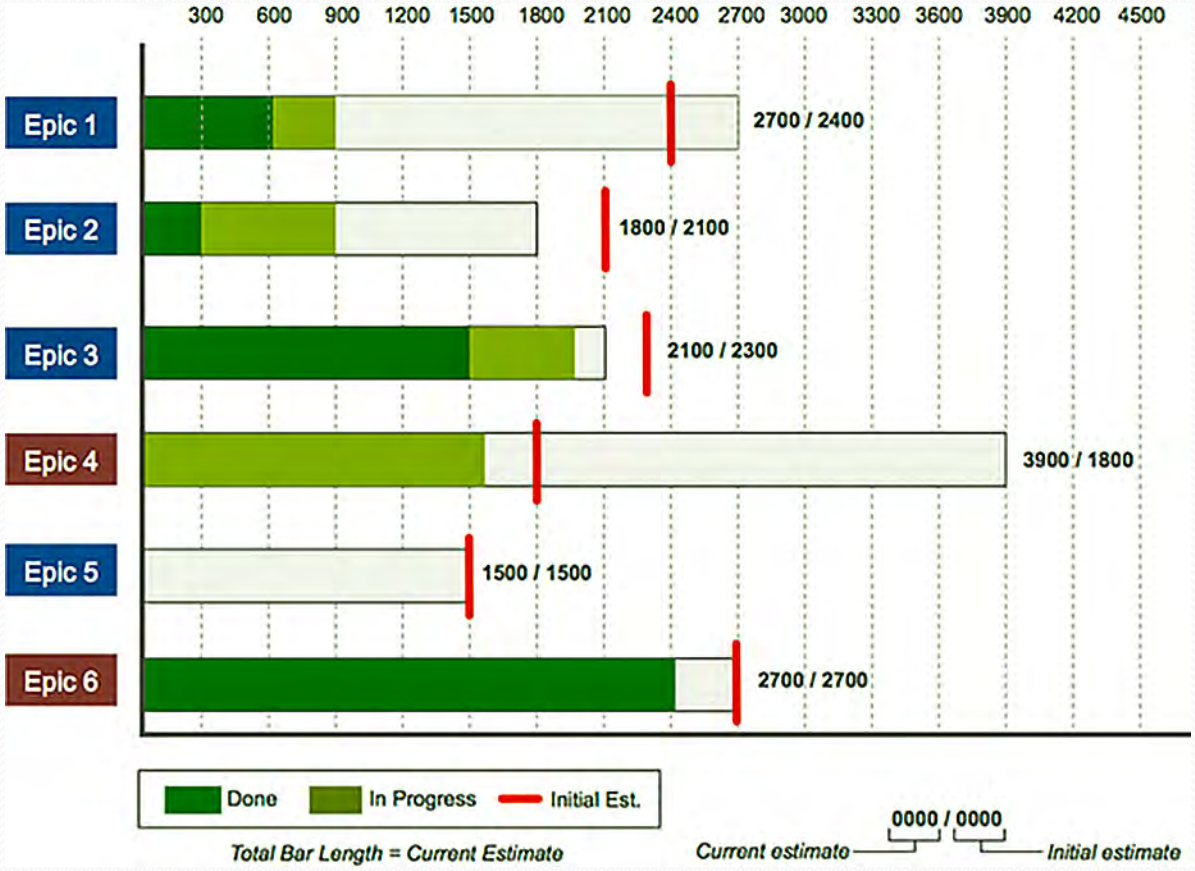
- Quantitative pseudo-EVM enterprise-level view
- Depicts planned vs. actual story points completed
- ☞ Includes story point estimates, actuals, & cumulative



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#4 • Epic Progress Measure

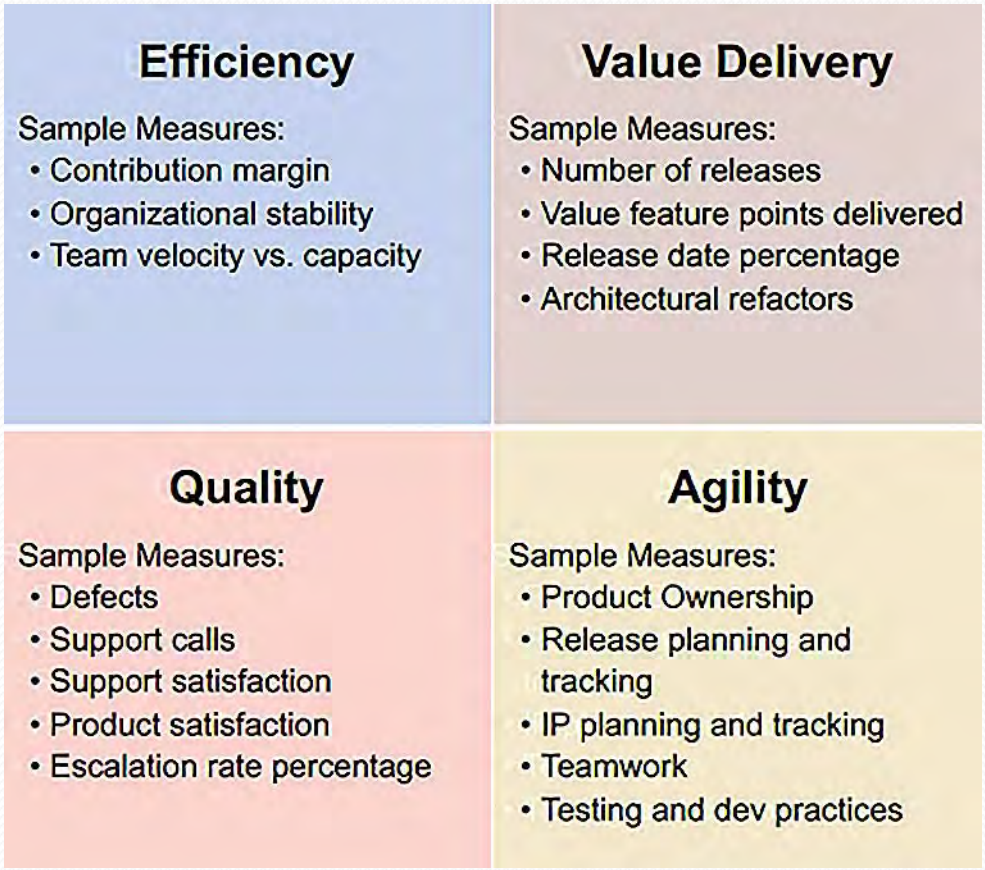
- Visualization of the status of enterprise initiatives
- Epic-by-epic view of planned vs. actual story points
- ☞ Includes epics, epic progress, & story points complete



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#5 • Enterprise Scorecard

- Enterprise-level balanced scorecard visualization
- Depicts key enterprise tangible & intangible metrics
- Includes efficiency, value, quality, & leanness-agility



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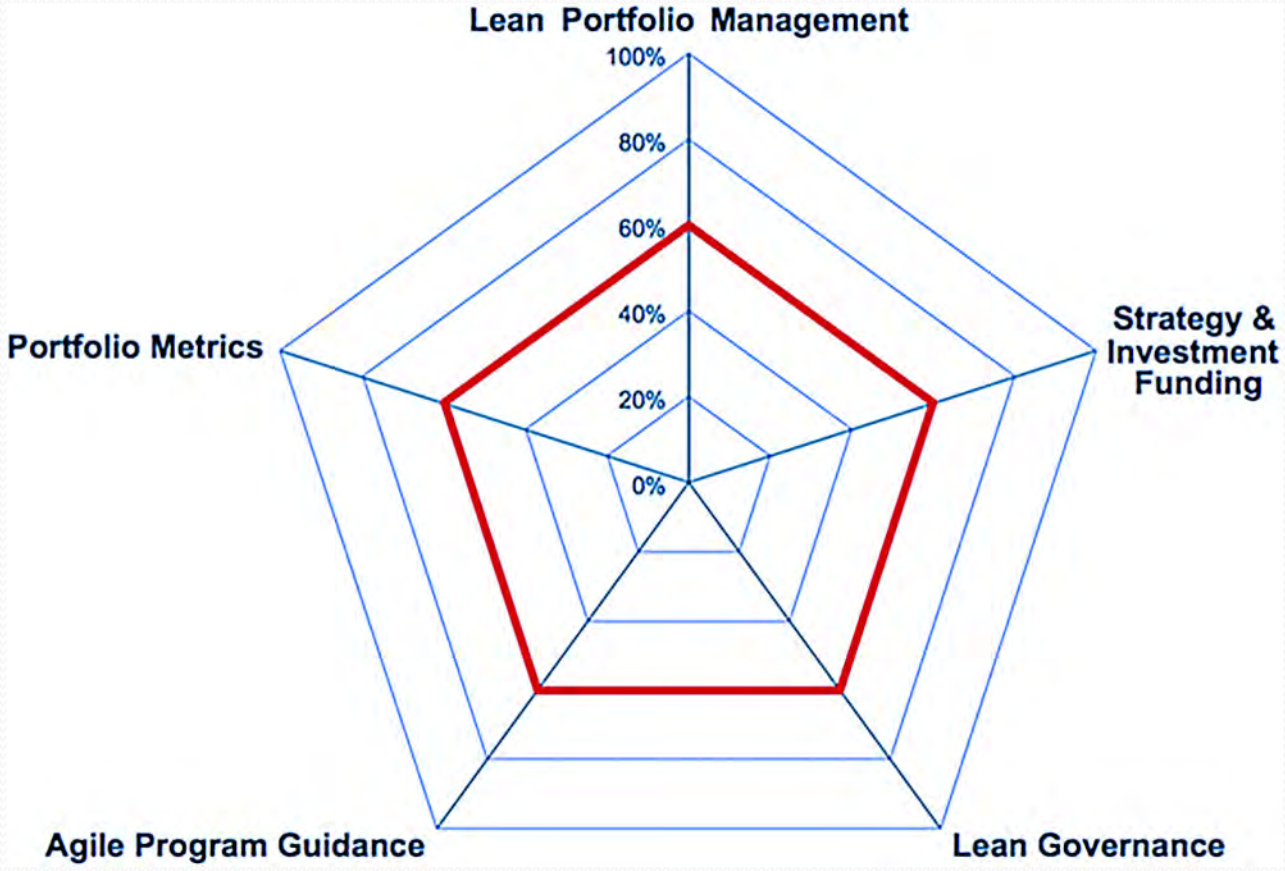
#6 • LPM Self Assessment

- Ordinal multi-dimensional view of portfolio health
- Contains a few KPIs, simple scales, or percentages
- Includes management, investments, governance, etc.



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#7 • Value Stream KPIs

- Enterprise-level value stream performance in KPIs
- Often contain intangible external innovation metrics
- ☞ Inc. end-user volumes, retention, & referral statistics

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Large Solution Metrics

- Metrics for large multi-program technical solutions
- Lean & agile metrics to evaluate multiple programs
- Measurement of cost, prioritization, & predictability

Solution Kanban Board	**Ensures Capabilities and Enablers are reasoned and analyzed prior to reaching a PI boundary, prioritized, and have acceptance criteria to guide a high-fidelity implementation.**
Solution Predictability	**Aggregation of individual predictability measures for Agile Release Trains (ARTs) to assess the overall predictability of Solution Trains.**
Solution Performance	**Aggregation of individual performance measures for Agile Release Trains (ARTs) to assess the overall performance of Solution Trains.**
Economic Framework	**Rules to align work to financial objectives and guide economic decision-making, i.e., Lean Budgeting, Epic funding and governance, decentralized economic decision-making, and CoD job sequencing.**
WSJF	**A prioritization model used to sequence "jobs" (e.g., Features, Capabilities, and Epics) to produce maximum economic benefit.**
Cost of Delay	**A way of communicating the impact of time on the outcomes we hope to achieve, i.e., partial derivative of the total expected value with respect to time (combining urgency and value).**
Duration (Job Size)	**Length of time it will require to complete an epic, enabler, capability, or feature, i.e., size or complexity of functional or non-functional requirement measured in story points.**

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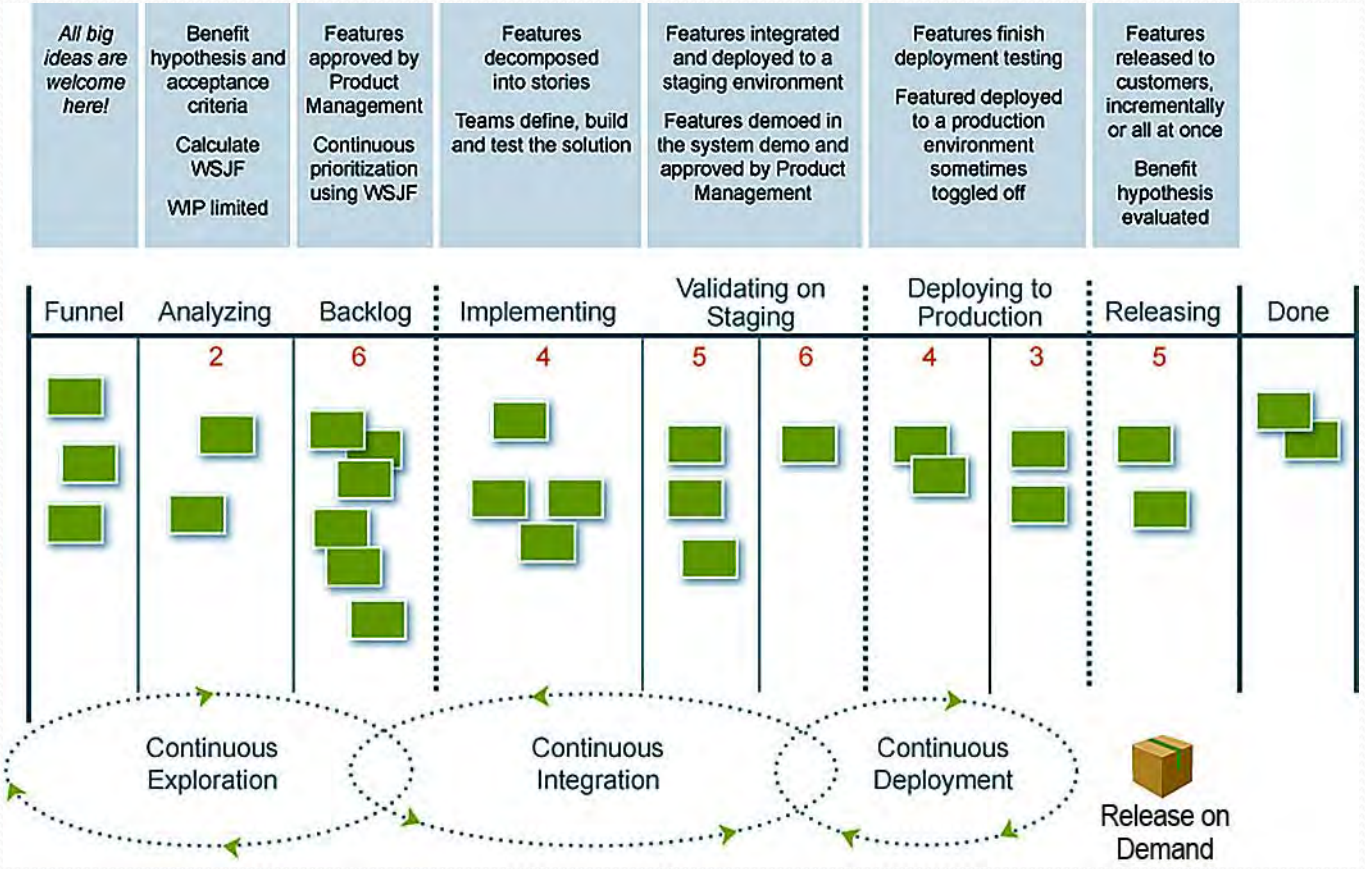
#8 • Solution Kanban Board

- Visualizes flows of progress for large solution streams
- Kanban of large solution-level capabilities & features
- ☞ Includes priority, WIP limits, & completion status



