Navigating Agile Estimation Challenges

QSM The Intelligence behind Successful Software Projects

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Laura Zuber has 25 years of experience in software development consulting, training, and support. She has conducted training and coaching sessions for all QSM SLIM-Suite tools and helped customers implement SLIM across a wide variety of processes and platforms. Laura has managed software development projects, served as a senior software process improvement specialist, performed process assessments, designed and implemented best practices, and authored numerous training programs. She is a Certified Scrum Master and SAFe Agilist.

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It's Complicated!

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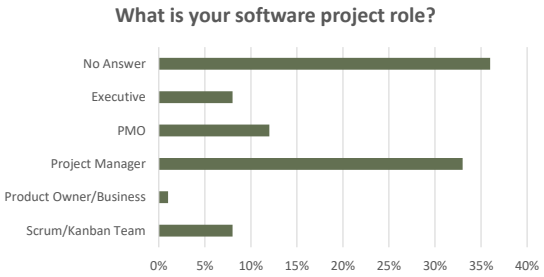
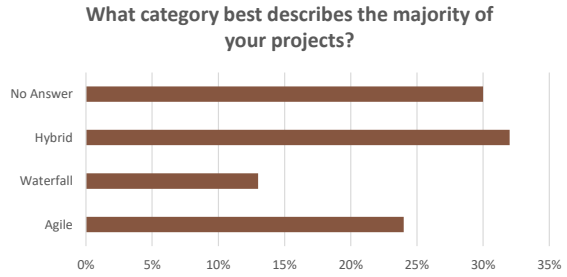
- Every business has challenges and each business probably thinks theirs are unique. Probably, but software development challenges are different mainly due to the need to create reliable products quickly in the midst of rapidly changing technologies and having to jump in, often with little information.

- Before we start to address common Agile estimation challenges, we'd like to know more about you and your world, so we have a couple of polls:

- What is your software project role?
- What category best describes the majority of your projects?

Poll Results — 1 and 2





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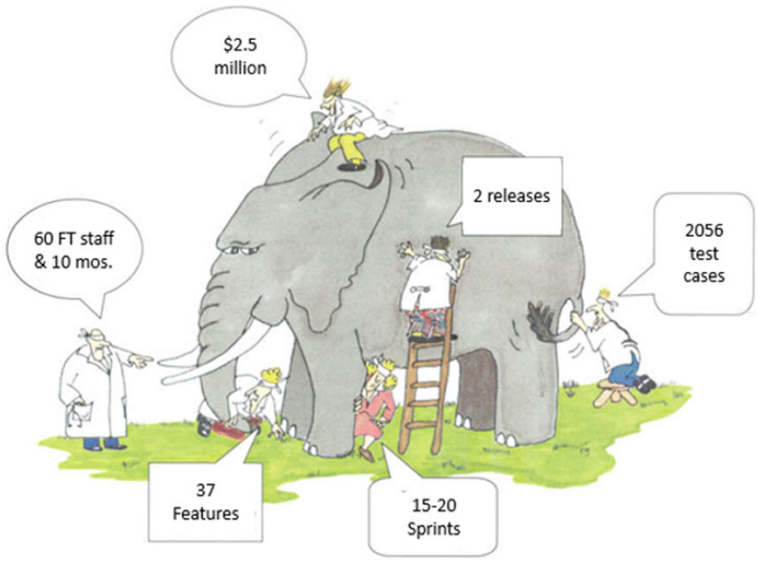
Stakeholders View Product Development Differently



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- I asked about your role, because software projects have a variety of stakeholders – each has their own needs and perspective, and that means their challenges are varied as well.
- This fact alone is one of the biggest sources of typical estimation challenges. It is hard to get everyone on the same page. There are different goals that are sometimes in conflict – like do it fast & make sure it's high quality – especially early in the life cycle when all the details have yet to be worked out and assumptions have to be made.

- Many organizations are at various levels of Agile implementation or only use Agile for certain project types. Variability here can create challenges.

Why We Estimate

- Strategic enterprise need
- Win new business
- Prioritize the backlog
- Budget
- Schedule
- Resource needs
- Technical challenges

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- You may not have thought about it, but there are different reasons why we estimate.
- {List]
- These are the typical reasons we see.

What Are Your Estimation Challenges?

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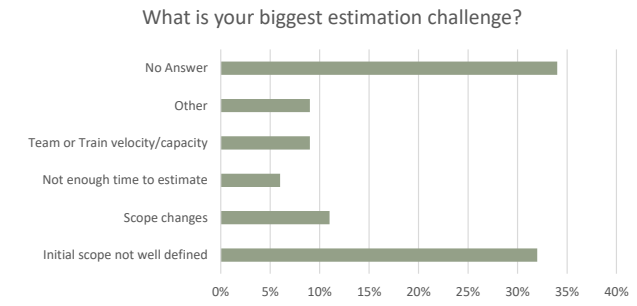
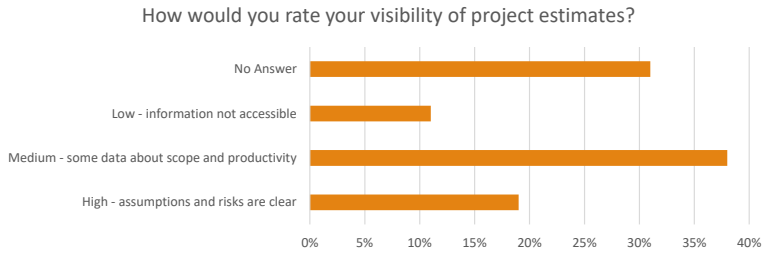
- Before we start navigating through Agile Estimation Challenges, I want to make sure I understand a little about your struggles.
- A couple more quick polls, please:

- What is your biggest estimation challenge?
- How would you rate your visibility of project estimates, namely the assumptions upon which they are based?

Poll Results — 3 and 4





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Software Lifecycle Management Challenges

Estimation • Tracking & Forecasting • Closeout

- Scope not well defined
- Scope / Size measurements inconsistent
- Agreement on need to estimate
- Velocity / Productivity unknown & fluctuations
- Historical Data not available
- Assumptions regarding Time & Effort Tradeoff
- Tracking & Forecasting
- Measuring Deliverable Quality

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- The title of this slide is not “Agile Estimation Challenges” for two reasons:
- The software development challenges I’ll describe are not unique to Agile methods / organizations
- Estimate challenges are really lifecycle management challenges – across all stages: Estimation * Tracking & Forecasting * Closeout

- [List]

- The challenges highlighted in blue are more likely to be issues with Agile.

