ESTIMATING WORK

LACE

CCSQ Lean Agile Center of Excellence

CCSQ LACE TRAING

COURSE OBJECTIVES

- Explore the science of estimation
- Understand imprecise estimation
- Learn how estimates drive delivery plans

Humans are terrible at estimating

LACE
CCSQ Lean Agile Center of Excellence

ESTIMATE Definition

transitive verb
1a: to judge tentatively or approximately the value, worth, or significance of

b: to determine roughly the size, extent, or nature of

c: to produce a statement of the approximate cost of

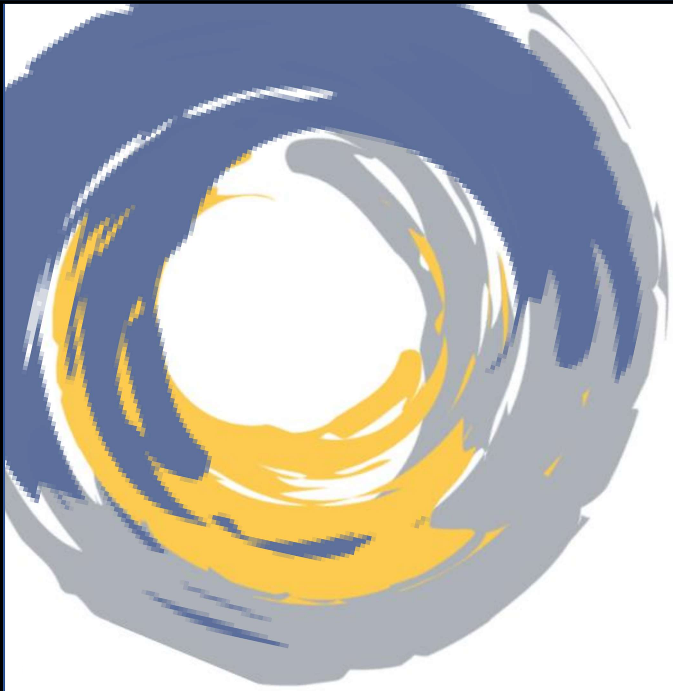
What theme do you see?

CCSQ Lean Agile Center of Excellence

Time Based Project Estimation Fails (unless you get lucky)

- Large projects involve many interdependent tasks, creating complexity, uncertainty and high vulnerability to random events
- The tipping point between low-risk and high-risk projects is sudden, not gradual. Once a project passes the tipping point, the risk curve changes quickly and dramatically. Failure rates skyrocket, as does the resulting amount of damage
- Date driven estimation leads to fixed cost models. “Budget Overruns” and “Missed Deadlines” become the focus, overtaking the purpose of delivering customer value
- Multiple biases reduce the accuracy of estimates

LACE
CCSQ Lean Agile Center of Excellence



The overwhelming evidence against our ability to estimate time and cost accurately

- Study in 1977
    - **Intuitive Prediction: Biases and Corrective Procedures**
    - https://apps.dtic.mil/dtic/tr/fulltext/u2/a047747.pdf

- 3 factors that make estimating difficult

    - Singular and Distributional Data
    - Regression and Intuitive Prediction
    - The Overconfidence Effect

LACE
CCSQ Lean Agile Center of Excellence

Singular and Distributional Data

- The known factors and biases for the current estimation take precedence over historical, empirical data
- In other words, an *optimism bias* is applied to the new work, while the actual history of previous estimation accuracy is ignored
    - “The **optimism bias** is essentially a mistaken belief that our chances of experiencing negative events are lower and our chances of experiencing positive events are higher than those of our peers.” - [The Optimism Bias and Its Impact (verywellmind.com)]

LACE
CCSQ Lean Agile Center of Excellence

Regression and Intuitive Prediction

- People make predictions based on their impression of the situation
- If you have a favorable reaction to something, you are more likely to predict success
- This intuitive prediction is flawed, because it is based on your reaction, which drives your intuition of the outcome
- Conversely, you should regress to the statistical average of success, and apply your intuition to adjust the prediction from that starting point
    - In other words, your intuition is probably correct in adjusting the prediction, but it is not the final arbiter

LACE
CCSQ Lean Agile Center of Excellence

The Overconfidence Effect

- The less we know about a situation, the more confident we are in our prediction
- This is caused by our inability to account for that which we don’t know
- We make more assumptions, which are based on singularity and intuition