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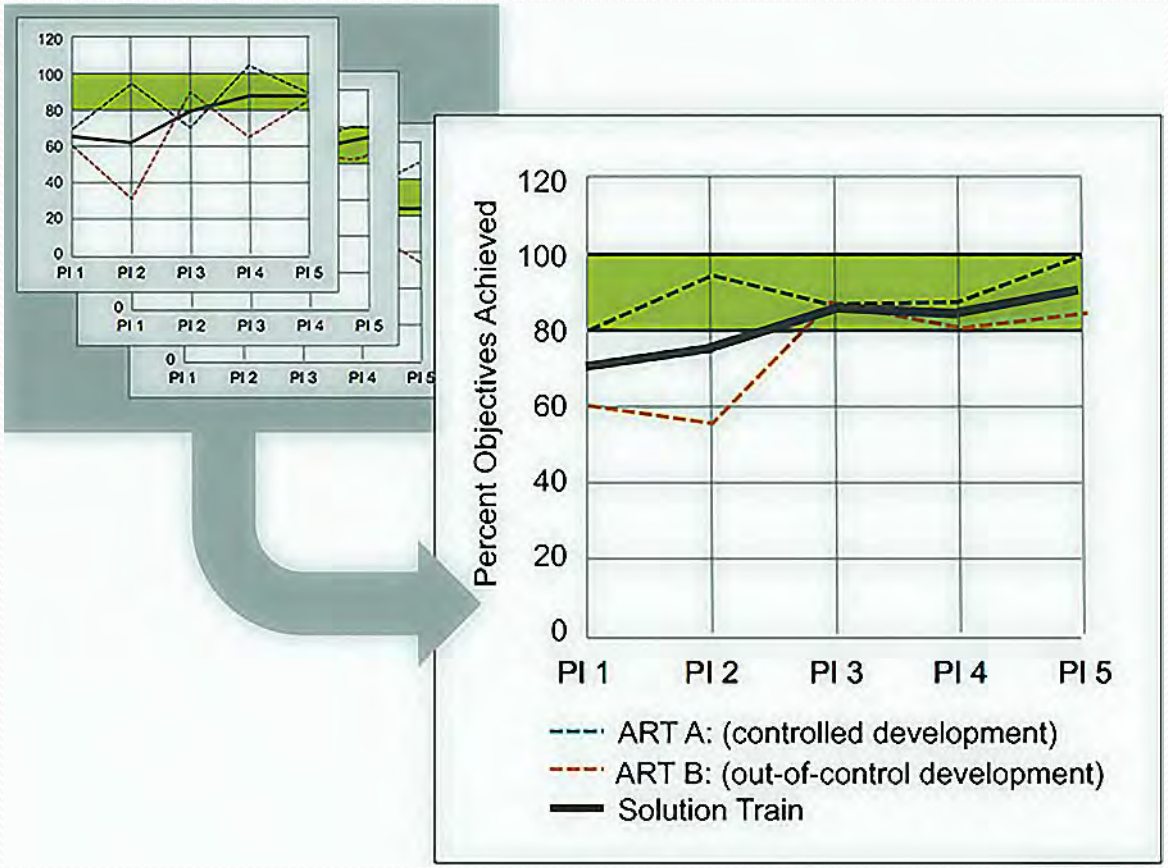
#9 • Solution Predictability

- Aggregated program visualization of PI objectives
- Measures status in terms of PI objective satisfaction
- ☞ Inc. programs, PI objectives, & PI objectives satisfied



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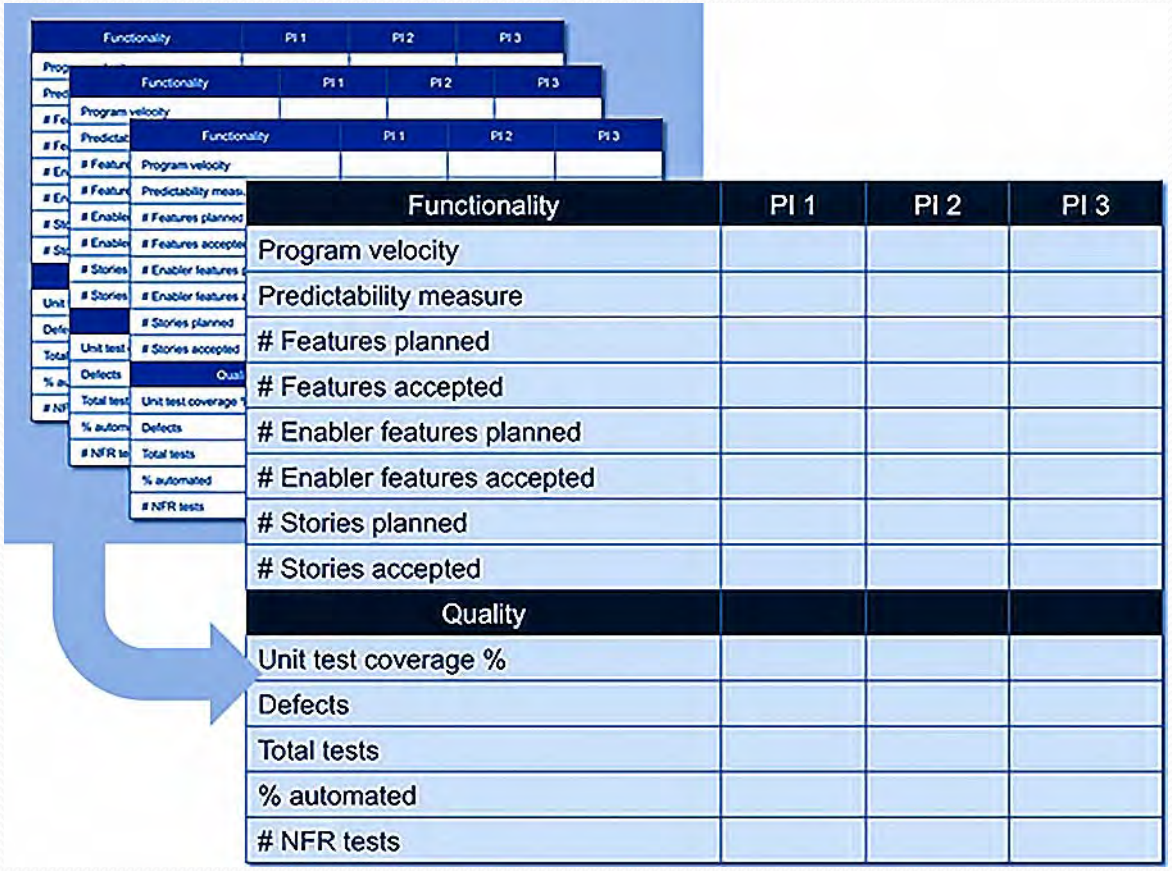
#10 • Solution Performance

- Aggregated program visualization of individual metrics
- Contain productivity, quality, & story points complete
- ☞ Includes velocity, story points, & product quality



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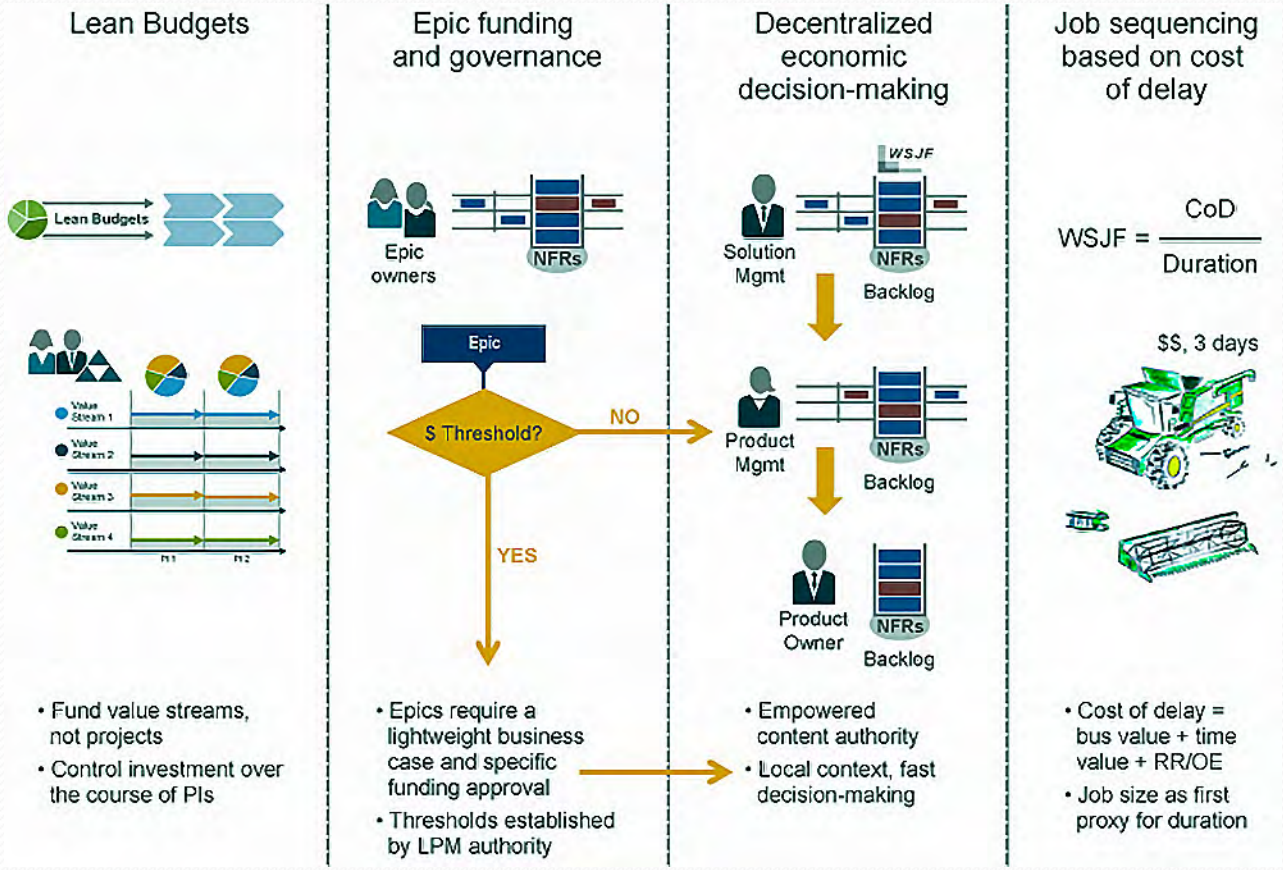
#11 • Economic Framework

- Decision-making framework for lean & agile budgets
- Method of budgeting work for large-solution streams
- ☞ Inc. budgets, governance, decisions, & job priorities



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#12 • Weight. Short. Just. Feature

- Algorithmic method for prioritizing work to be done
- Simple ratio of business value to job or batch size
- ☞ Inc. value, urgency, risk, & capability complexity

$$\text{WSJF} = \frac{\text{User-Business Value + Time Criticality + Risk Reduction | Opportunity Enablement Value}}{\text{Job Size}}$$

Feature	User-Business Value	Time Criticality	RR-OE Value	Job Size	WSJF

- Rate each parameter of each feature against the other features.
- Scale: 1, 2, 3, 5, 8,13, 20.
- Do one column at a time, start by picking the smallest item and giving it a "1". There must be at least one "1" in each column!
- The highest priority is the highest WSJF.

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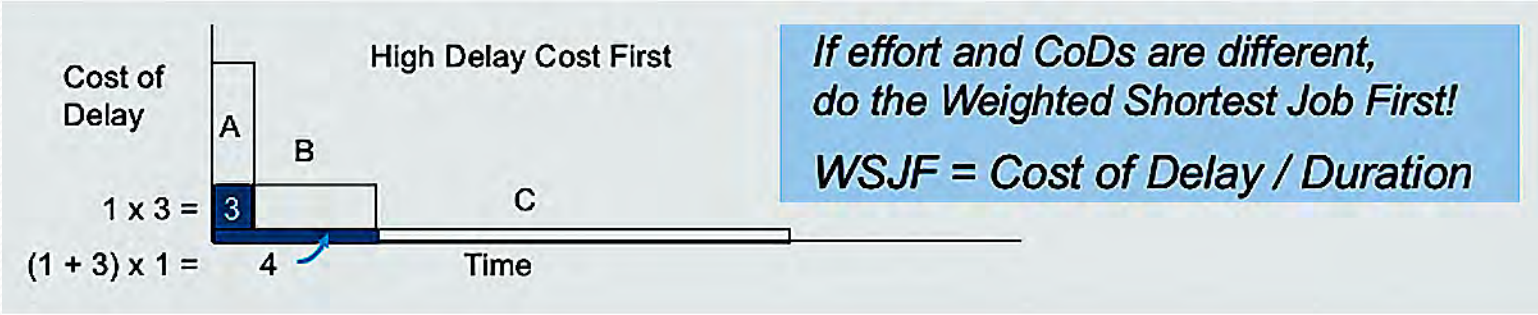
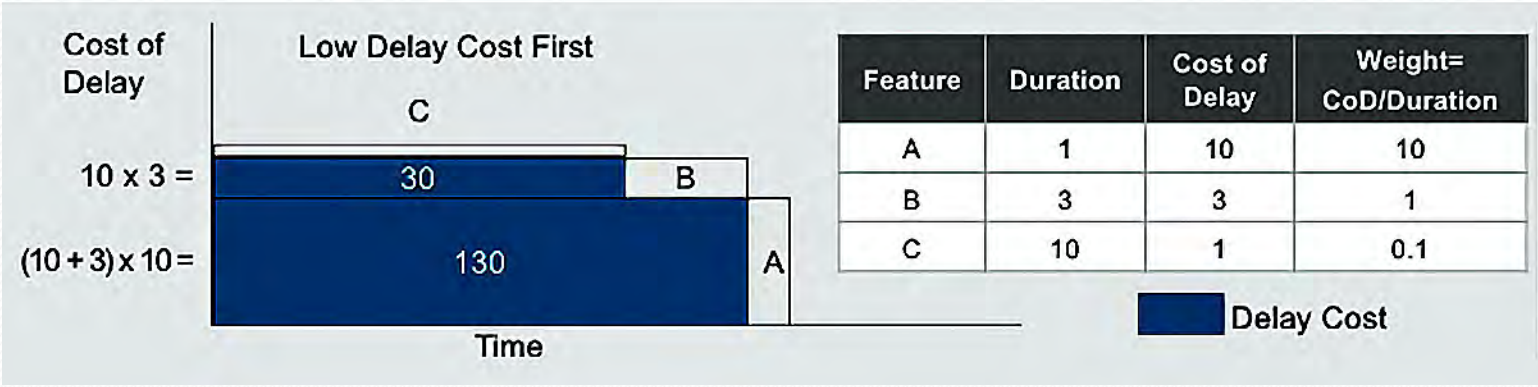
#13 • Cost of Delay (CoD)

- Aggregate measure of business value to be gained
- Method to prioritize needed capabilities & features
- Inc. business value, urgency of need, & risk values

CoD = Business Value + Time Criticality + Risk Reduction and/or Oppty





Feature	Duration	Cost of Delay	Weight= CoD/Duration
A	1	10	10
B	3	3	1
C	10	1	0.1

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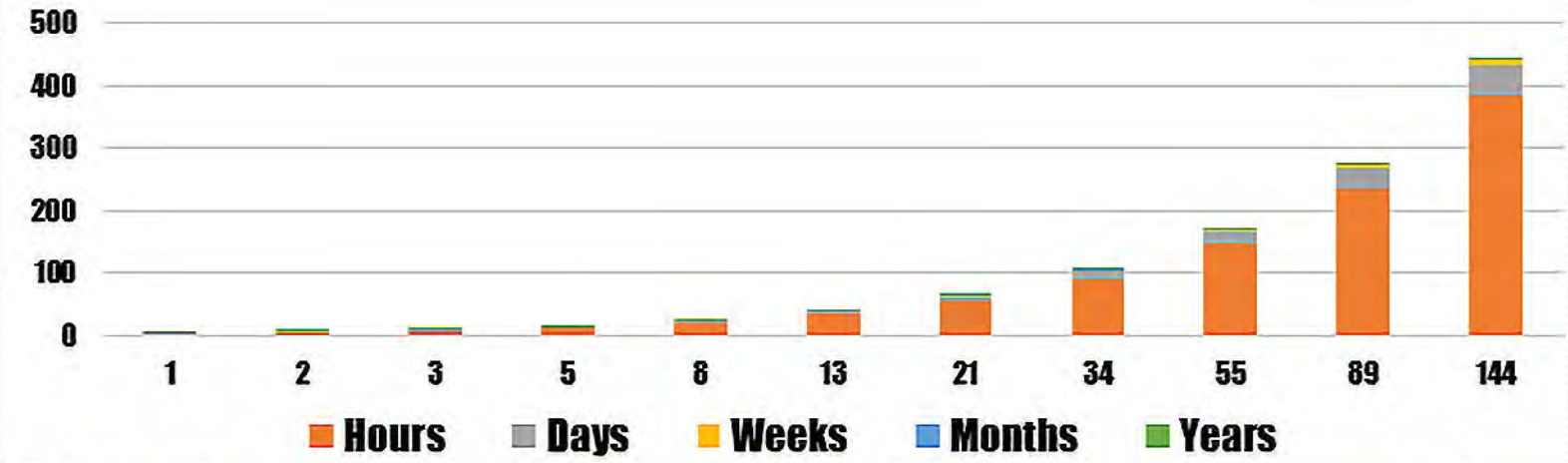
#14 • Duration (Job Size)