SLIM APPROACH

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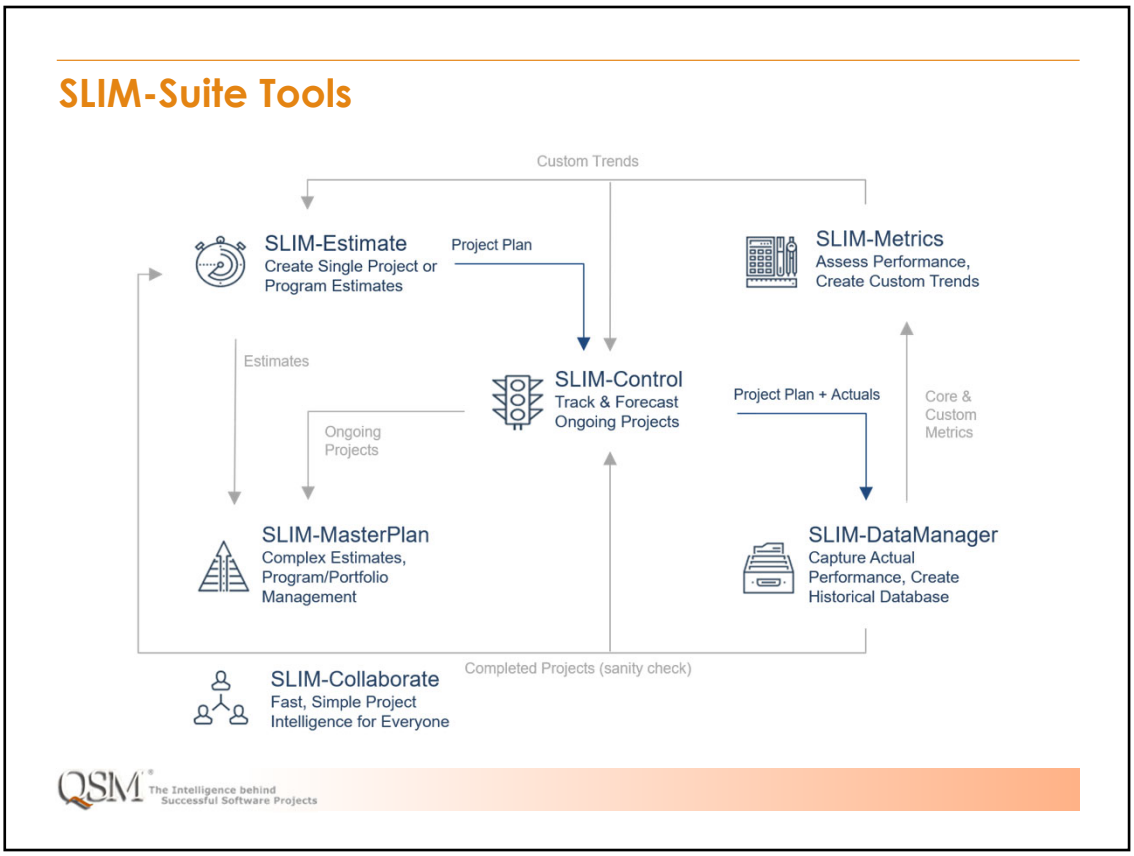

- For those who are unfamiliar with SLIM-Suite tools, I will briefly describe each one and describe some key principles and modeling parameters embodied across the entire suite, before we address Agile Estimation Challenges.

The Software Production Equation

Delivered System Size | **Is proportional to** | **Effort** | **over** | **Time** | **at some level of** | **Productivity**

Value Delivered	Resources Expended	Duration Required	Influenced by Capability and Difficulty of the task

This equation can be re-arranged
to solve various estimation problems (Wizards).

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- The software production equation is at the heart of SLIM tools (developed by our company founder Larry Putnam Sr). To deliver value to customers and/or management, we need to apply some amount of Effort over some amount of Time at some level of Productivity

- For straightforward estimate calculations, inputs are Size and Productivity.
- Outputs are Time and Effort
- Equation can be re-arranged to take what we know to solve for what we don't know. This provides different strategies for the different reasons we perform estimates. For example, our Time Boxed, Fixed Team wizard uses assumptions about Effort, Time, and Productivity to determine the amount of Size that can be delivered by a certain team for a particular application type.

- Time and Effort trade off against each other. A project with given size and productivity can be developed in less time with more effort, or more time with less effort.
- This time/effort tradeoff can be measured and modeled empirically. It is non-linear (and thus, hard for humans to predict).

Productivity Example

Project A	Project B
Size = 300 FP	Size = 300 FP
Effort = 1038 Hrs	Effort = 1038 Hr
Duration = **1 Month**	Duration = **6 Months**
Team Size = **6 FTEs**	Team Size = **1 FTE**
Productivity = FP/Effort	
.289 FP per Hour	.289 FP per Hour

Project A	Project B
PI = **26.3**	PI = **16.4**
MTTD = **.755**	MTTD = **4.51**

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SLIM's Productivity Index is not a traditional linear measure like sprint velocity. It measures the efficiency of your development environment, not just people. It is calculated from completed projects.

Productivity is affected by a host of factors, some of which can be quantified and some of which cannot:

- Personnel Factors: . . . morale, experience, management capability,…
- Technology Factors: . .tools, infrastructure, language,…
- Process Factors: . . . . . standards, maturity level, precedentedness…
- Product Factors: . . . . . size, complexity, hardware integration,…
- Reuse: . . . . . existing software, existing documentation…

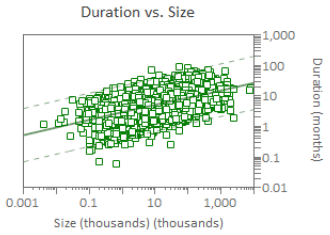
[Walk through example]

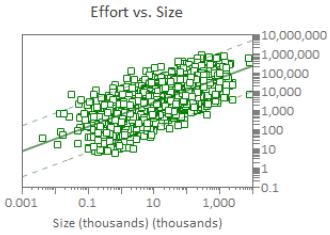
Challenge met – measuring productivity for the entire environment at the release level gives greater predictability.

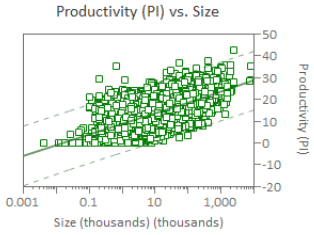
Estimation Expertise in a Box!