LACE
CCSQ Lean Agile Center of Excellence

Imprecise Estimation Methods

- **Multi-Factor Estimation:** Distributes the margin of error across all factors
- **Abstract Scalar Estimation:** Work Items are assigned an arbitrary value, not tied to time, money, or people
- **Collective Estimation:** Rapidly gathers information and combats individual cognitive bias

Benefits of Imprecise Estimation

Reduce Uncertainty

- Smaller work is better understood because its easier to thoroughly think through delivery and identify questions
- Revisit Potential work as more information is gathered

Reduce Cognitive Biases

- Using collective estimation leverages the Wisdom of the Crowd
- Remove singularity by referencing historical Velocity and other metrics

Reduce Risk

- Limit interdependent tasks
- Avoid sudden and dramatic “risk curve tipping point” events

LACE
CCSQ Lean Agile Center of Excellence

Multi Factor Estimation in Software Development

- Assess relevant factors individually
- Combine those assessments to aggregate the estimate
- Equally weight the factors to avoid bias of scrutiny

Estimation Factors in Software Development

- Risk
- Complexity
- Effort

LACE
CCSQ Lean Agile Center of Excellence

Defining Risk

- Missing information and unanswered questions
- Unknown Unknowns: We will only know everything when product is delivered
- Dependencies on uncontrolled factors. Suppliers, regulation changes, weather, etc.

Ziv's Law: Software development is unpredictable, and specifications and requirements will never be fully understood

Mitigating Risk

- Identify missing information and unanswered questions
- Expect Unknown Unknowns
- Refine Your Backlog
- Limit Scope

LACE
CCSQ Lean Agile Center of Excellence

Defining Complexity

- Integration and/or interdependencies with other systems
- Formulas, calculations, processing decisions
- Integration/deployment into a complex system can affect its behavior and outcomes
- Validation of desired behaviors and outcomes depends on large parts of an existing system

Gall's Law: All complex systems that work evolved from simpler systems that worked

Mitigating Complexity

- Pareto Rule – find the case that covers the most outcomes with the fewest business rules
- Incrementally add more complex cases, one at a time
- Decrease the size and scope of work
- Move one data element through the system to create design patterns

LACE

CCSQ Lean Agile Center of Excellence

Defining Effort

- Known, repetitive tasks
- Research and Knowledge Sharing
- Anticipated time needed

Little's Law: Consistent input yields consistent output

Mitigating Effort

- Decrease the size and scope of work
- Definition of Ready and Definition of Done
- Software Development Design Patterns
- Pair Programming
- Automation

LACE
CCSQ Lean Agile Center of Excellence

Abstract Scalar Estimation in Software Development

- Focus the conversation on the estimation factors and uncover unknown information
- One team's assessment of work on a scale *will* differ from another team
- Establish historical dataset to combat *singularity estimation*

The Credibility Theory:

The credibility of an estimate is increased by the estimator's open acknowledgment of uncertainty. Credibility is increased over time, as historical data is produced

Hong, Liang and Martin, Ryan, Imprecise Credibility Theory (October 23, 2020). Available at SSRN: https://ssrn.com/abstract=3717924 or http://dx.doi.org/10.2139/ssrn.3717924

LACE
CCSQ Lean Agile Center of Excellence

Some Agile Estimation Scales

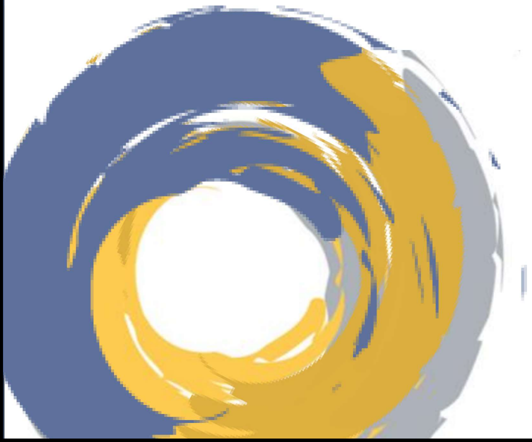
- Scales provide a basis for comparing one piece of work to another
- The scale is baselined by choosing the smallest piece of work to the smallest value on the scale
- The team doing the estimation chooses the scale

