User Stories & Agile Planning

CSCI 5828: Foundations of Software Engineering
Lecture 08 — 09/15/2016

Goals

- Present an introduction to the topic of user stories
  - concepts and terminology
  - benefits and limitations
- Present an introduction to iteration planning
  - Estimating User Stories
  - Planning a Release
  - Planning an Iteration
  - Measuring and Monitoring Velocity

Credit Where Credit is Due

- This material is drawn from a textbook I used for this class in Fall 2014
  - "User Stories Applied" by Mike Cohn
    Publisher: Addison-Wesley/Pearson Education
    ISBN-13: 978-0-321-20568-1
- It's a great book for going in depth on the topic of user stories

User Stories

- User stories are a means to **capture requirements** during the analysis phase of software development
  - whenever that phase occurs during your particular software life cycle
  - (in agile life cycles, analysis can happen at any time)
- They are a **lightweight mechanism** for *spreading decision making* out across a software development project with respect to individual features
  - We know we need feature X but we don't know much about it?
    - name it and put it in a user story
  - We learned a little bit more about feature X today?
    - add a short note to the user story (or even better, write a test)

Background (I)

- Agile life cycles evolved the notion of a user story because *capturing software requirements is a communication problem*
    - Those who want new software need to communicate what they need to those who will build it
    - Many stakeholders will provide input to the process
        - customers, users, and domain experts
        - business and marketing
        - developers

Background (II)

- If any group dominates this discussion, the whole project suffers
  - if business dominates, it may mandate features and schedules with little regard to feasibility
  - if the developers dominate, a focus on technology may obscure business needs and the developers may miss important requirements
- Furthermore, the goal is to **understand the user's problem** and ensure the software meets their needs
  - both business and developers will move on, the users have to live with the developed software day in and day out

Background (III)

- Furthermore, everything about the project is in flux
    - We still don't understand *exactly* what the user needs
        - Their domain is complex; they are experts, we are novices
        - We'll get things wrong and need to be corrected
        - We'll get to a certain point and then they will remember things that they forgot to tell us
        - We'll show them prototypes and they'll come up with new ideas
    - We don't have enough information to make accurate estimates
        - what we thought would be easy, turns out to be very complex

Background (IV)

- But, we must make progress!
  - And, so we have to *make decisions based on the information we have*
- We set our scope **small** (one feature, for instance) and our development life cycle **short** (one week, for instance)
  - and then we show the customer what we have
- By then, *new information will be available* and we'll have **feedback on the work we've done so far**
  - With that input, we identify the new scope and start a new iteration
- We thus ***spread out the decision making***
  - It's not "everything up front" but "a little at a time"

User Stories: The Basics (I)

- That's where User stories come in; they describe **functionality that will be valuable to the user and/or customer**
  - Note the distinction:
    - **user**: the people who actually use the produced software in their work
    - **customer**: a person, not necessarily a user, who is responsible for purchasing the software for a set of users
    - Sometimes they are one and the same, but not always
  - Note also the use of the word "***valuable***"
    - We do NOT implement a feature because it is "cool"
      - *we implement features to provide value to users*

User Stories: The Basics (II)

- User stories consist of
  - a **short written description** of a feature used for planning and a reminder
  - **conversations** about the feature used to flesh out its details
  - **software tests** that convey details about functionality and help us determine when the story is completely implemented
- Ron Jeffries calls these three aspects Card, Conversation, and Confirmation
  - He says “card” because traditionally users stories are written on index cards and put up on a wall in the shared space of a development project
    - Using index cards **forces** you to keep the story brief!

User Stories: The Basics (III)

- Example users stories for a website that helps a person’s job search
  - A user can post a resume to the website
  - A user can search for jobs
  - A company can post new job openings
  - Users can restrict access to their resume
- Important:
  - User stores are written so that **customers value them**
  - This helps maintain a customer perspective within the development team

User Stories: The Basics (IV)

- So, is this a good user story?

    - The software will make use of a bloom filter to determine if a desired data element is in our data set before we perform disk I/O to retrieve it

Not Really

- Is your customer a distributed systems researcher?
    - Then, yes, ***maybe***, this might be a good user story
        - (as it is for Cassandra, a popular NoSQL database)
- But, in general, technical details like this do **NOT** make good user stories
    - These details may change
        - we need to switch from this framework to this other framework to be compatible on a wider range of devices
    - while the fundamental user story does not change
        - Users need to access schedule information

How do we track details?

- The users stories for an application can often be written simply at a high level of abstraction (known as **epic user stories** or **epics** for short); for example:
  - A user can search for jobs
  - A company can post job openings
- But, you need to specify details at a lower level of abstraction
  - how do we do that?
- Three places
  - in the conversations around a user story; we will converge on details
  - more users stories!
  - as tasks when we decide to implement user stories (discussed below)

More users stories

- You can take an epic like “A user can search for a job” and split it into new stories
    - A user can search for a job by attributes (such as …)
    - A user can view information about a job found by a search
    - A user can view profile information about a company offering a job
- On the epic, you note that it’s covered by these other stories and then you go work on those stories
- The challenge: getting the balance right
    - We want to resist the temptation to document everything on a user story
        - Our conversations are the key element where details live (since the details **WILL change** while the user story remains the same)