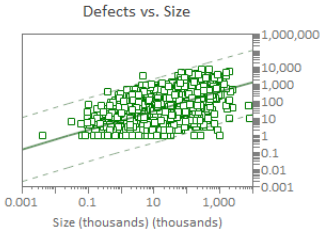
Core metrics scale non-linearly with project size. These relationships are robust and consistent over time (38+ years!) and across domains.

Empirical knowledge of these relationships is "built in" to SLIM-Estimate's algorithms, charts, and reports.









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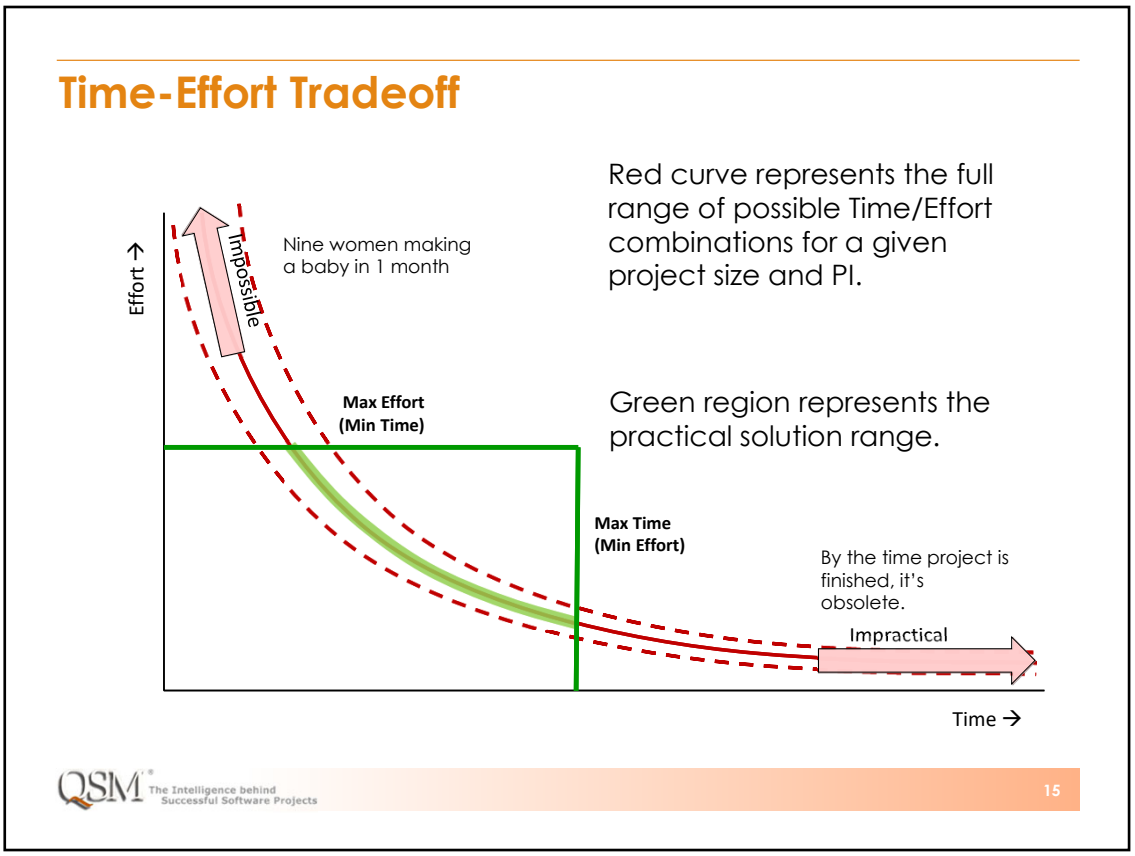
- Objective, Expert Judgment in a Box!
- Core Metrics increase with Size
- The increase is nonlinear
- Different trends for different application types



- [Describe chart]
- Projects can be scheduled and staffed in different ways but for a given project, time and effort are NEVER completely independent.
- Software development is not manufacturing!

AGILE ESTIMATION CHALLENGES

Software Sizing Challenges

- Function Points
  - Standard
  - Platform Agnostic
- Story Points
  - Customer Satisfaction
  - Inconsistent
- "Big Rock" relative sizing
- Estimates vs Actuals

"Even though we're not trying to be consistent, it will work out that we are."

- Andy Berner

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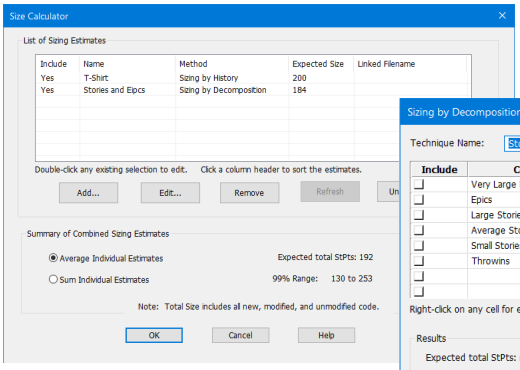
- QSM customers have shared their Agile estimation challenges over the years. We wanted to create away for them to share ideas and get help from QSM also.

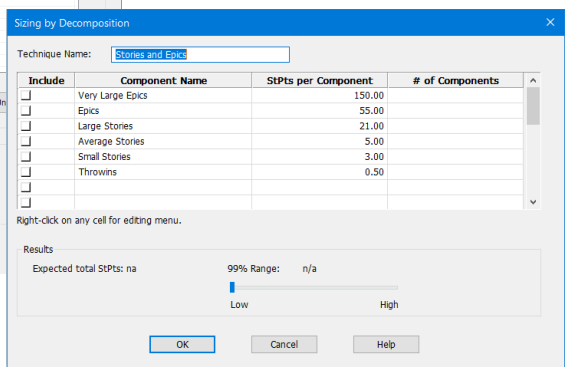
- We conducted a several month-long forum with customers in 2018 called the Agile Round Table.
- The majority of discussion was related to sizing:
- Sizing units – [bullets]
- Consistency – Andy's quote
- Estimated versus what is actually delivered – often not measured

Multiple Software Sizing Methods

T-Shirt sizing



Epics & Stories



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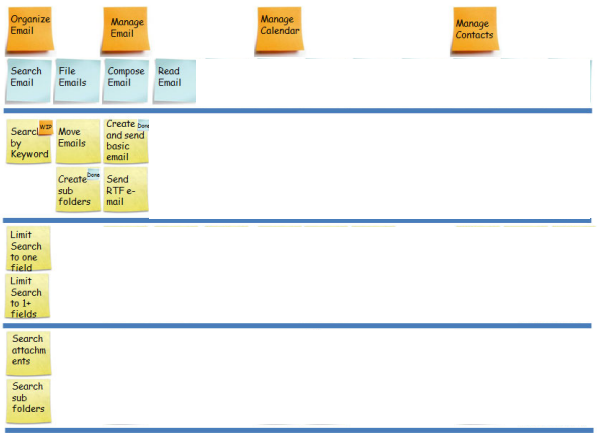
- SLIM is extremely flexible when it comes to measuring size. Different methods are appropriate for different kinds of projects and at different points in the lifecycle.
- T-shirt sizing is based on statistical trends that showed earlier, either industry data or your own, let's you create defensible estimates when you don't know much. The T-Shirt sizes are automatically calculated from the range of projects in your historical database.
- Once you start breaking out features and stories, you can quantify size by complexity. Size estimates are easily updated to account for scope changes.
- Challenge met – scope not well defined and scope changes.