- Fibonacci Scale
  - 1, 2, 3, 5, 8, 13, 20
- T-Shirt sizing
  - XS, S, M, L, XL
- Ball size
  - Golf ball, Baseball, Soccer ball, Basketball, Beach ball

LACE
CCSQ Lean Agile Center of Excellence

Collective Estimation in Software Development

- Develops a shared understanding of the work
- Uncovers missing requirements through conversation
- Surfaces concerns and perspectives from all members of the team
- Defines potential implementation options
- Creates collective ownership of the estimation



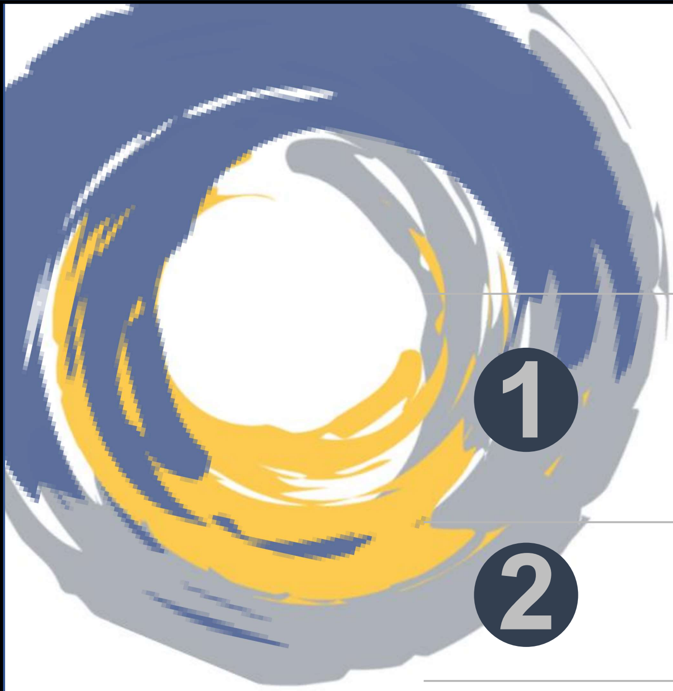
Collective Estimation Techniques

- Planning Poker
- Affinity Mapping

LACE
CCSQ Lean Agile Center of Excellence

Rules for estimating (regardless of technique)

- Use the relative value of one estimation against another estimation
- Only the people that do the work provide the estimates
- Give everyone estimating a voice to contribute to the estimation conversation



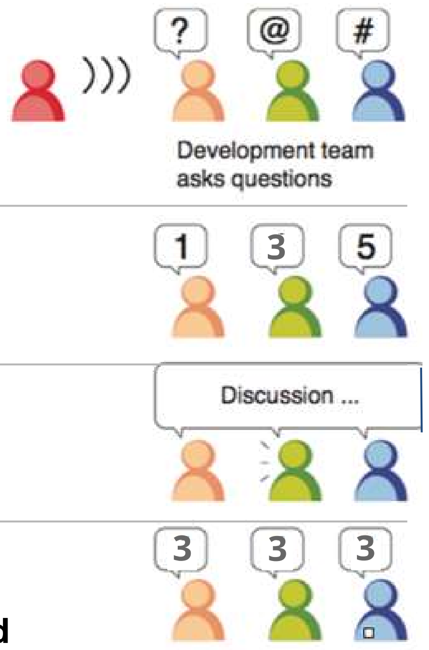
Estimating Size with Planning Poker

1. **Product Owner Presents Stories and Acceptance Criteria**
   The team asks questions and discusses how the work will be done

2. **Team Estimates**
   considering effort development and testing effort, risk and complexity

3. **Team Discusses**
   If there is lack of agreement

4. **Team Estimates Again**
   Until agreement on Point Value is reached and the story is voted as "Ready"



LACE
CCSQ Lean Agile Center of Excellence

Affinity Mapping

1. Choose a known work item and use it as an anchor
2. The work item to be estimated is presented and discussed
3. After discussion participants rotate placing work items into the scale
4. When placing a work items, a participant may remove any items that have already been placed if they disagree with it's placement.
5. If an item is moved it is removed from the board for more discussion until agreement on where it fits into the scale

Silent Affinity Mapping

1. The overall purpose of the body of work is discussed in a timebox
2. A single participant takes any piece of work and places it on the scale
3. Without speaking, participants rotate placing work items into the scale
4. Whenever an item is moved, the facilitator adds a mark to the items
5. The items with the most tick marks are discussed first, and the items with no marks indicate full agreement and do not require discussion

LACE
CCSQ Lean Agile Center of Excellence

KNOWLEDGE CHECK

1) How do each of the following estimation methods work?
   - Multi-Factor Estimation
   - Abstract Scalar Estimation
   - Collective Estimation

2) What factors are used in software development estimation?