- Measure of capability & feature size in story points
- Method to quantify duration of capabilities & features
- ☞ Include parametric, analogous, & bottom up estimates



Story Points	Hours	Days	Weeks	Months	Years
1	3	0.3	0.07	0.02	0.00
2	5	1	0.13	0.03	0.00
3	8	1	0.20	0.05	0.00
5	13	2	0.33	0.08	0.01
8	21	3	0.53	0.12	0.01
13	35	4	0.87	0.20	0.02
21	56	7	1.40	0.32	0.03
34	91	11	2.27	0.52	0.04
55	147	18	3.67	0.85	0.07
89	237	30	5.93	1.37	0.11
144	384	48	9.60	2.22	0.18

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

Program Metrics

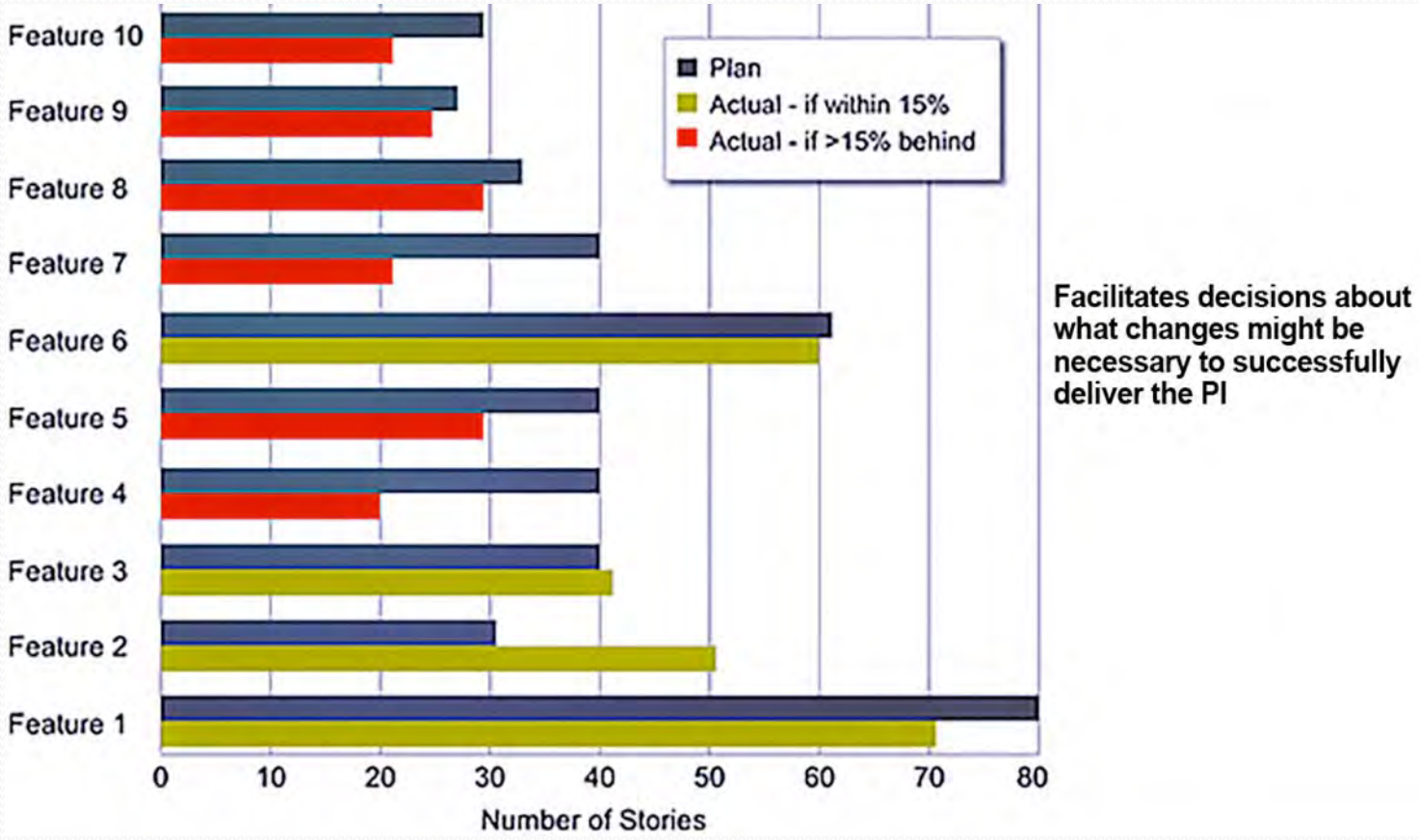
- Metrics for programs of multiple lean-agile teams
- Lean & agile metrics to assess program performance
- Measures of innovation, cycle times, & product quality

Feature Progress	Tracks the status of features and enablers during PI execution and indicates which features are on track or behind at any point in time, i.e., plan vs. actual.
Program Kanban	Ensures Features are reasoned and analyzed prior to reaching a PI boundary, prioritized, and have acceptance criteria to guide a high-fidelity implementation.
Program Predictability	Aggregation of Team PI Performance Reports for all teams on the train to assess the overall predictability of the release train, i.e., planned vs. actual business value.
Program Performance	Aggregation of team metrics collected at the end of each PI, i.e., functionality (velocity, predictability, features, enablers, stories, etc.) and quality (tests, automation, coverage, defects, performance, etc.).
PI Burn-down Chart	Shows the progress being made toward the program increment timebox used to track the work planned for a PI against the work that has been accepted, i.e., iterations vs. story points.
Cumulative Flow	A graph for easily visualizing the amount of work waiting to be done (backlog), work in progress (started), and completed (validated and delivered), i.e., efficiency, velocity, lead time, cycle time, etc.
ART Self Assessment	Periodic assessment to measure and improve program processes, i.e., PI planning readiness, planning event, execution, results, inspect and adapt, stakeholder engagement, CD, and portfolio alignment.

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#15 • Feature Progress

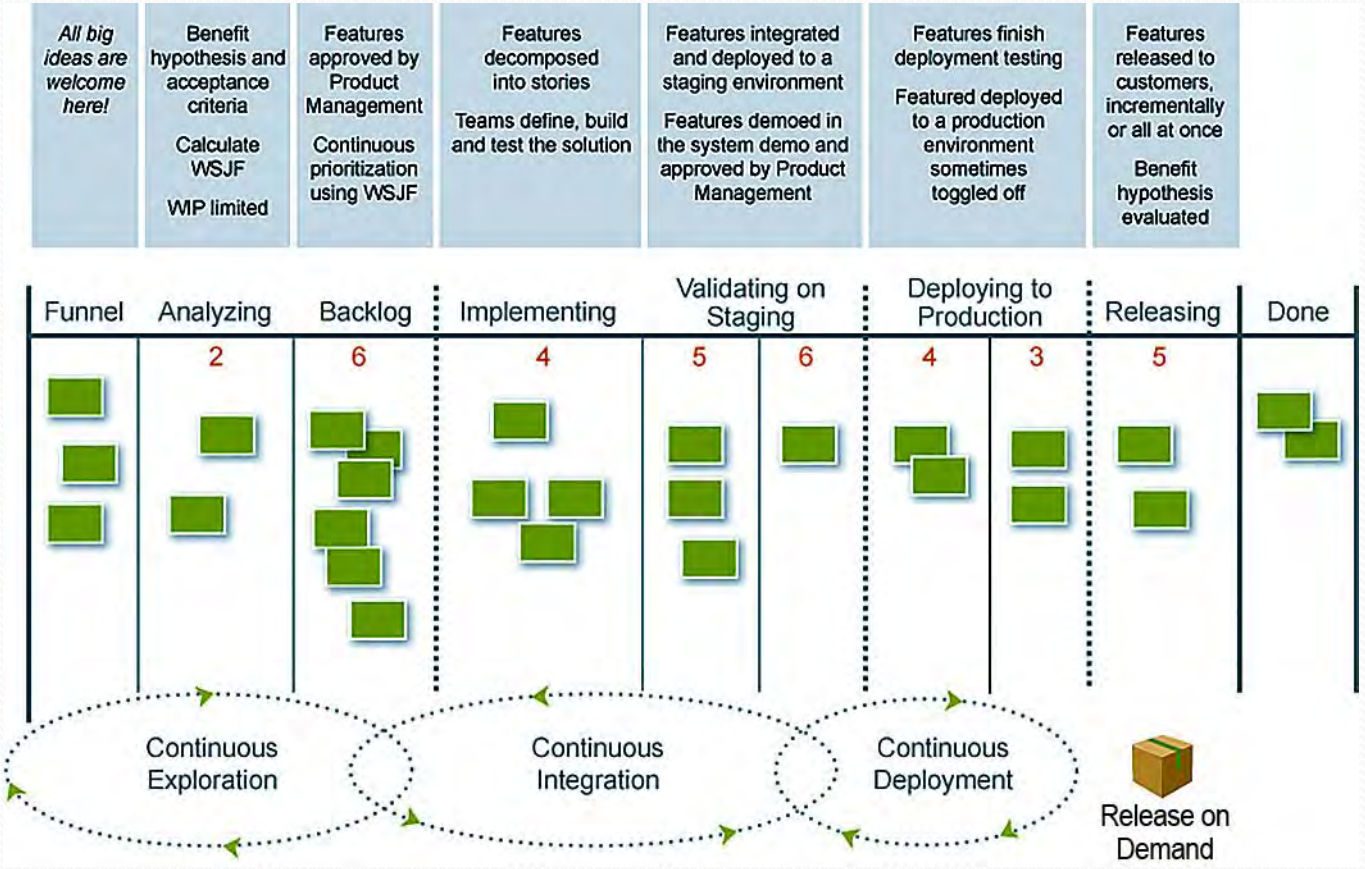
- Visualization of feature status at program-level
- Measure of planned vs. actual stories completed
- Includes features, planned stories, & actual stories



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#16 • Program Kanban

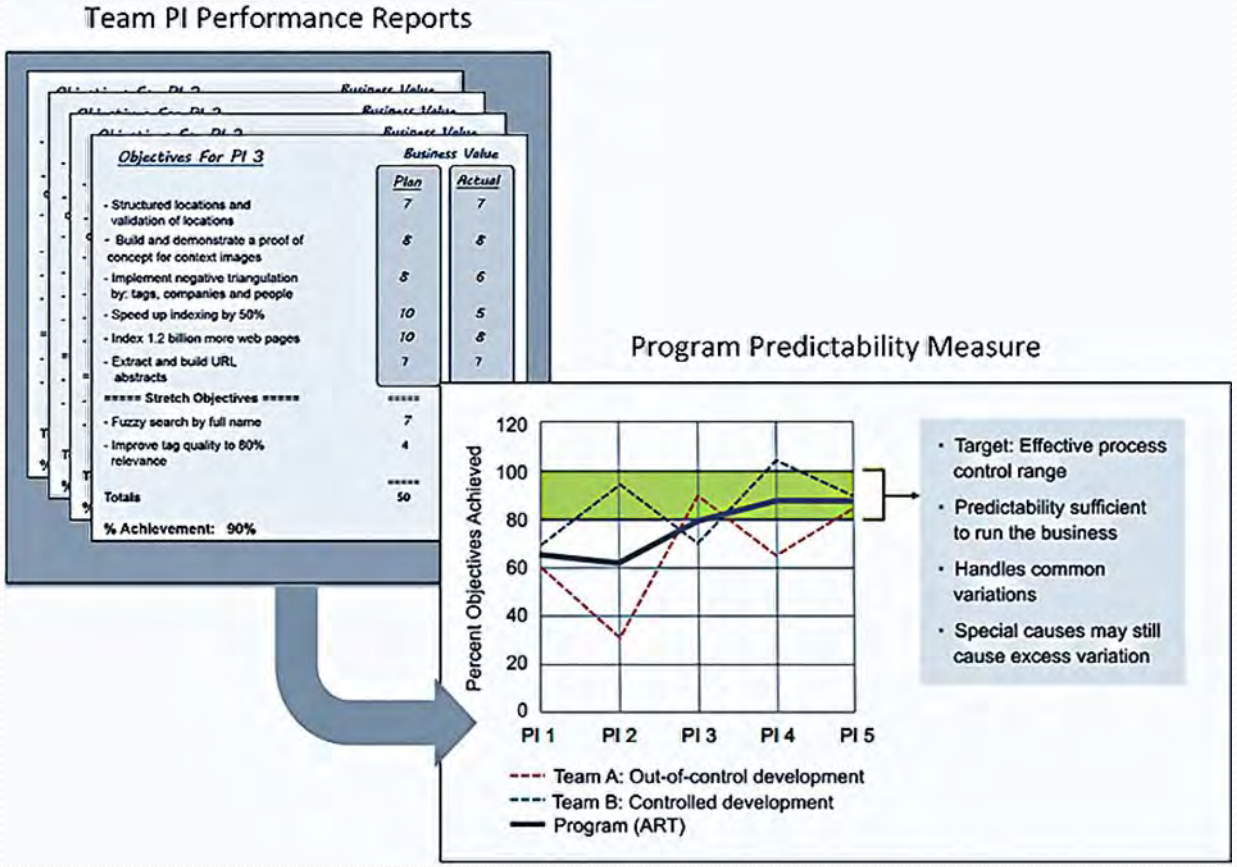
- Visualizes flow of progress for program-level
- Kanban of features for agile release train (ART)
- ☞ Includes priority, WIP limits, & completion status



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#17 • Program Predictability

- Aggregated visualization of PI objectives for teams
- Measures status in terms of PI objective satisfaction
- Includes teams, PI objectives, & PI objectives satisfied



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#18 • Program Performance

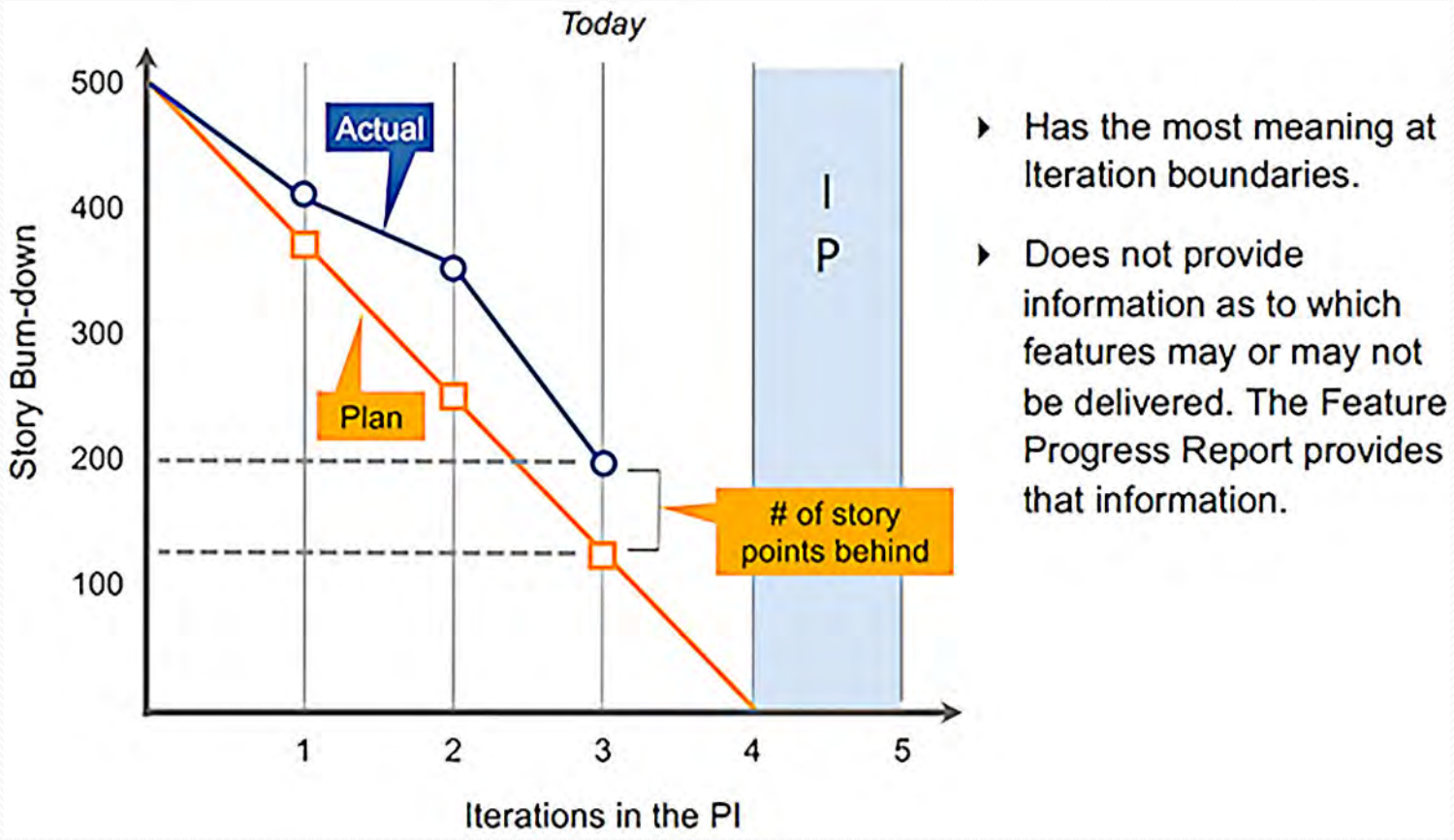
- Aggregated visualization of team performance in ART
- Contain productivity, quality, & story points complete
- Includes velocity, story points, & product quality