How do you get total size from Jira?

For Epics refined into stories, add the story points of the "leaf" stories



Some Stories not traced back to Epics

Steve Rogalski http://winnipegagilist.blogspot.com/2012/03/how-to-create-user-story-map.htm

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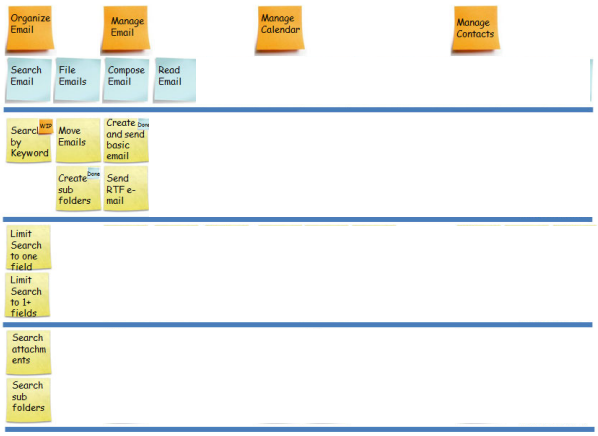
- Let's take a look at how we can determine the size of your stories and epics from a tool like Jira.
- SLIM has an API used to prototype this integration; could be any other tool.
- There are many ways organizations use Jira, but QSM will work with you to map your data to what is needed.

- Example User Story map of the hierarchy of Epics and Stories – multiple levels of medium to small stories.
- Early on, only some Epics are refined.

How do you get total size from Jira?

For Epics not yet refined, use the average of the refined epics

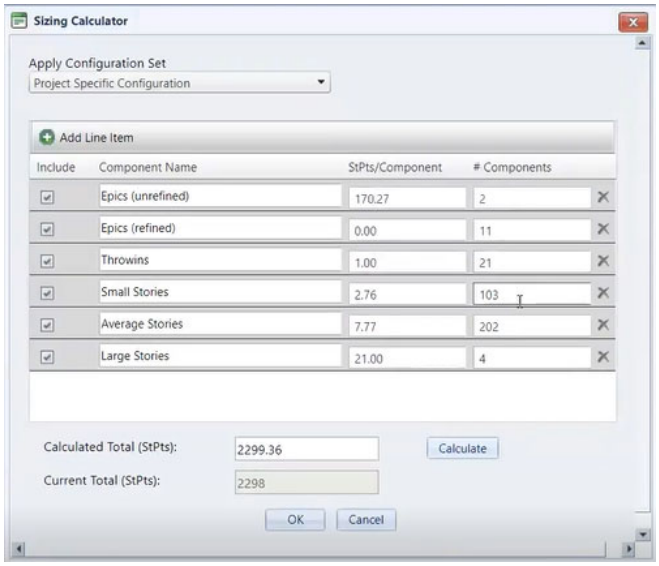


Steve Rogalski http://winnipegagilist.blogspot.com/2012/03/how-to-create-user-story-map.htm

And don't forget to add in the story points for stories not traced back to an epic!

- Take story points for each of the leaf stories, add them up to get the size of Epics.
- Make the assumption the Epics that have not been refined are about the same size.
- Categorize each of the Stories to a size bin based on the StPnt count.
- Add the individual Stories

Jira Size Date Imported to Sizing Calculator



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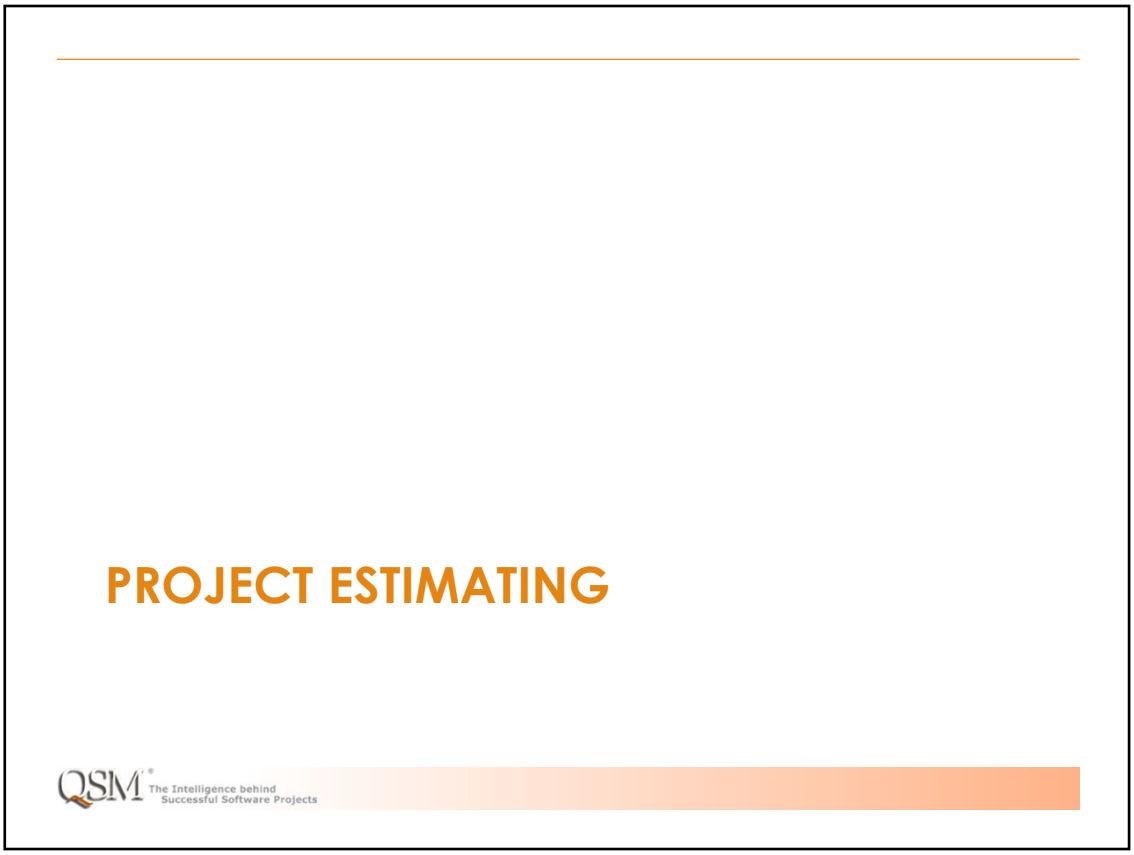