3) Which estimation techniques can be used to provide rapid estimates on large bodies of work?

4) How do the following biases inhibit quality estimation?
   - Singular and Distributional Data
   - Regression and Intuitive Prediction
   - The Overconfidence Effect

5) Explain the Credibility Theory

LACE
CCSQ Lean Agile Center of Excellence

Crafting Delivery Plans Using Estimates

“The more detailed we made our plans, the longer our cycle times became”
- Donald G. Reinertsen

The more detailed the plan with hard dates, the more “late” the delivery of value

The less slack we have in our plan, the more disrupted our plan becomes from emergent discovery

The more we plan to maximum capacity, the longer new work waits to be started

The longer you spend in planning, the later you start the work

LACE
CCSQ Lean Agile Center of Excellence

Delivery Plan

When you have a …

- Refined, Estimated, and Prioritized Backlog;
- Historical velocity

If the backlog doesn't change …

And the resources don't change …

Given an amount of time …

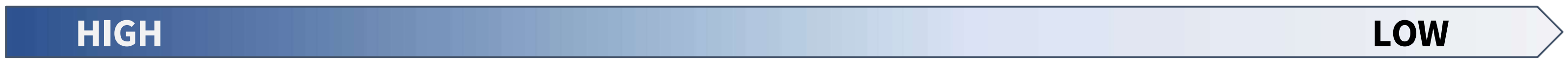
The work items will be completed!

LACE

CCSQ Lean Agile Center of Excellence

Use Estimated Work to Project delivery Timeframes

Next Iteration	Iteration 2	Iteration 3	Iteration 4	Iteration 5
Feature 1 Started	(5 pt) Story 6	(5 pt) Story 18	(5 pt) Story 27	(?) Story 12
(3 pt) Story 1	(1 pt) Story 31	(2 pt) Story 19	(?) Story 28	(?) Story 33
(1 pt) Story 2	(5 pt) Story 13	(3 pt) Story 20	Feature 2 Delivered	(2 pt) Story 4
(2 pt) Story 3	Feature 1 Delivered	(3 pt) Story 21	Feature 3 Started	
(5 pt) Story 8	Feature 2 Started	(2 pt) Story 15	(5 pt) Story 29	
(1 pt) Story 5	(2 pt) Story 33	(1 pt) Story 23	(2 pt) Story 30	
(3 pt) Story 11	(3 pt) Story 22	(?) Story 24	(?) Story 17	
(1 pt) Story 7	(?) Story 16	(2 pt) Story 25		
(2 pt) Story 14	(2 pt) Story 26	(1 pt) Story 32		
(2 pt) Story 9				
(1 pt) Story 10				
21 points total	18 points total	19 points total	12 points total	