Functionality	PI 1	PI 2	PI 3
Program velocity			
Predictability measure			
# Features planned			
# Features accepted			
# Enabler features planned			
# Enabler features accepted			
# Stories planned			
# Stories accepted			
Quality			
Unit test coverage %			
Defects			
Total tests			
% automated			
# NFR tests			

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#19 • PI Burn-Down Chart

- Visualization of program performance in story points
- Pseudo EVM of planned vs. actual story points done
- Inc. total, planned, & actual story points per iteration

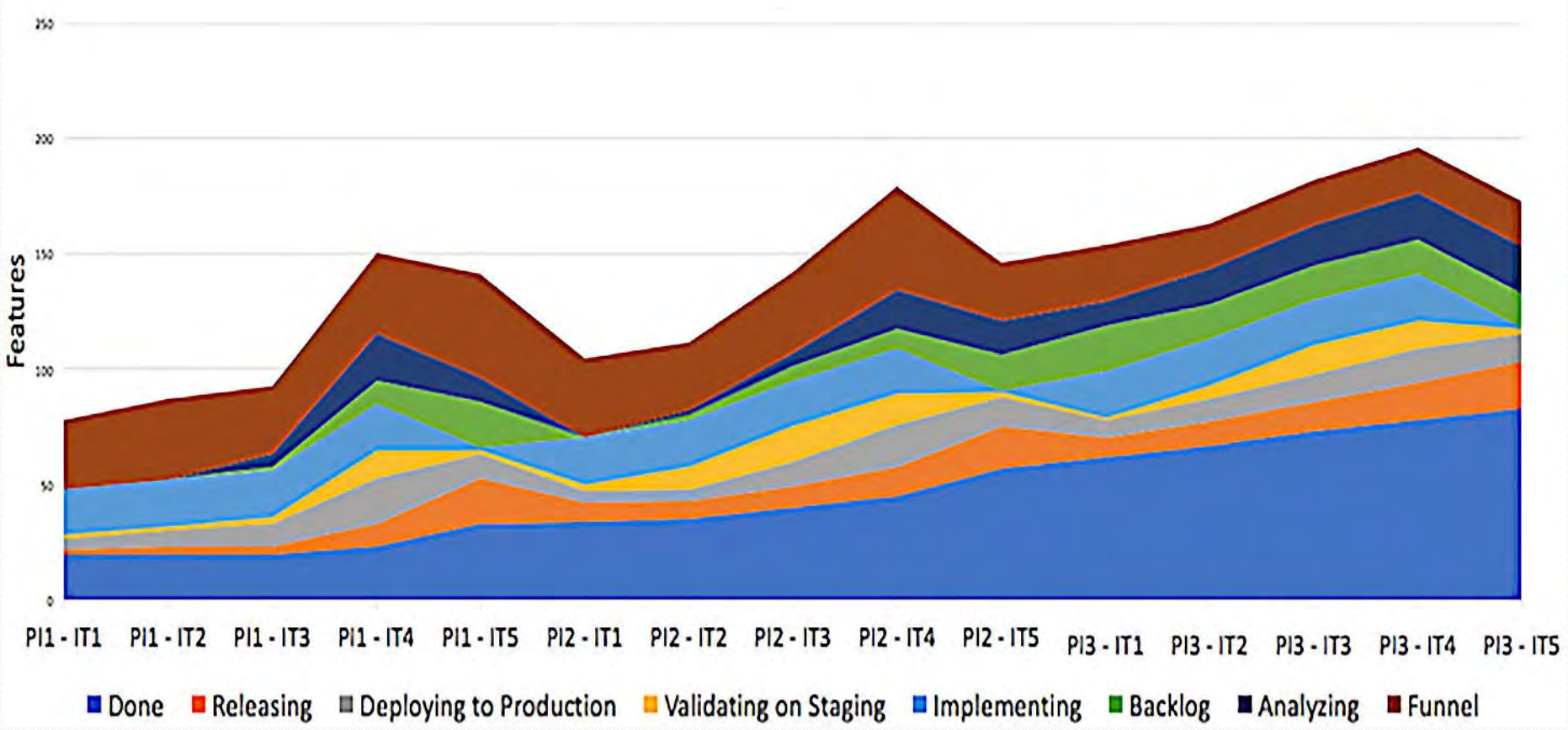


- Has the most meaning at Iteration boundaries.
- Does not provide information as to which features may or may not be delivered. The Feature Progress Report provides that information.

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#20 • Cumulative Flow

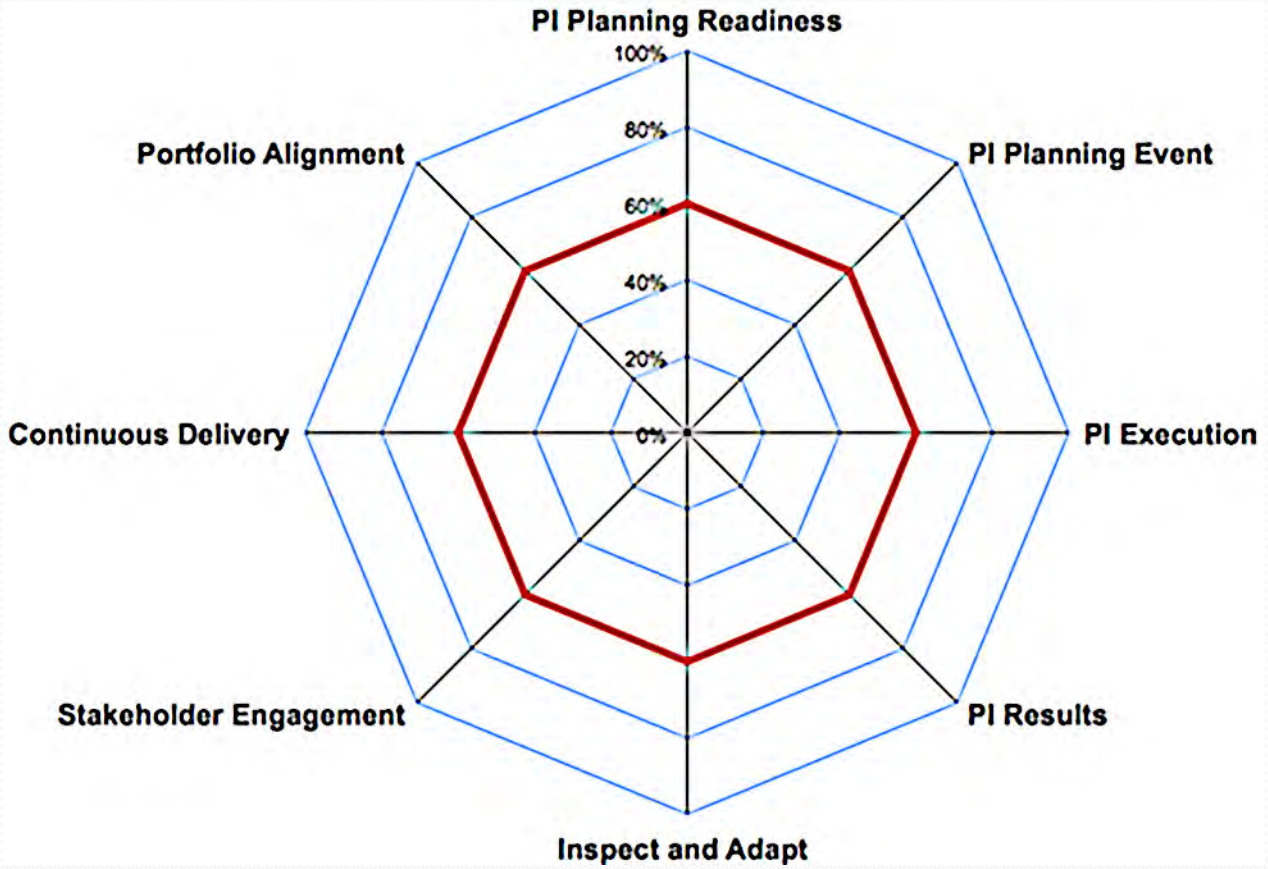
- Lean workflow visualization of program feature status
- Illustrates features unstarted, started, and completed
- ☞ Includes planned, in-process, & completed features



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#21 • Art Self Assessment

- Ordinal multi-dimensional view of program health
- Contain a few KPIs, simple scales, or percentages
- ☞ Includes PI planning, execution, soft-measures, etc.



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

Team Metrics

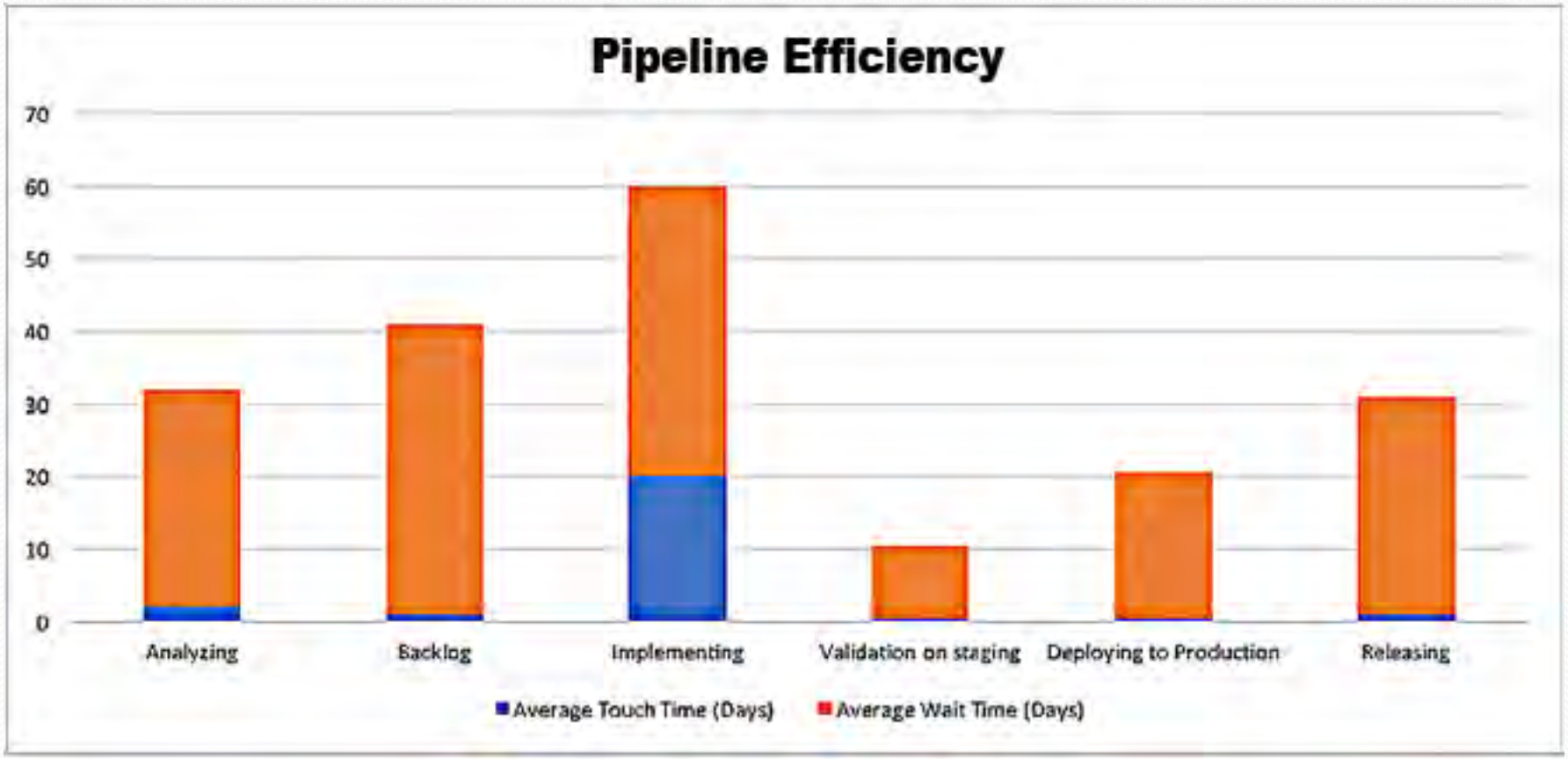
- Metrics for individual lean & agile groups or teams
- Lean & agile metrics to evaluate team performance
- Metrics of efficiency, teamwork, & leanness or agility

CD Pipeline Efficiency	A measure of the efficiency of each step in terms of touch and wait time, i.e., analyzing, backlog, implementing, validation, deployment, releasing, etc.
Deployments & Releases	Shows programs are making progress towards deploying and releasing more frequently as a ratio of deployment to production vs. product release frequency after each program increment.
Recovery over Time	Shows how often physical or logical rollbacks are performed by overlaying points in time for product deployment, release, and necessary rollbacks, recalls, and re-establishing prior (good) baselines.
Innovation Indicators	Hypothesis measures of Minimal Marketable Feature and Minimal Viable Product business outcomes based upon actionable innovation accounting measures, i.e., activation, retention, revenue, etc.
Hypotheses Tested	Number of validated hypotheses in a PI and how many of them failed (with a goal of increasing the number, frequency, and success of hypothesis tests every program increment or product release).
Team Performance	Individual team metrics collected at the end of each PI, i.e., functionality (velocity, predictability, features, enablers, stories, etc.) and quality (tests, automation, coverage, defects, performance, etc.).
Team Kanban	Ensures Stories and Tasks are reasoned and analyzed prior to reaching a PI boundary, prioritized, and have acceptance criteria to guide a high-fidelity implementation.
Team Business Value	Estimate of actual business value achieved for each team's PI objectives during a PI demo by business owners, customers, Agile Teams, and other key stakeholders, i.e., planned, actual, achievement%, etc.
Team Self-Assessment	Structured, periodic self-assessment to continuously measure and improve Team processes, i.e., Product ownership, PI, iteration, team, and technical health.