- Now I'd like to take what we've discussed so far and see how we apply this specifically to Agile projects in the big 3 lifecycle activities:
- Estimation
- Tracking & Forecasting
- Closeout

Multiple Estimate Scenarios to Assess Risk

- What if?
  - Scope increases
  - Productivity is low
  - Staffing is increased / decreased
  - Budget is cut
  - Schedule changes
- Quickly compute multiple estimate scenarios
- Compute probability of potential outcomes
- Determine contingency needed to mitigate risks

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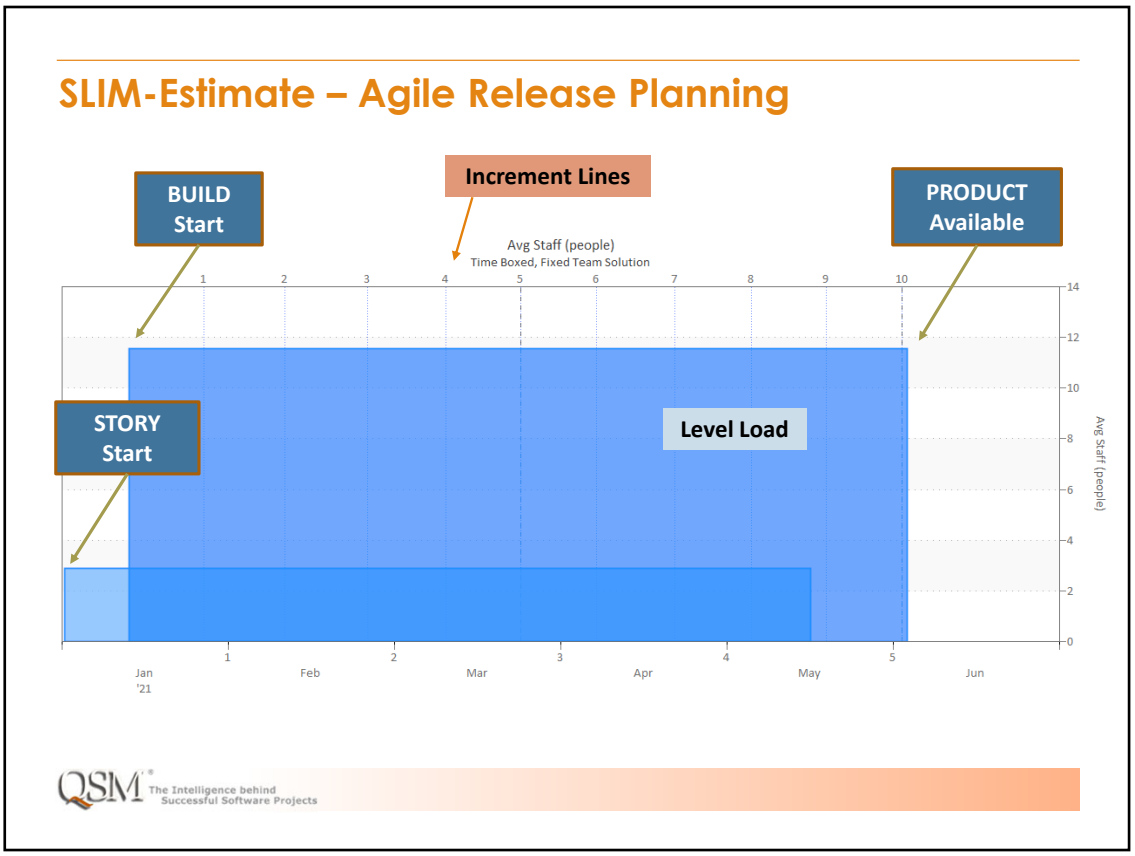
- Estimating Size is the biggest challenge. And as I've described, effort, costs, and time are driven by size.

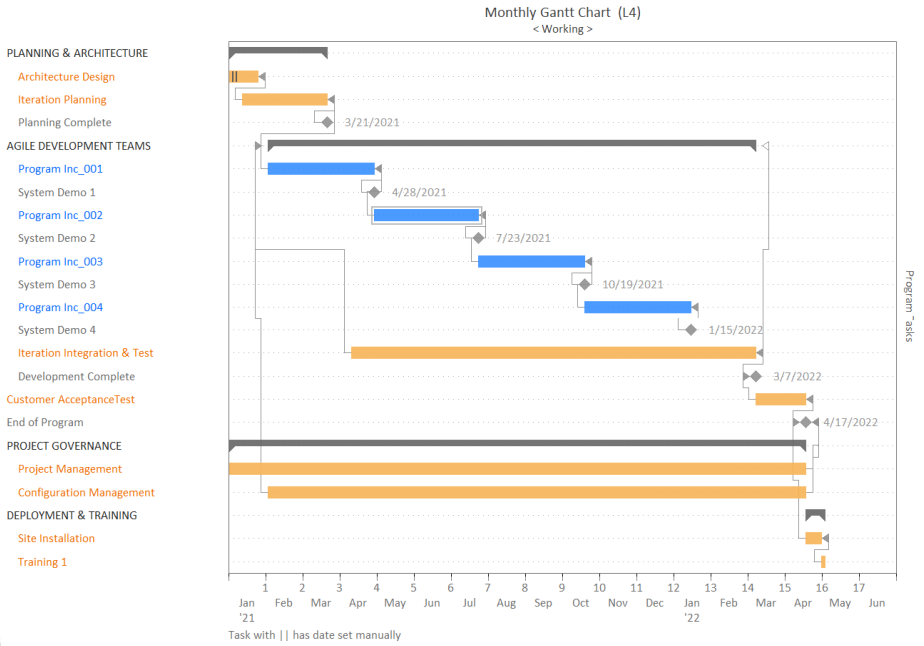
- One of SLIM's greatest benefits is the ability to explore a range of potential outcomes [list]



- Let me show you some of the features of each of our estimation tools.