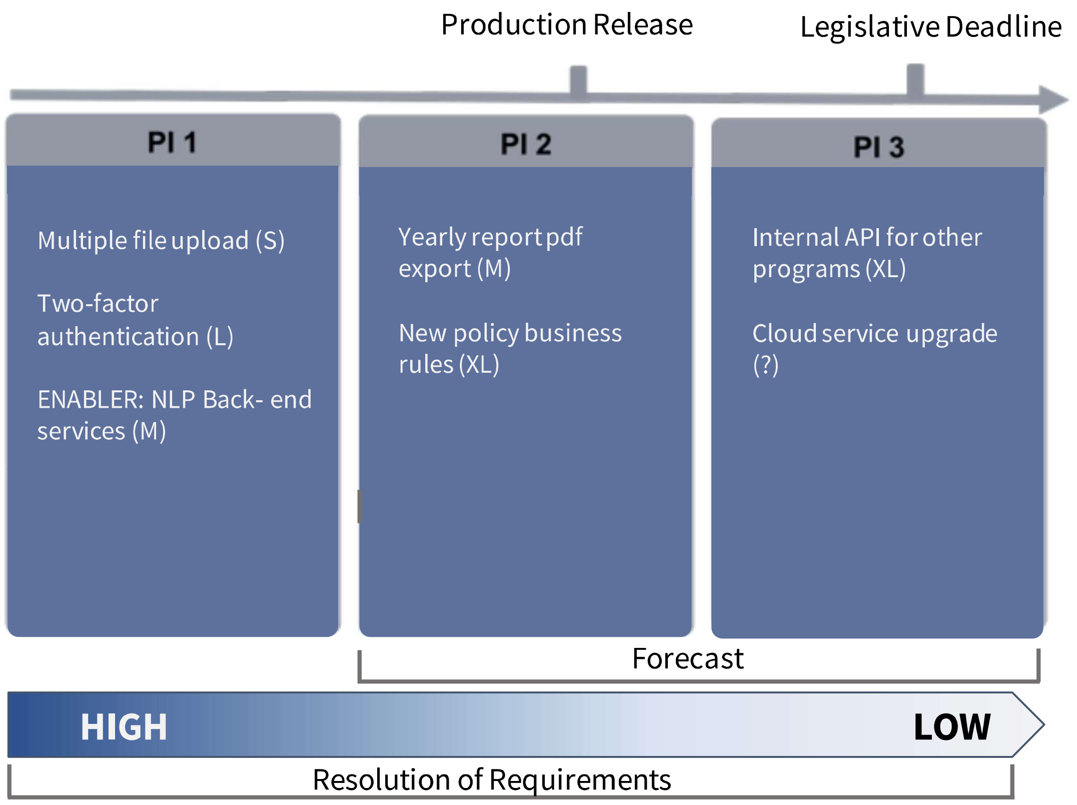


Story Clarity/Level of Refinement

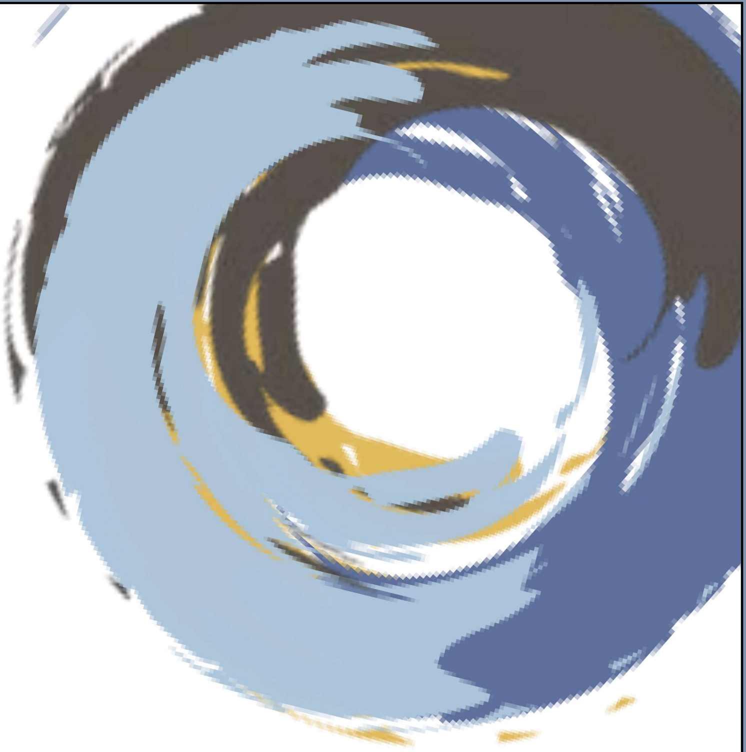
LACE
CCSQ Lean Agile Center of Excellence

PI Roadmap

Delivery Plan that forecasts 1-3 Program Increments using the Program Backlog.



Production Release
Legislative Deadline
PI 1
Multiple file upload (S)
Two-factor authentication (L)
ENABLER: NLP Back- end services (M)
PI 2
Yearly report pdf export (M)
New policy business rules (XL)
PI 3
Internal API for other programs (XL)
Cloud service upgrade (?)
Forecast
HIGH
LOW
Resolution of Requirements



Pro Tip: Even the current PI commitment is a forecast