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#22 • CD Pipeline Efficiency

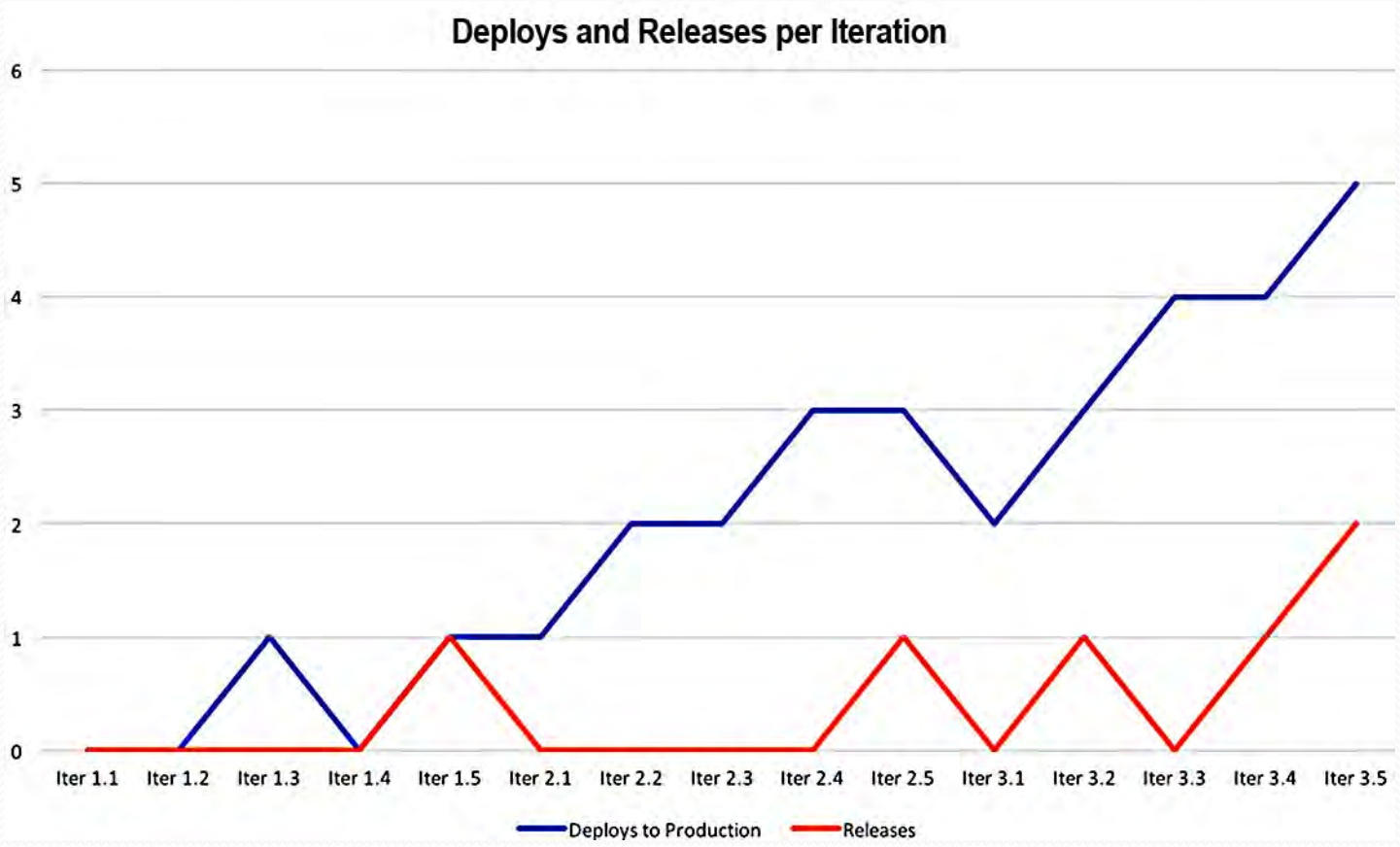
- Simple visualization of continuous delivery pipeline
- Measures the ratio of human interaction to wait times
- ☞ Inc. total, touch, & wait time of CI & CD performance



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#23 • Deployments and Releases

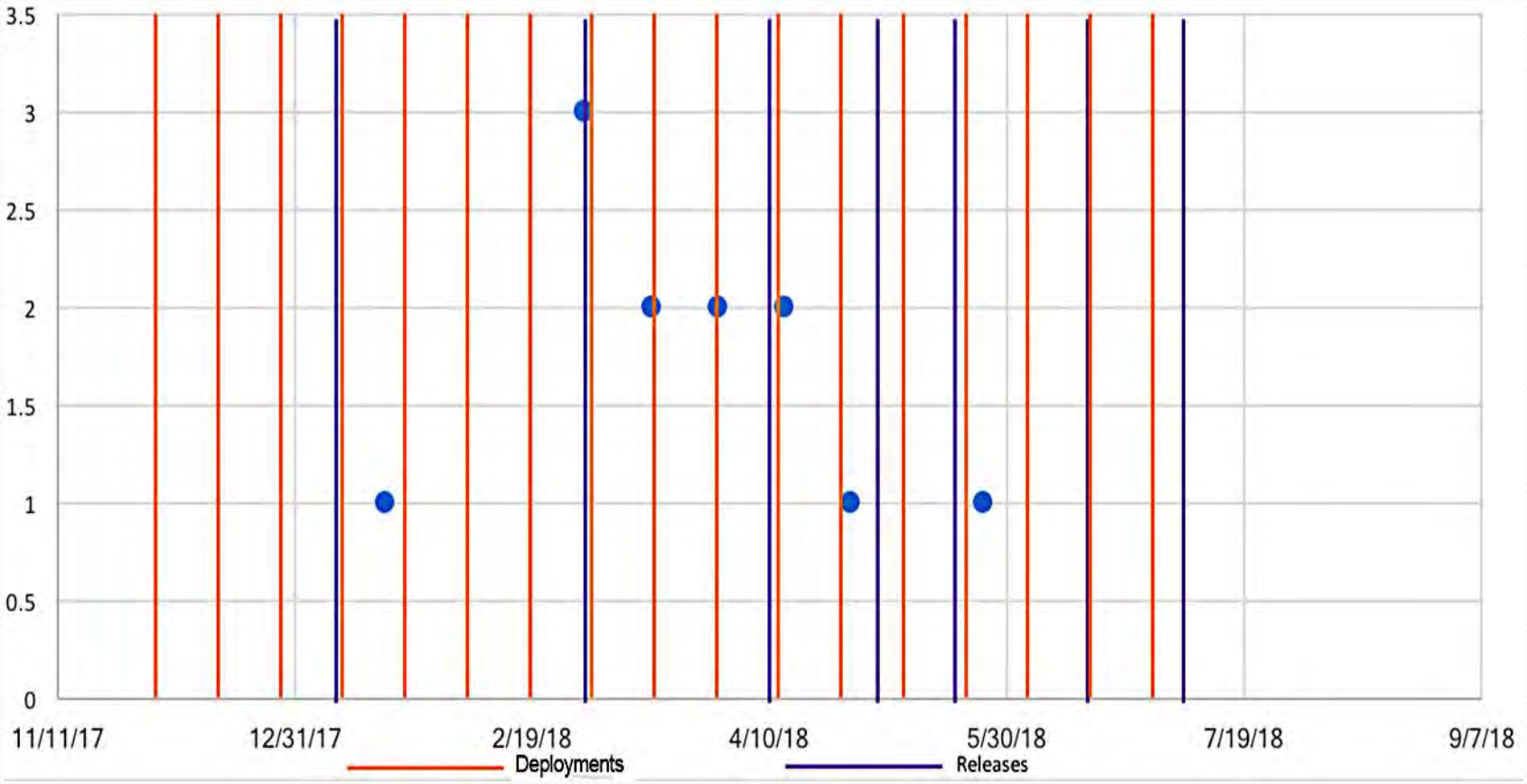
- Simple visualization of system release efficiency
- Measures the number of deployments to releases
- ☞ Inc. iterations, deployments, & releases of DevOps



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#24 • Recovery Over Time

- Simple visualization of system release quality
- Measures ratio of system rollbacks and releases
- Inc. deployments, releases, & rollbacks of DevOps



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#25 • Innovation Indicators

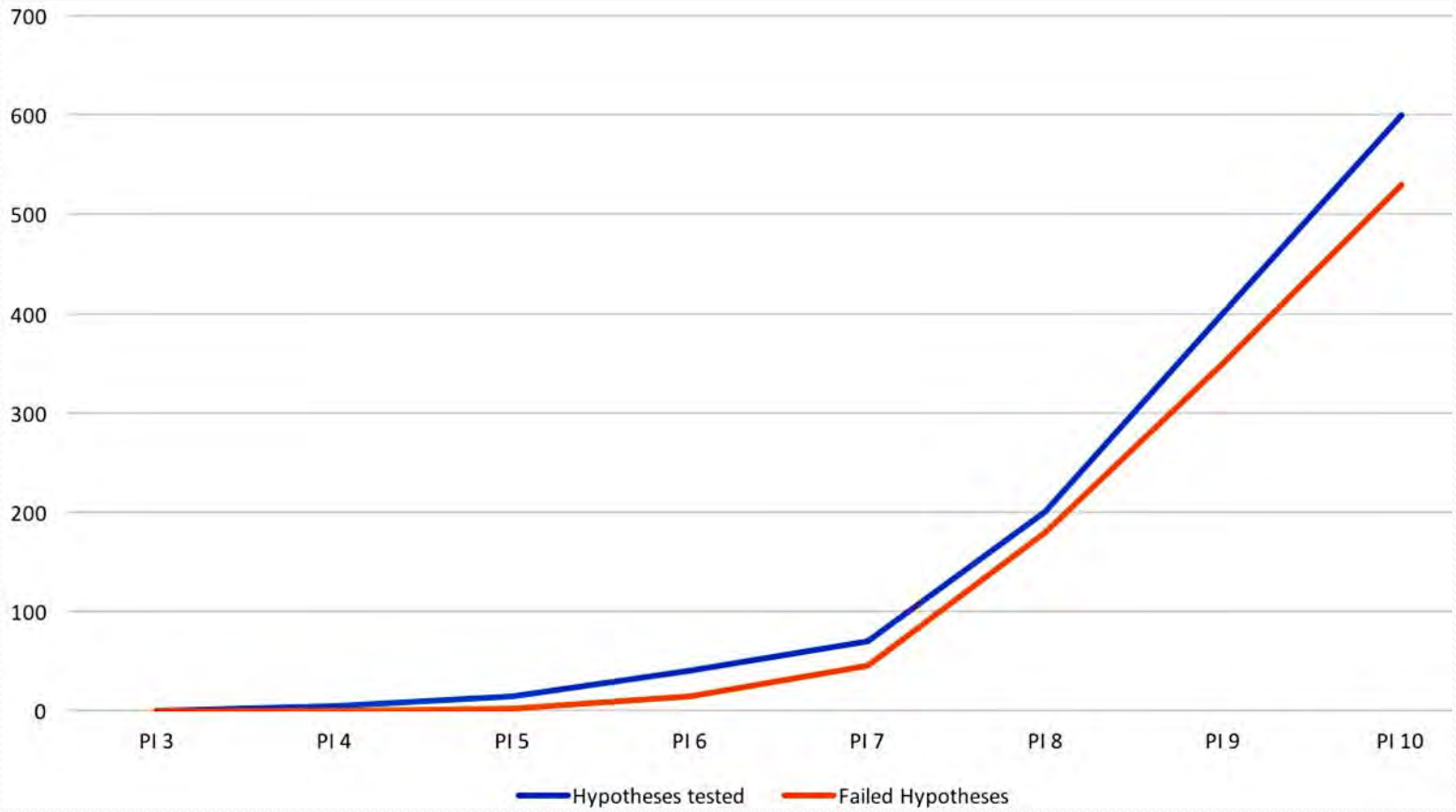
- Simple visualization of system release performance
- Raw volumetrics of intangible innovation indicators
- ☞ Inc. visits, abandonment, duration, & downloads

	6/1/17	6/6/17	6/11/17	6/16/17	6/21/17	6/26/17	7/1/17	7/6/17	7/11/17
Visits to the site	4000	4200	4150	3900	4000	5500	6500	6000	4500
New vists	40%	38%	41%	40%	42%	10%	12%	12%	30%
Bounce rate	52%	51%	50%	51%	50%	15%	17%	15%	25%
Time on site	6:53	6:50	7:00	6:50	7:01	12:01	14:47	12:23	8:47
Number of articles visited	3.25	3.2	3.7	3.4	3.24	7.5	8.7	7.7	6.5

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#26 • Hypotheses Tested

- Simple visualization of hypothesis testing efficiency
- Measures ratios of successful vs. unsuccessful tests
- ☞ Includes PI, hypothesis success, & hypothesis failures



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#27 • Team Performance

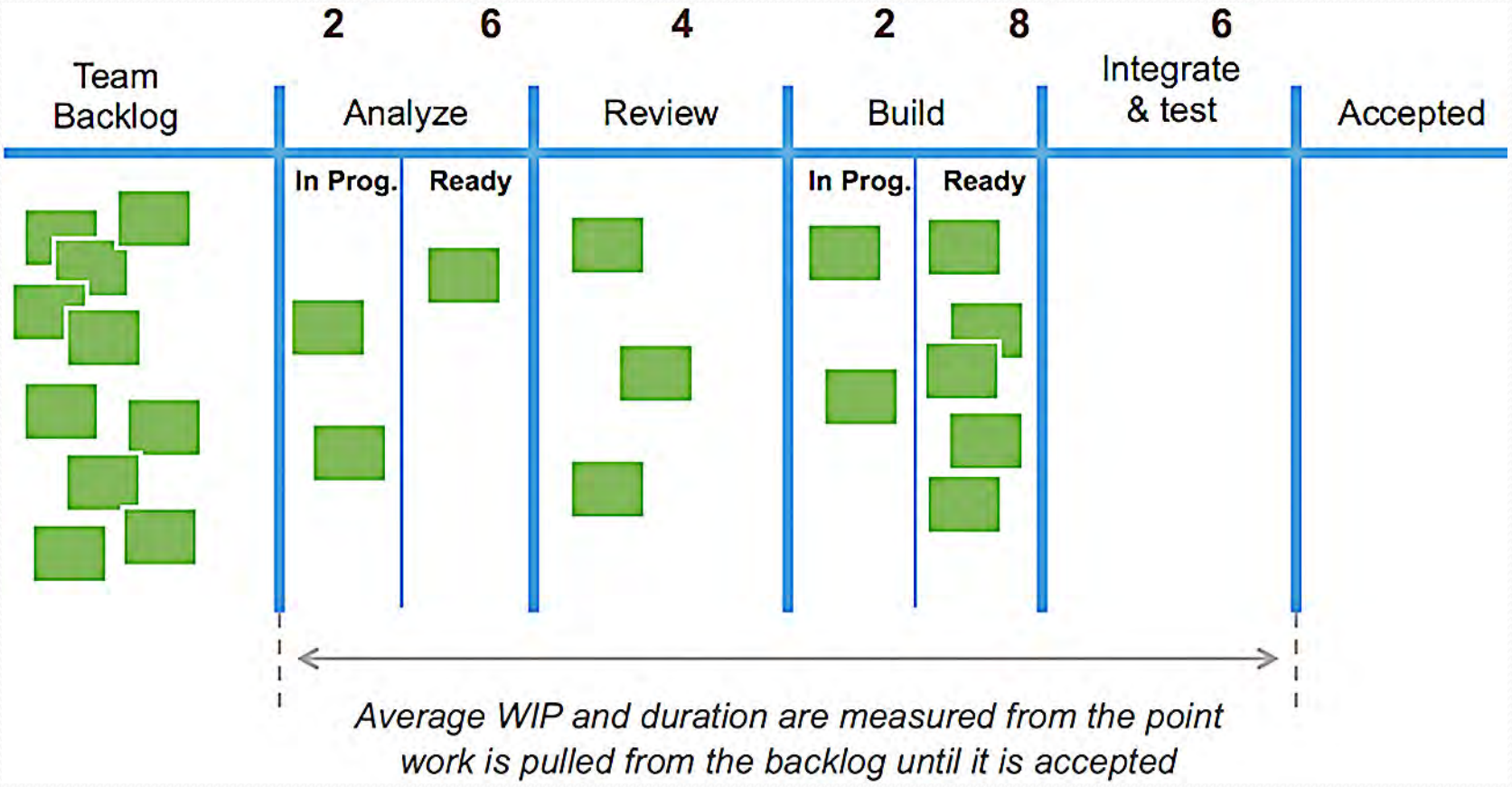
- Simple visualizations of team iteration performances
- Contain productivity, quality & story points complete
- Includes velocity, story points, & product quality

Functionality	Iteration 1	Iteration 2	Iteration 2
Velocity planned			
Velocity actual			
# Stories planned			
# Stories accepted			
% Stories accepted			
Quality			
Unit test coverage %			
# Defects			
# New test cases			
# New test cases automated			
Total tests			
Total % tests automated			
# Refactors			

Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#28 • Team Kanban

- Visualizes flow of progress for team-level
- Story Kanban for team-level iteration activities
- ☞ Includes priority, WIP limits, & completion status



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

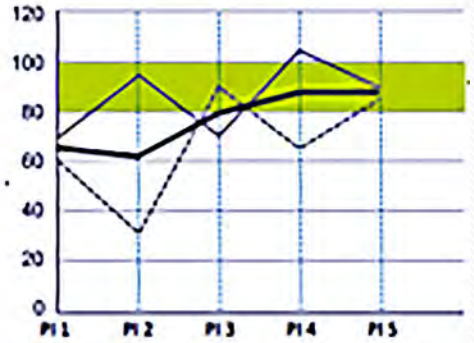
#29 • Team Business Value

- Simple visualization of team-level business value
- Consensus estimate of PI objective business value
- ☞ Inc. PI objectives, estimated, & actual business value

Objective	BV	Actual BV
- Proof of concept with mock sounds	10	9
- Help with Radar POC	4	0
- Decide buy/make engine noises	3	0
===== **Stretch Objectives** =====	===	===
- Proof of concept with real sounds	7	7
Total	17	16