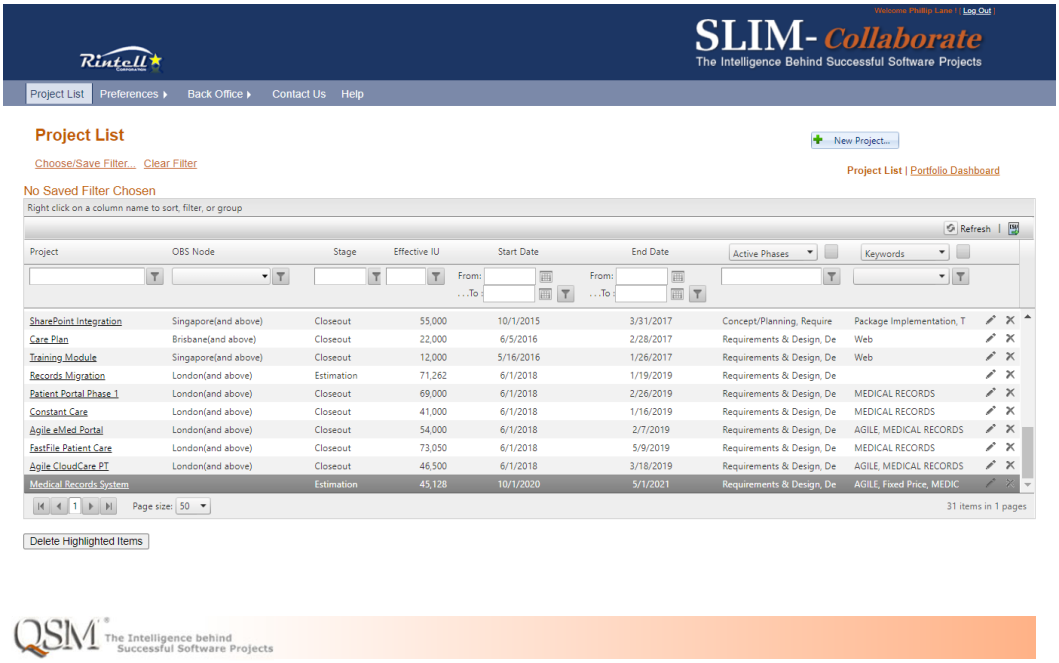
- SLIM-Estimate:
- Models the development of a consumable release.
- 2 major groups of activities – story writing and build & test
- Arranged to model iterative sprint activity.
- See impact of decisions to schedule with Agile Sprint lines

SLIM-MasterPlan – Multiple Releases / SAFe



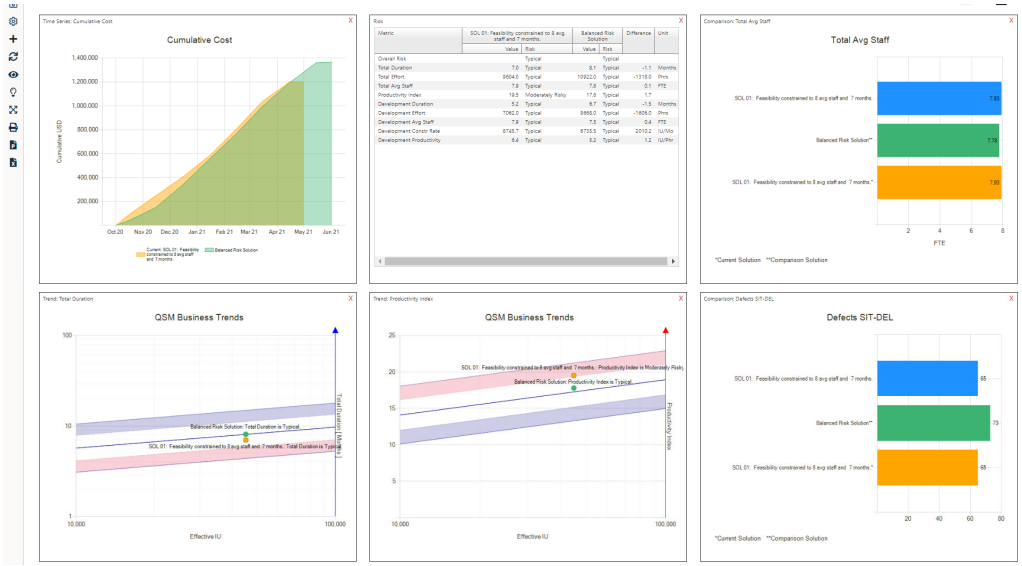
- SLIM-MasterPlan:
- Models scaled Agile methods
- Include non-development tasks
- Extremely flexible hierarchy
- Show dependencies
- Based on value produced each increment, adjustments can quickly be made with What-if analysis here as well.

SLIM-Collaborate – Stakeholders & Workflow



- SLIM-Collaborate:
- Central database; filter and group & use keywords; drill-down; list specific to user
- Estimation and Closeout projects – have our estimates and history in one place, can pick and choose relevant projects to support an estimate

SLIM-Collaborate – Portfolio & Project Dashboards



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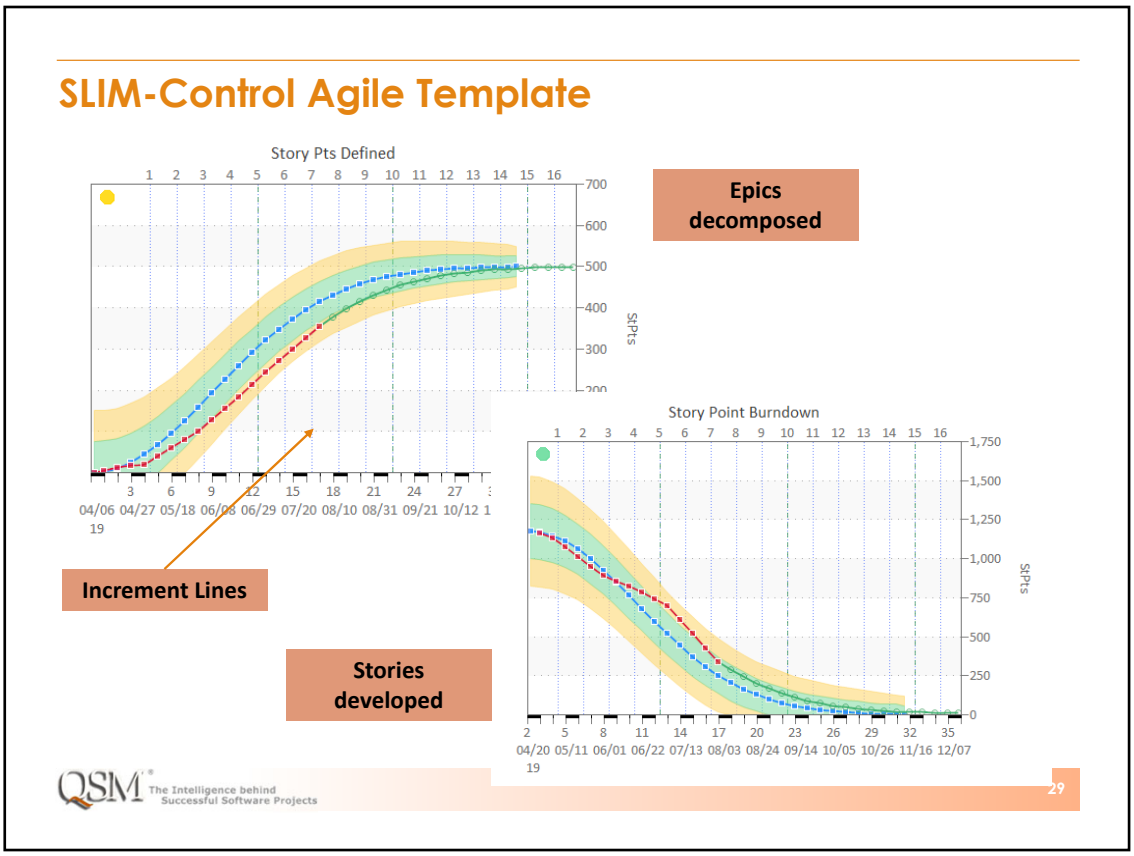
- SLIM-Collaborate specializes in providing project intelligence with 4 different dashboards.
- Portfolio dashboards show metrics for your filtered list – benchmarking performance, get range of sizes, compare to estimates!

- This is the Project dashboard [describe].

- Challenges met – productivity and other assumptions based on history, and account for fluctuations across increments; see the impact of time and effort tradeoffs in real time.

PROJECT TRACKING

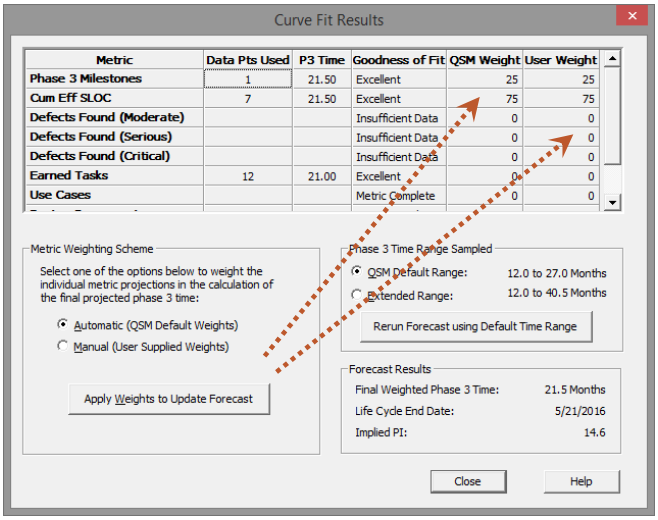


- This is a typical time series chart used for tracking

- Plan, Actuals, Forecast (talk about in a moment)
- Control Bounds
- Release time Sprints & Program Increments

Forecasting – An "Estimate" Based on "Actuals"

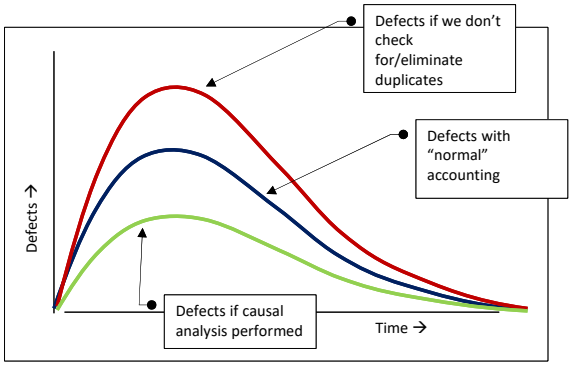
- Curve Fit Forecast — "try out" various re-planning options and assess their impact on the final cost, schedule, and quality.
- Tradeoff Forecast — assess impact of adding staff.
- Maintenance Forecast — date to meet quality goal.



- When Should You Consider Replanning?
- When a project goes off track, SLIM-Control's curve fit forecast offers a mechanism for performing "what-if" analysis.
- The curve fit forecast projects the most likely delivery date for the project using your actual progress, updated staffing assumptions, and the final values of metrics used in the forecast.
- You can run several forecasts: one based on continuing with the present plan and others based on re-planning options like deferring non-essential features or negotiating additional time.
- Tradeoff forecasts let you determine the impact of staffing changes
- Maintenance forecasts help you determine if the product quality is good enough to release.
-

Defect Tuning Calculator

- Tunes defect projections using actual defect data from the project
- Can use all defects or exclude early



Defect tuning factors over 100 are neither good or bad; just different!

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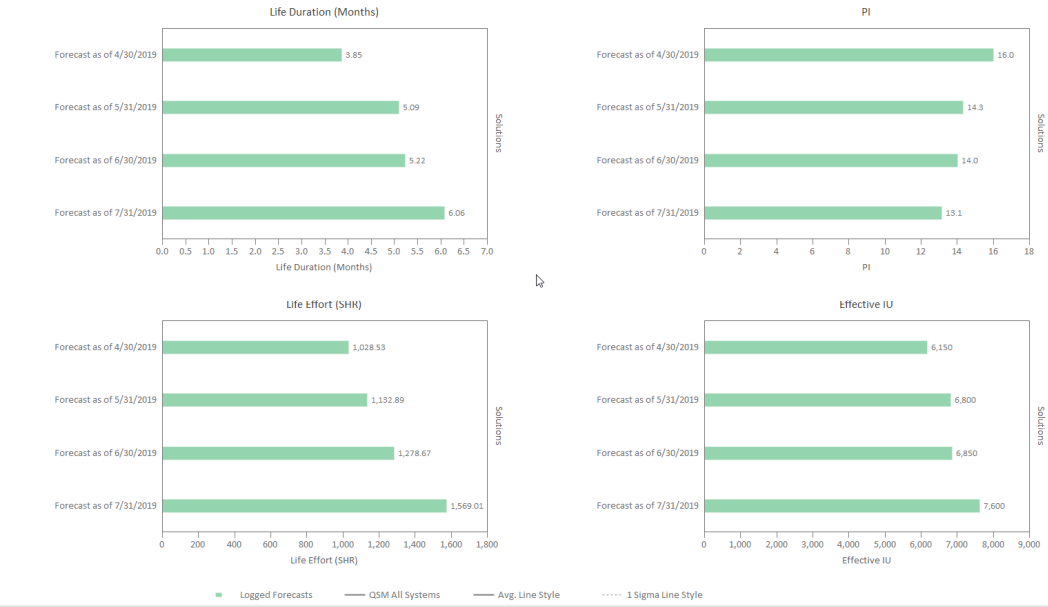
- A key metric used to forecast completion is defects. They become more important and influential late in the lifecycle.
- SLIM's defect model can be adjusted to your environment – your practices – based on defect discovery data for completed projects.