Achievement: 94%

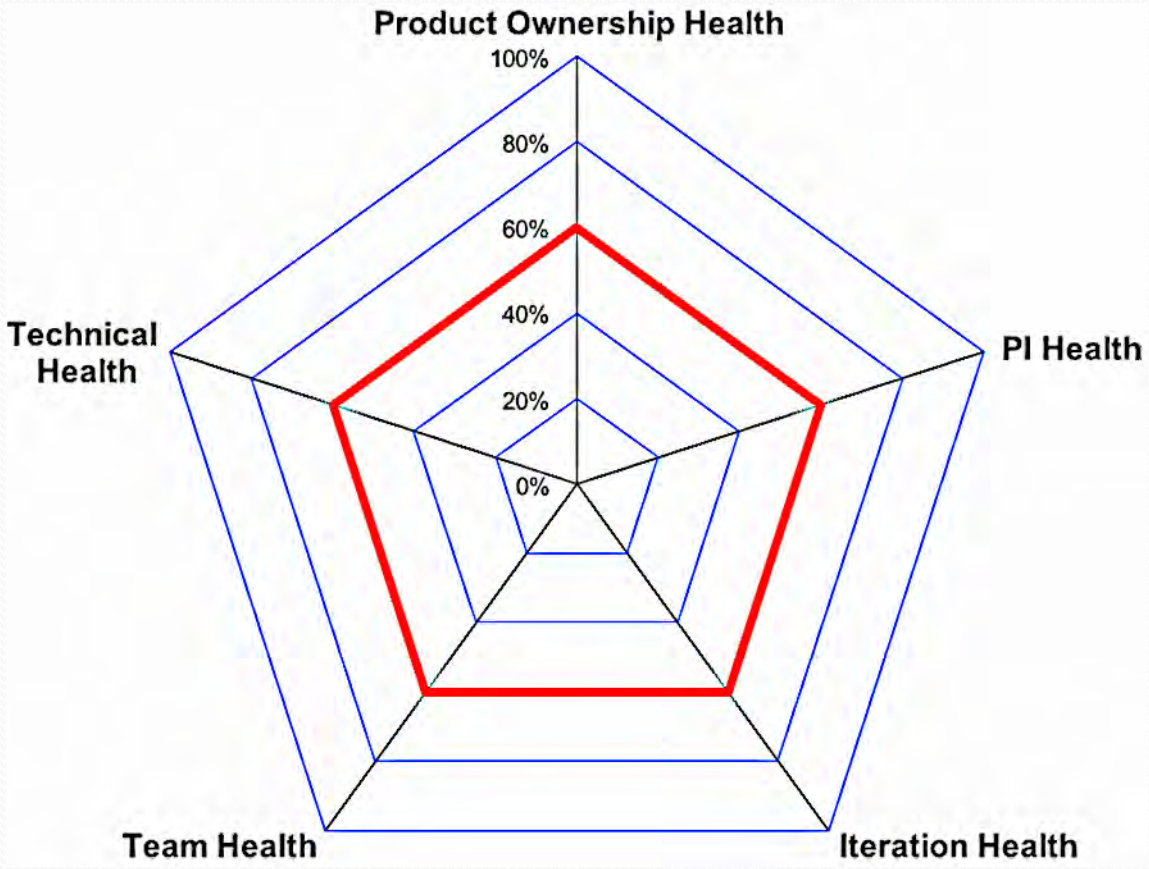
Program Predictability Measure



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

#30 • Team Self-Assessment

- Ordinal multi-dimensional view of team-level health
- Contains a few KPIs, simple scales, or percentages
- Includes role health, PI health, iteration health, etc.



Leffingwell, D. (2017). *Scaled agile framework (SAFe)*. Retrieved September 18, 2017 from http://www.scaledagileframework.com

SAFe BENEFITS

- Cycle time and quality are most notable improvement
- Productivity on par with Scrum at 10X above normal
- Data shows SAFe scales to teams of 1,000+ people

Benefit	Nokia	SEI	Telstra	BMC	Trade Station	Discount Tire	Valpak	Mitchell	John Deere	Spotify	Comcast	Average
App	**Maps**	**Trading**	**DW**	**IT**	**Trading**	**Retail**	**Market**	**Insurance**	**Agricult.**	**Cable**	**PoS**	
Weeks	95.3	2		52				52	52		52	51
People	520	400	75	300	100		90	300	800	150	120	286
Teams	66	30	9	10	10		9	60	80	15	12	30
Satis		25%	29%					15%				23%
Costs			50%								10%	[illegible]
Product				2000%		25%					10%	678%
Quality			95%					44%	50%		50%	60%
Cycle			600%	600%				300%	50%	300%		370%
ROI				2500%	200%							1350%
Morale			43%					63%	10%			39%

Leffingwell, D. (2014). *Scaled agile framework (SAFe) case studies*. Denver, CO: Leffingwell, LLC.
Rico, D. F. (2014). *Scaled agile framework (SAFe) benefits*. Retrieved June 2, 2014, from http://davidfrico.com/safe-benefits.txt

SAFe Change Management

- Most firms adopting lean-agile principles at scale today
- Top-management commitment important for 65 years
- Important to have internal lean-agile-SAFe coaches

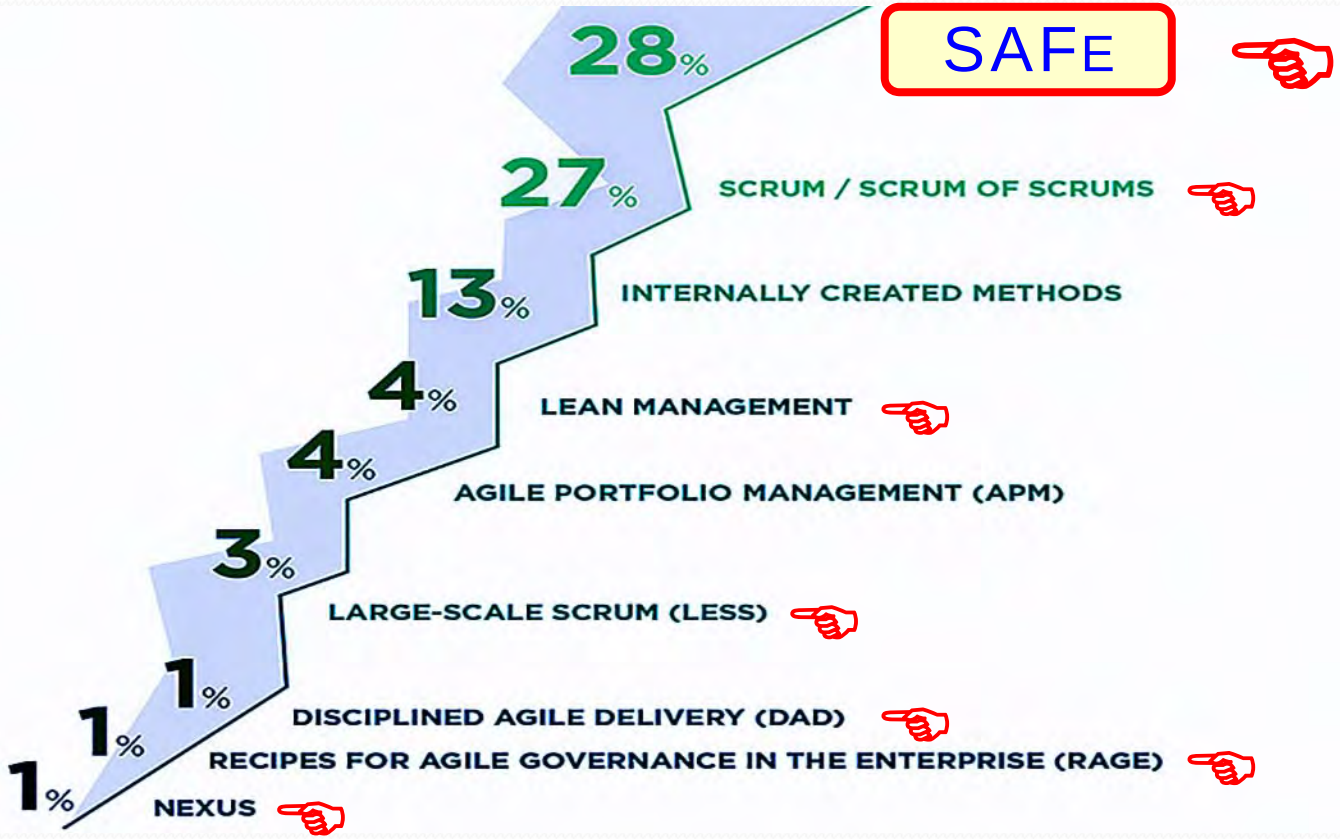
Top 5 Tips for Success with Scaling Agile

Executive sponsorship (48%), consistent process and practices (41%), implementation of a common tool across teams (36%), and agile consultants or trainers (36%) continue to be cited in the top five tips for successfully scaling agile for the past few years and likely points to the long-term importance of self-sufficiency when scaling agility. The top cited tip this year, internal agile coaches (52%), was a new entry into the top five.

Holler, R. (2017). *11th annual state of agile survey*: *State of agile development*. Atlanta, GA: VersionOne.

Agile Enterprise F/W Adoption

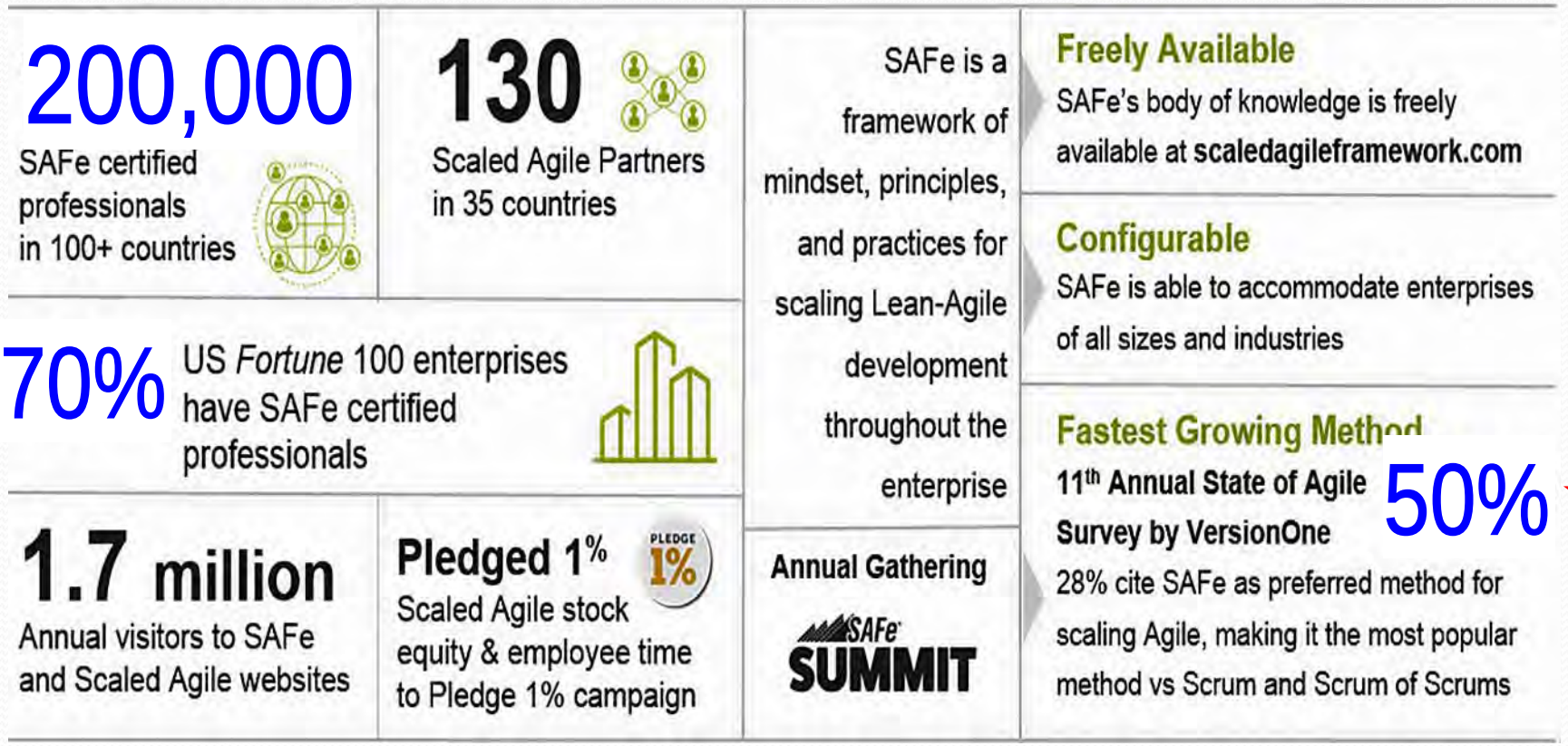
- Lean-agile enterprise framework adopt stats emerging
- Numerous lean-agile frameworks now coming to light
- SAFe is most widely-adopted "formalized" framework



Holler, R. (2017). *11th annual state of agile survey*: *State of agile development*. Atlanta, GA: VersionOne.

SAFe ADOPTION

- Over **200,000** SAFe professionals globally (& growing)
- Over **70%** of U.S. firms have SAFe certified people
- ☞ **50%** prefer SAFe for scaling lean-agile principles



★ **200,000** SAFE CERTIFIED PROFESSIONALS IN 2018

★ **50%** ACCORDING TO NEW CPRIME SURVEY

Irani, Z. (2017). *Scaling agile report*: *The first annual edition*. Foster City, CA: CPrime, Inc.

Leffingwell, D. (2017). *Foundations of the scaled agile framework* (*SAFe*). Retrieved March 1, 2017 from http://www.scaledagileframework.com

Lean & Agile Metrics Summary

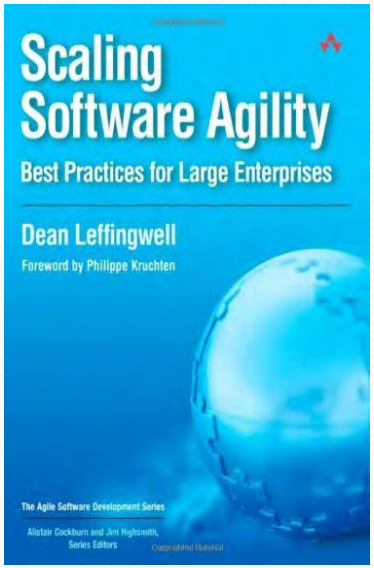
- Traditional metrics and principles apply to lean & agile
- Metrics range from source code up to portfolio levels
- Metrics apply to teams, projects, and organizations

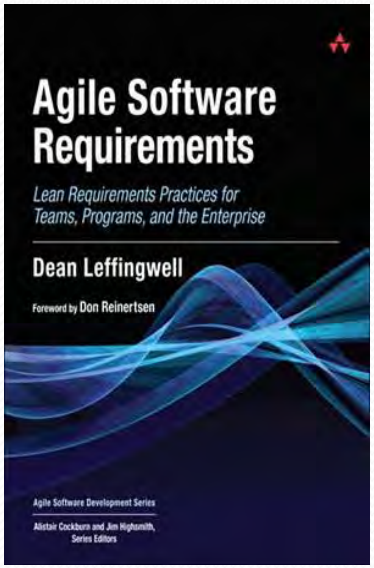
- **Measure** - *You can't manage what you don't measure*.
- **Early & Often** - *Don't hesitate to measure early and often*.
- **Traditional Metrics** - *Don't throw the baby out with the bathwater*.
- **Alignment** - *Align metrics and measures with lean-agile principles*.
- **Resistance** - *Expect resistance to change with respect to metrics*.
- **Hierarchy** - *Use metric hierarchy ranging from code to portfolios*.
- **Basic** - *Remember to use basic metrics such as burndown charts*.
- **Testing** - *Testing metrics may be the single most important metrics*.
- **Health** - *Use health metrics to assess team, project, and org. perf.*
- **Portfolio** - *Portfolio metrics used to track organizational projects*.
- **Easy** - *Collecting and analyzing metrics is easier than you think*.
- **FOSS** - *Don't break the bank on multi-million dollar metric tools*.