Run Multiple Forecasts



- Here is chart that shows the comparison of multiple forecasts, including size, PI, effort and schedule results based on actual performance and forecast assumptions.
- You can take one of these forecasts and make it the current plan!
- Challenge met – visibility of project status at regular increments, scientific forecast based on multiple metrics with a choice about which metrics are the best predictors and measuring deliverable quality.

PROJECT CLOSEOUT

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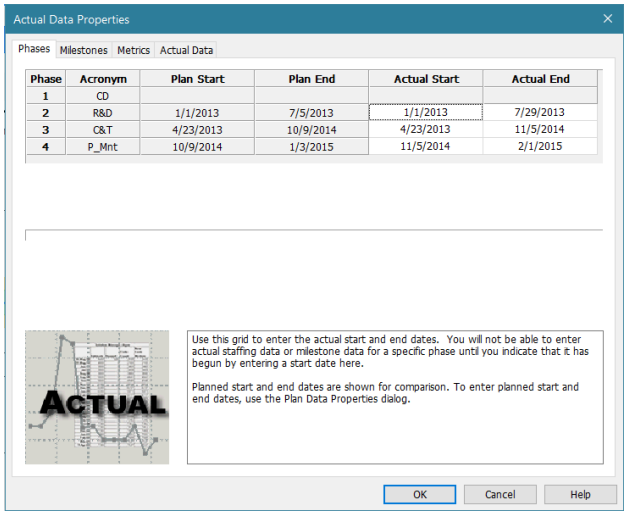
SLIM-DataManager & SLIM-Collaborate

- Staffing
- Cum Eff Size
- Defects
- Phase End Dates

Core Metrics



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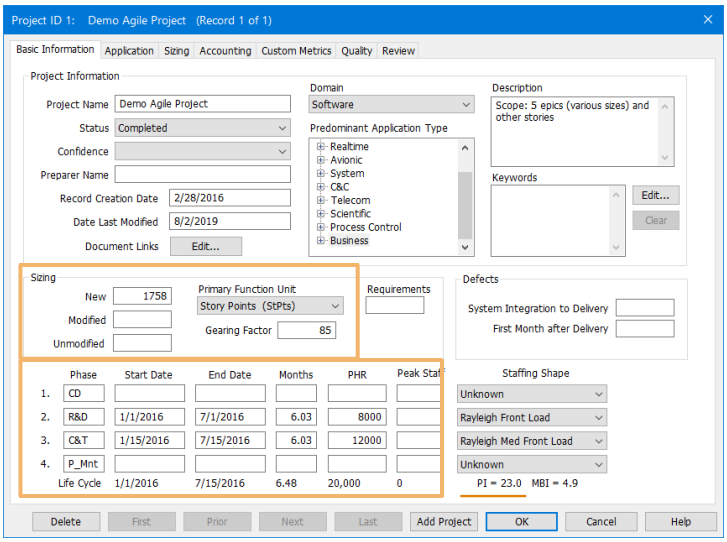
- Gathering data for completed projects may seem challenging, but when you stick with 4 or 5 core metrics it isn't.

- When you can, it is important to capture the start and end dates for phases. This image is from SLIM-Control, so if you're using that, you have your history all ready and simply import it into SLIM-DataManager.

Import SLIM-Control project into SLIM-DataManager

- Status is Completed
- Effort Totals by Phase
- Actual Size
- Defects SIT-DEL
- Defect Tuning Factor
- Actual PI - calculated



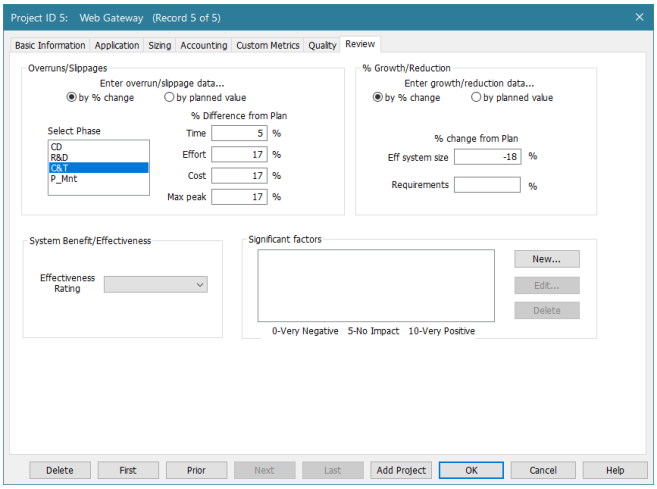
- When you measure the actual software size and high-level capture time and effort data, PI is calculated.

- Defects discovered during and after delivery are optional, but extremely valuable.

- This data can be pulled into the estimation tools to sanity check estimates against multiple projects and used to create trend lines.

Capture lessons learned

- Overruns/Slippages automatically calculated – Plan vs. Actual
- % Growth/Reduction of Eff Size
- Free-form Significant Factors



- Lastly, you measure your predictability with calculations of estimates vs. actuals and documents project factors, like scope changes, that impact the final outcome.

- Challenges met – more visibility, historical data as basis of estimation, measuring final delivered quality and calculating PI to support future estimates.

QSM Agile Resources

- Search for "agile" on the QSM website ……
  - More than 6 pages listing white papers, blogs, webinars, and other resources
- Recommended key resources
  - Agile Estimation, Beyond the Myths (2 part webinar)
  - QSM Agile Round Table (4 published articles)
    - Big Rock Estimation, Sizing in Story Points, Changing Scope, Diff between PI and Velocity
  - Measuring Effort and Productivity in Agile Projects
  - Estimating Program Increment Capacity – one of several resources for "doing Agile at scale"
  - Measuring Software Size Webinar

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Questions?

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