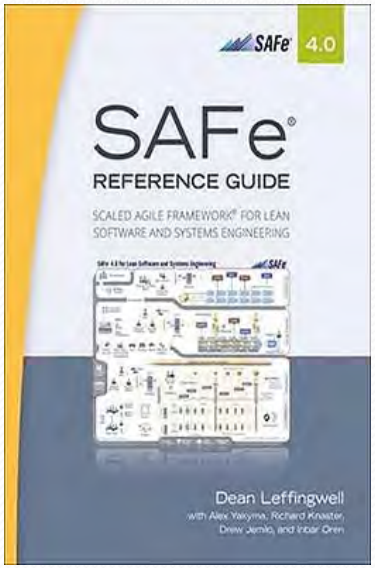
Bottom Line—Peter Drucker

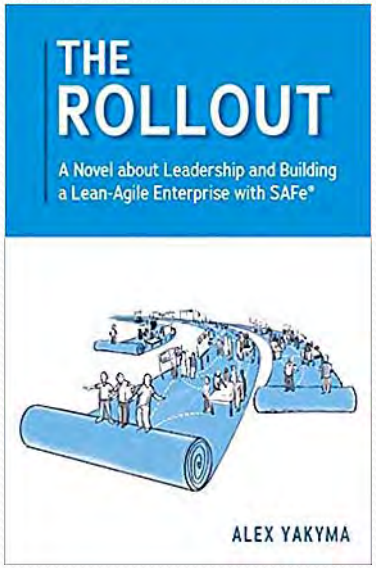
SAFe Resources

- Guides to lean systems & software development
- Illustrates key principles, concepts, and practices
- ☞ Keys to applying lean ideas systems development



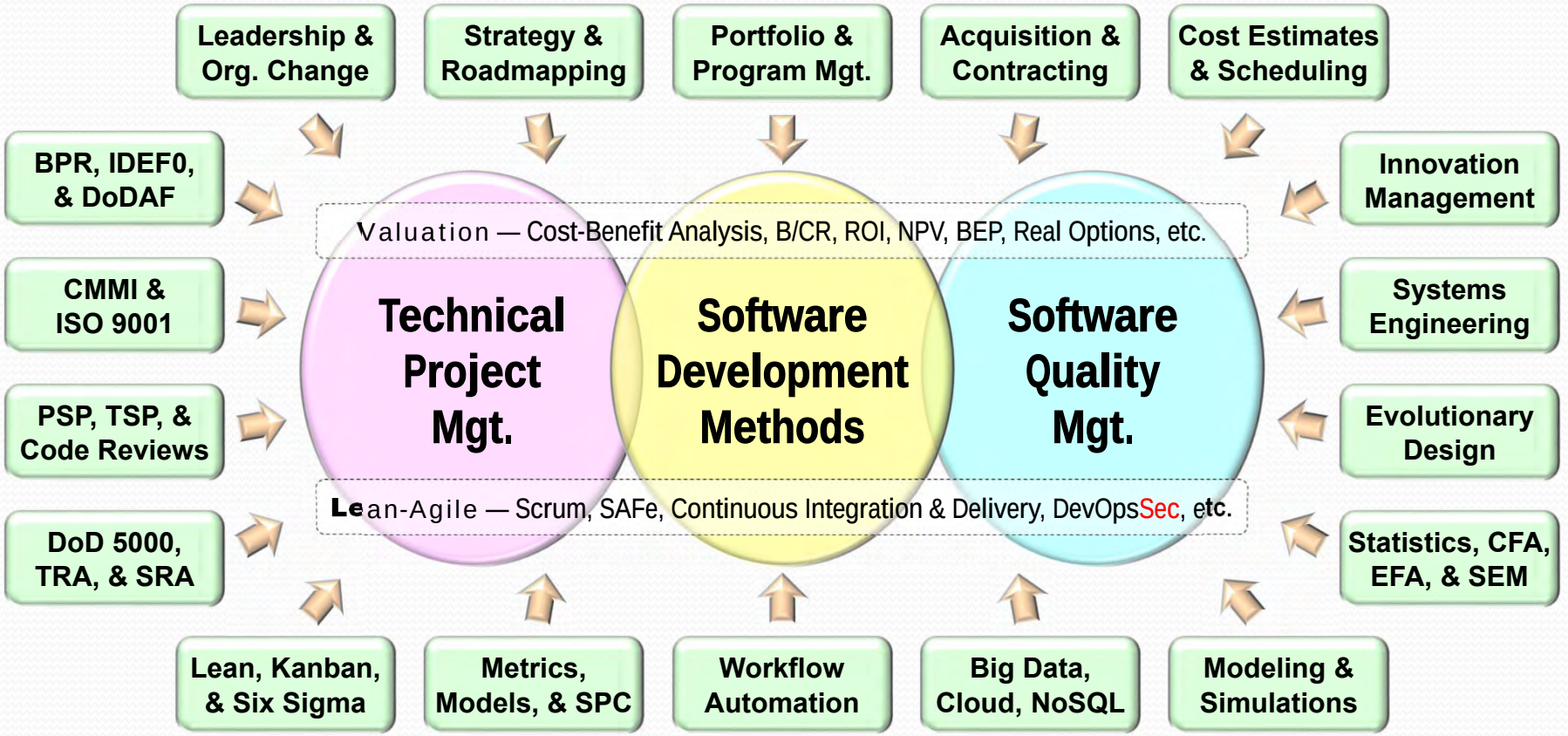






Leffingwell, D. (2007). *Scaling software agility*: *Best practices for large enterprises*. Boston, MA: Pearson Education.
Leffingwell, D. (2011). *Agile software requirements*: *Lean requirements practices for teams, programs, and the enterprise*. Boston, MA: Pearson Education.
Leffingwell, D. (2017). *SAFe reference guide*: *Scaled agile framework for lean software and systems engineering*. Boston, MA: Pearson Education.
Knaster, R., & Leffingwell, D. (2017). *SAFe distilled*: *Applying the scaled agile framework for lean software and systems engineering*. Boston, MA: Pearson Education.
Yakyma, A. (2016). *The rollout*: *A novel about leadership and building a lean-agile enterprise with safe*. Boulder, CO: Yakyma Press.

Dave's Professional Capabilities



STRENGTHS – Communicating Complex Ideas • Brownbags & Webinars • Datasheets & Whitepapers • Reviews & Audits • Comparisons & Tradeoffs • Brainstorming & Ideation • Data Mining & Business Cases • Metrics & Models • Tiger Teams & Shortfuse Tasks • Strategy, Roadmaps, & Plans • Concept Frameworks & Multi-Attribute Models • Etc.

35+ Years in IT Industry

- Data mining. Metrics, benchmarks, & performance.
- Simplification. Refactoring, refinement, & streamlining.
- Assessments. Audits, reviews, appraisals, & risk analysis.
- Coaching. Diagnosing, debugging, & restarting stalled projects.
- Business cases. Cost, benefit, & return-on-investment (ROI) analysis.
- Communications. Executive summaries, white papers, & lightning talks.
- Strategy & tactics. Program, project, task, & activity scoping, charters, & plans.

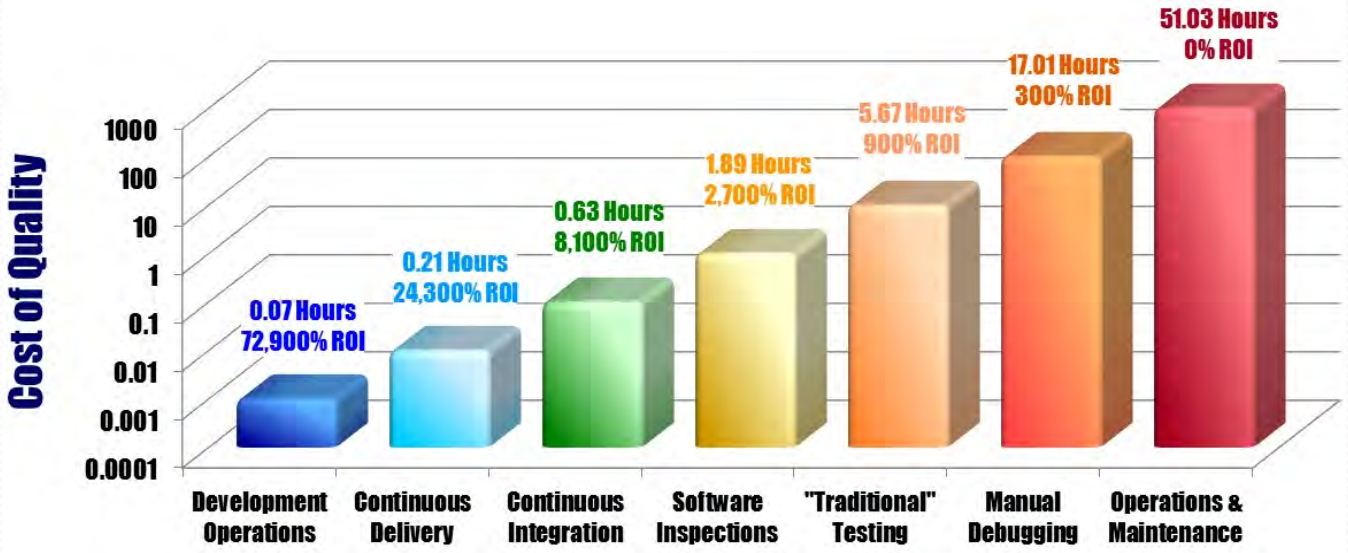
PMP, CSEP, FCP, FCT, ACP, CSM, SAFe, & DevOps

Backup Slides

Agile DevOps CoQ Metric

- Agile testing is orders-of-magnitude more efficient
- Based on millions of automated tests run in seconds
- One-touch auto-delivery to billions of global end-users

Activity	Def	CoQ	DevOps Economics	Hours	ROI
Development Operations	100	0.001	100 Defects x 70% Efficiency x 0.001 Hours	0.070	72,900%
Continuous Delivery	30	0.01	30 Defects x 70% Efficiency x 0.01 Hours	0.210	24,300%
Continuous Integration	9	0.1	9 Defects x 70% Efficiency x 0.1 Hours	0.630	8,100%
Software Inspections	3	1	2.7 Defects x 70% Efficiency x 1 Hours	1.890	2,700%
"Traditional" Testing	0.81	10	0.81 Defects x 70% Efficiency x 10 Hours	5.670	900%
Manual Debugging	0.243	100	0.243 Defects x 70% Efficiency x 100 Hours	17.010	300%
Operations & Maintenance	0.073	1,000	0.0729 Defects x 70% Efficiency x 1,000 Hours	51.030	n/a



Rico, D. F. (2016). *Business value, ROI, and cost of quality (CoQ) for DevOps*. Retrieved May 10, 2016, from http://davidfrico.com

Rico, D. F. (2016). *Devops cost of quality (CoQ): Phase-based defect removal model*. Retrieved May 10, 2016, from http://davidfrico.com

Agile DevOps ROI Metric

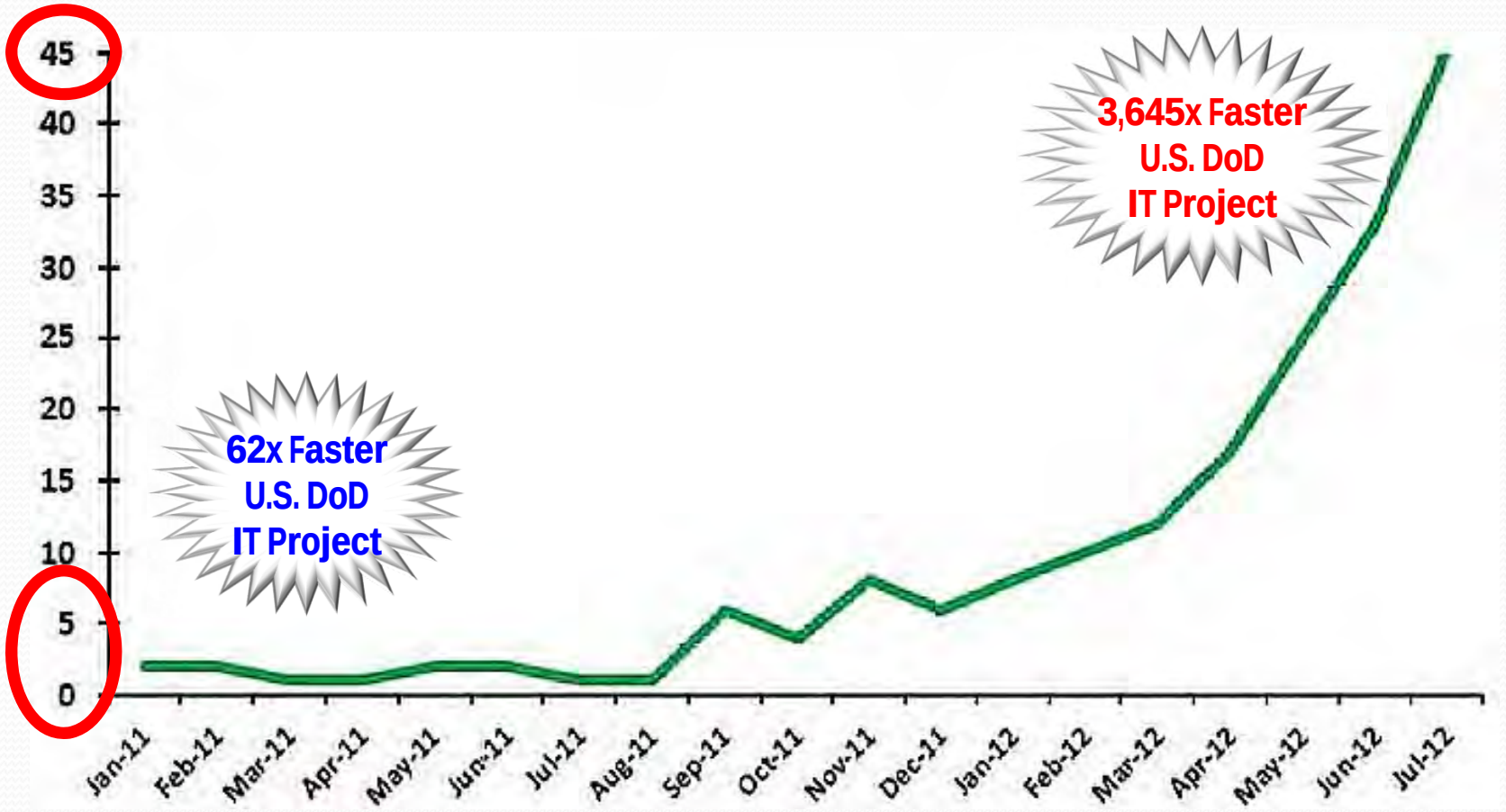
- Detailed agility economics starting to emerge
- ROI ranges from $17M to $195M *with minor costs*
- ☞ Benefits from cost savings, revenue, and availability

Org	Low Perf	Med Perf	High Perf
Small - 250 -	$23M Benefits	$29M Benefits	$17M Benefits
	$0.2M Costs	$0.2M Costs	$0.2M Costs
	13,589% ROI	**17,799% ROI**	**9,932% ROI**
	3 Day Payback	*2 Day Payback*	*4 Day Payback*
Medium - 2,000 -	$42M Benefits	$66M Benefits	$36M Benefits
	$1.3M Costs	$1.3M Costs	$1.3M Costs
	3,101% ROI	**4,901% ROI**	**2,663% ROI**
	11 Day Payback	*7 Day Payback*	*13 Day Payback*
Large - 8,500 -	$114M Benefits	$195M Benefits	$76M Benefits
	$5.6M Costs	$5.6M Costs	$5.6M Costs
	1,942% ROI	**3,375% ROI**	**1,254% ROI**
	18 Day Payback	*11 Day Payback*	*27 Day Payback*

Forsgren, N., Humble, J., & Kim, G. (2017). *Forecasting the value of devops transformations*: *Measuring roi of devops*. Portland, OR: DevOps Research.
Rico, D. F. (2017). *Devops return on investment (ROI) calculator*. Retrieved August 29, 2017, from http://davidfrico.com/devops-roi.xls

Agile DevOps Speed Metric

- Assembla went from 2 to 45 monthly releases w/CD
- 15K Google developers run 120 million tests per day
- 30K+ Amazon developers deliver 8,600 releases a day



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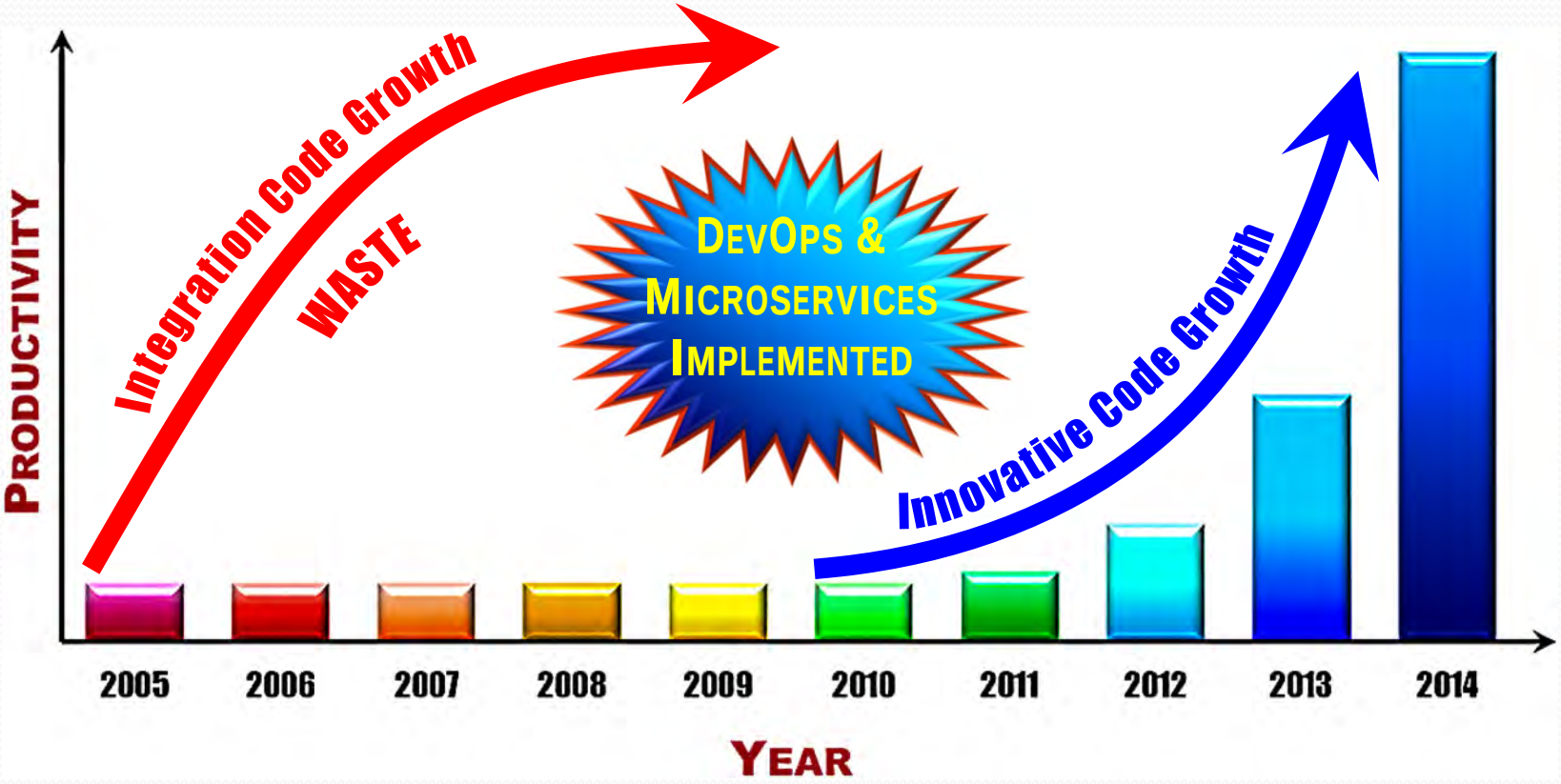
Agile Microservices Metric

- Productivity **STOPS** due to excessive integration
- Implements DevOps & Microservices around 2010
- Waste elimination, productivity & innovation skyrocket



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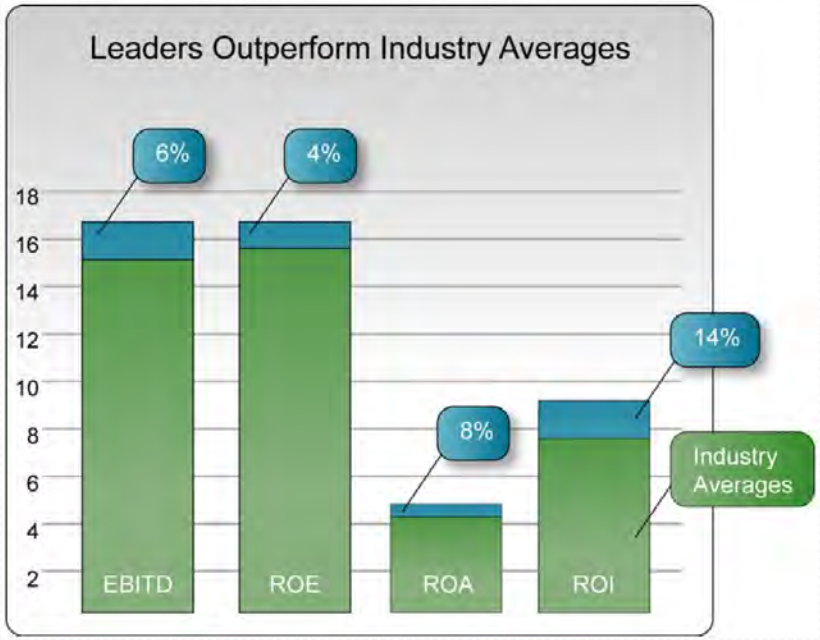
Agile Enterprise Metric

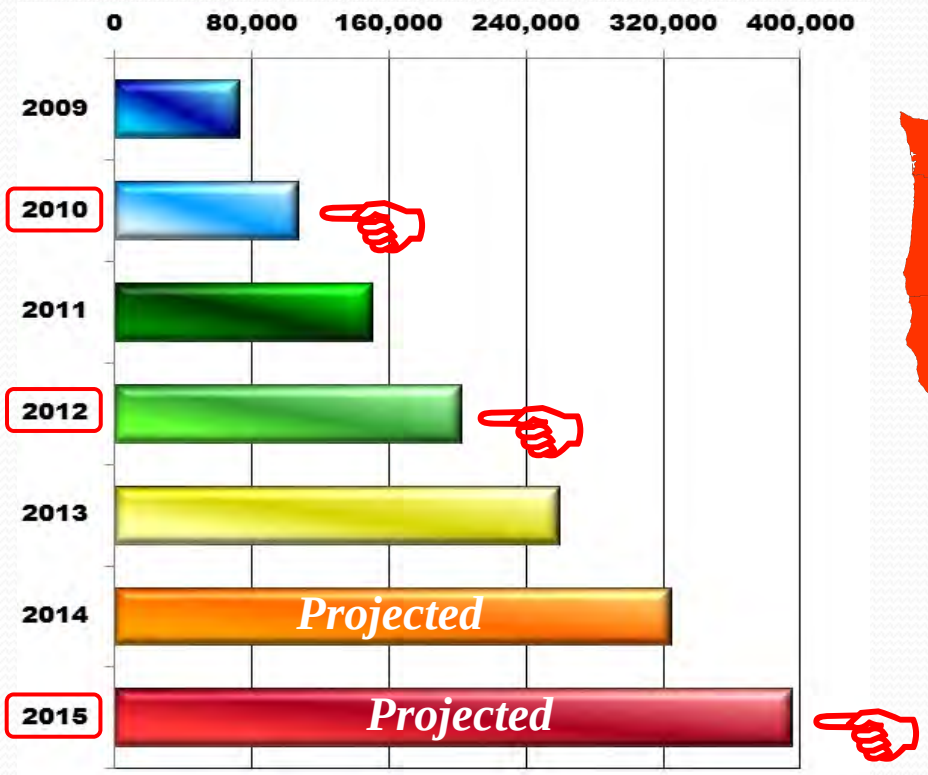
- Study of 15 agile vs. non-agile Fortune 500 firms
- Based on models to measure organizational agility
- Agile firms out perform non agile firms by up to 36%

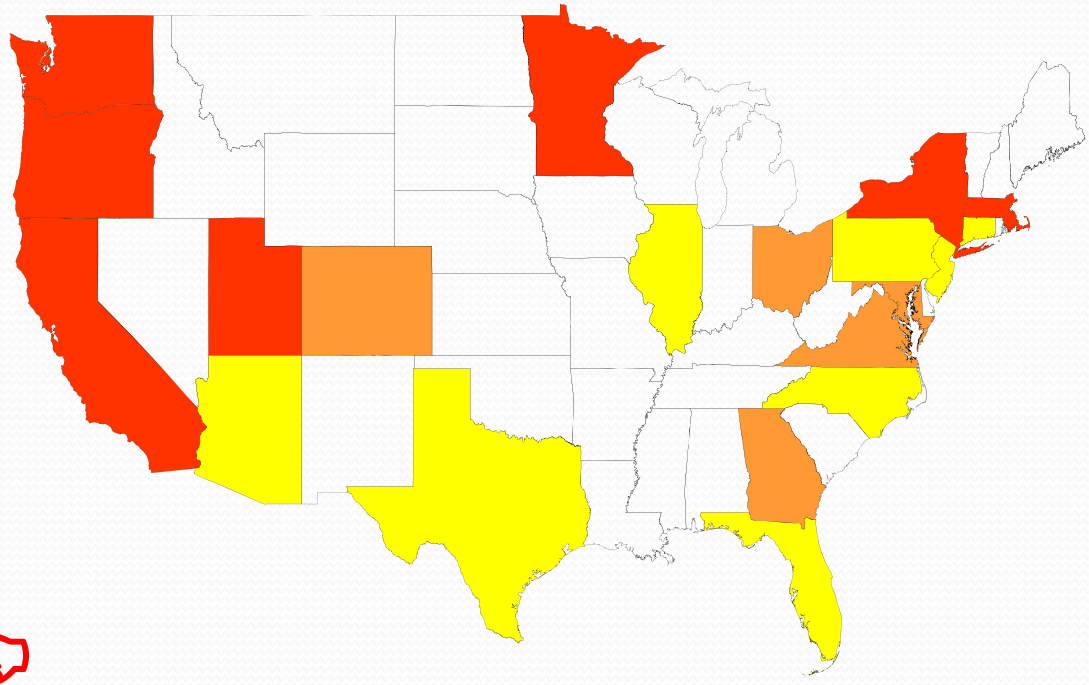


Hoque, F., et al. (2007). *Business technology convergence. The role of business technology convergence in innovation and adaptability and its effect on financial performance*. Stamford, CT: BTM Corporation.

Agile National Metric

- Number of CSMs have doubled to 400,000 in 4 years
- 558,918 agile jobs for only 121,876 qualified people
- 4.59 jobs available for every agile candidate (5:1)





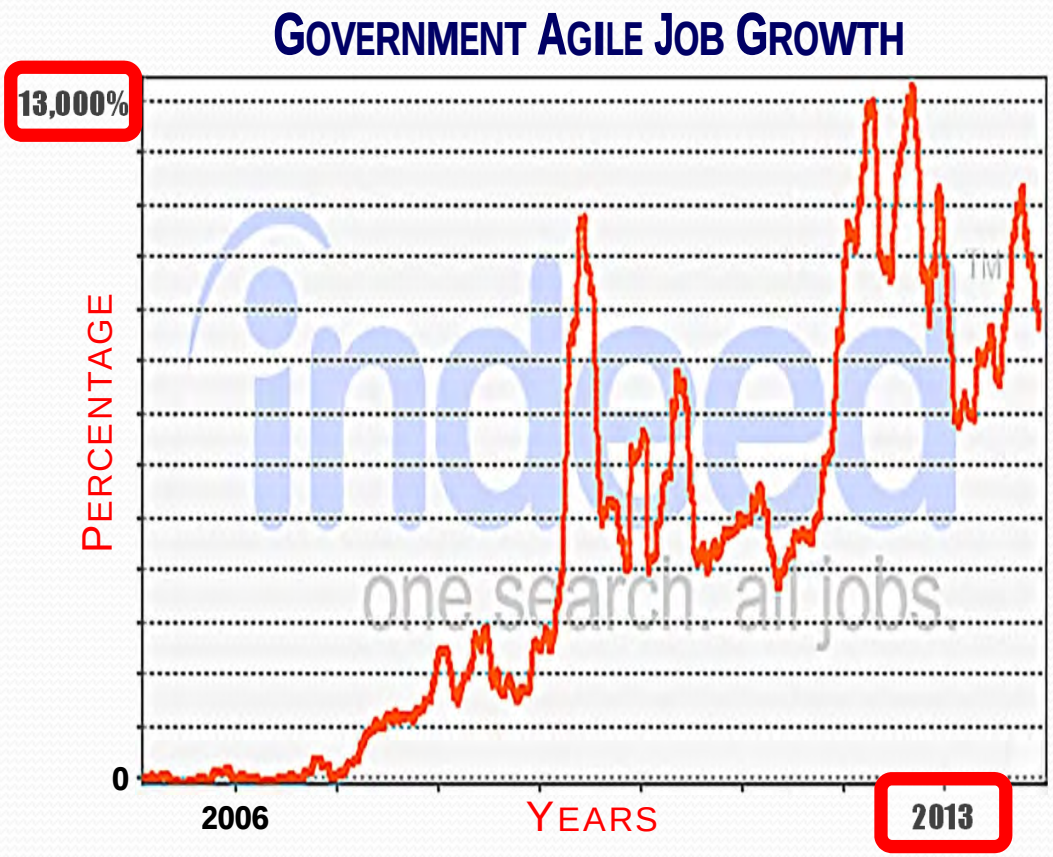
** PMI-PMPs grew from 552,977 to 625,346 in 2014 (i.e., added 72,369)*

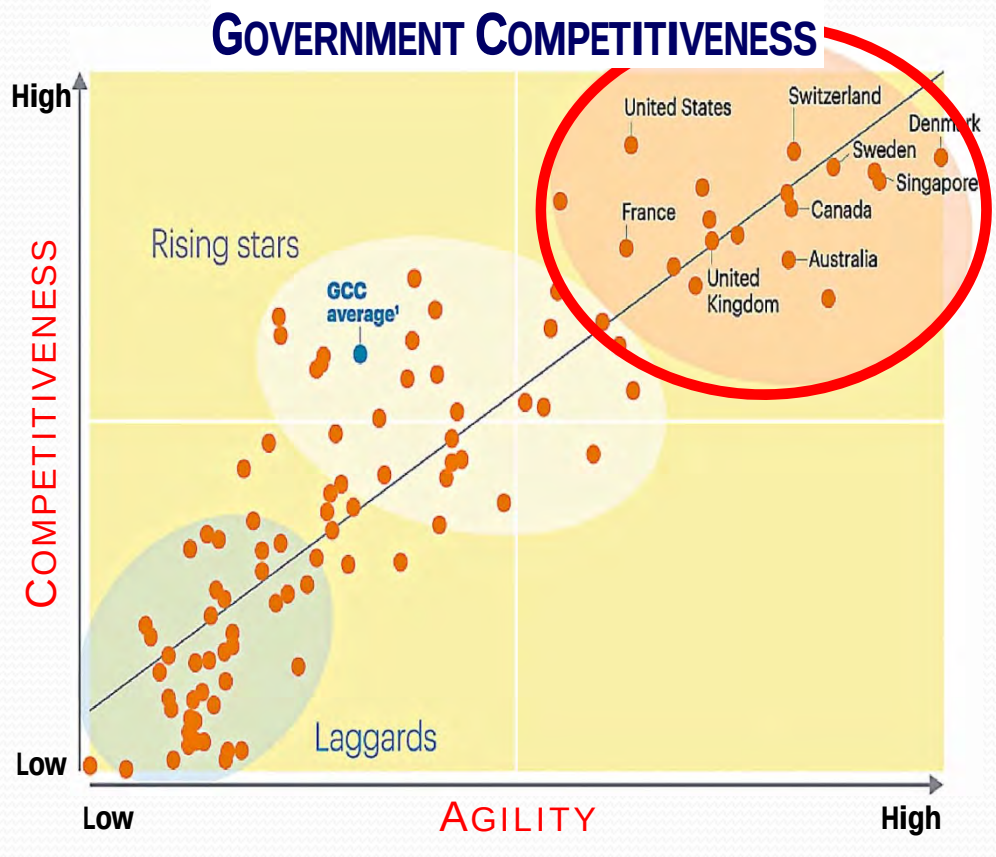
Scrum Alliance. (2013). *Scrum certification statistics*. Retrieved April 28, 2015, from http://www.scrumalliance.org

Taft, D. K. (2012). *Agile developers needed*: *Demand outpaces supply*. Foster City, CA: eWeek.

Agile International Metric

- U.S. gov't agile jobs grew by 13,000% from 2006-2013
- Adoption is higher in U.S. DoD than Civilian Agencies
- GDP of countries with high adoption rates is greater





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Porter, M. E., & Schwab, K. (2008). *The global competitiveness report*: *2008 to 2009*. Geneva, Switzerland: World Economic Forum.