Tests are integral to User Stories

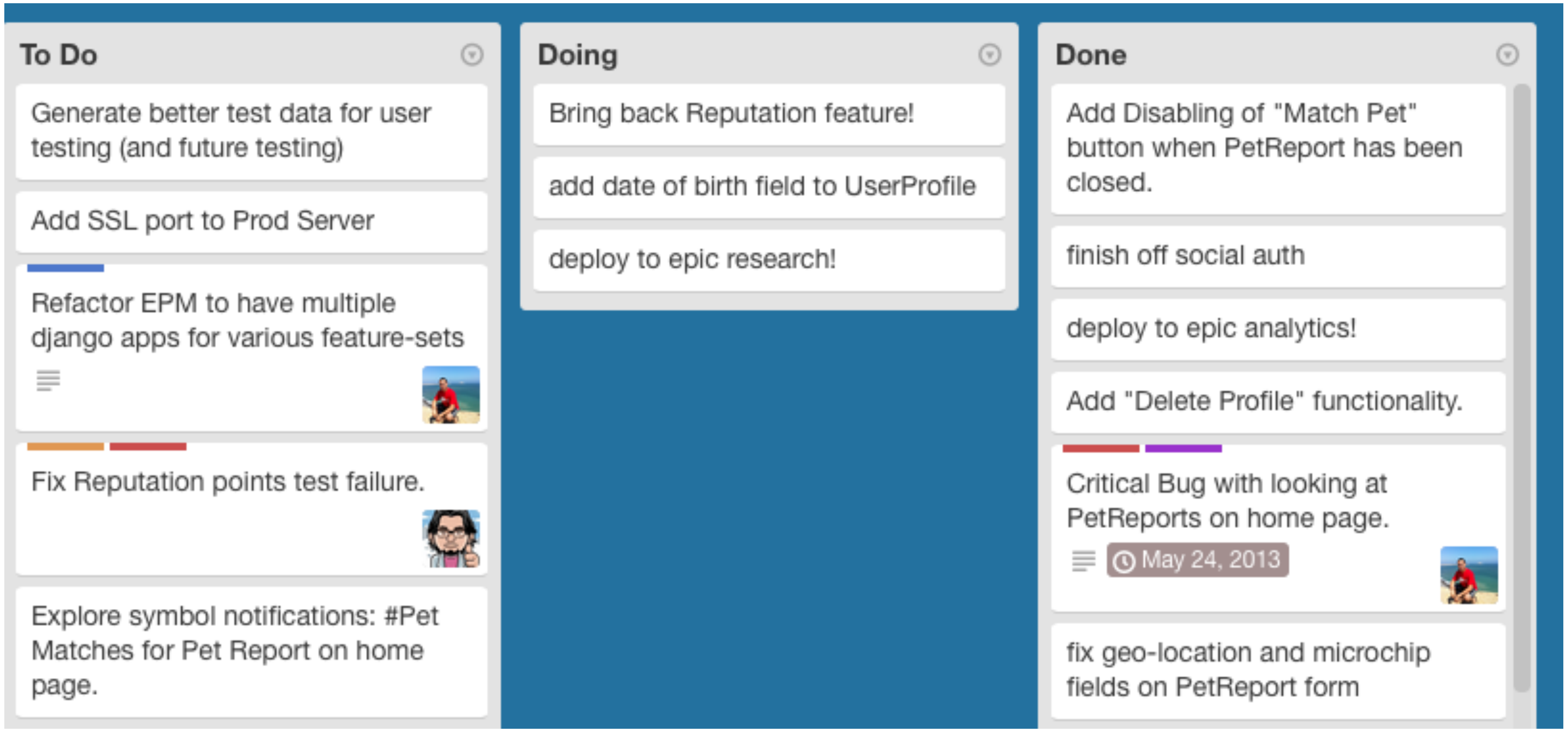
- At the start of a user story, the “tests” might exist as a set of customer expectations written on the back of a card
  - Try feature with an empty job description
  - Try feature with a really long job description
  - etc.
- In this form, the tests can come and go as we learn more about the feature
  - As this particular user story is worked on and implemented
    - these expectations are transformed into unit tests and integration tests that tell us when the feature is completely implemented
      - We’re not done until all tests have passed!

Benefits

- User stories provide the following benefits
  - They emphasize verbal rather than written communication
  - They are comprehensible by customers and developers
  - They are the right size for planning
  - They encourage and “work” for iterative development
  - They encourage deferring details until you have the best understanding of what you really need to implement a feature

Tool Support

- Systems, like Trello, can provide teams with support for tracking the status of user stories



To Do

- Generate better test data for user testing (and future testing)
- Add SSL port to Prod Server
- Refactor EPM to have multiple django apps for various feature-sets
- Fix Reputation points test failure.
- Explore symbol notifications: #Pet Matches for Pet Report on home page.

Doing

- Bring back Reputation feature!
- add date of birth field to UserProfile
- deploy to epic research!

Done

- Add Disabling of "Match Pet" button when PetReport has been closed.
- finish off social auth
- deploy to epic analytics!
- Add "Delete Profile" functionality.
- Critical Bug with looking at PetReports on home page. May 24, 2013
- fix geo-location and microchip fields on PetReport form

Here's a Trello board with a mix of stories and tasks

Overview of a Process

- A software development process driven by user stories feels very different than traditional life cycles; for instance, customers are included throughout the process (they do not disappear on you!)
  - to get a project started, a story writing workshop is held to brainstorm what features are valuable to the customer for an initial release
  - developers will assign initial estimates to each story using “points”
  - customers and developers set an iteration length (e.g. 2 weeks)
  - developers then determine their velocity (how much work they can get done in a single iteration)
  - customers assign priorities to the stories
  - iterations are formed by grouping stories by velocity based on their priorities and estimates

Midcourse Adjustments (I)

- This process is tunable (i.e. customizable)
  - It has to be because the developers will make mistakes with respect to
    - the points they assigned to a user story
    - the velocity (number of points per iteration) they chose
- At the end of each iteration
  - they will know more about their true velocity and
  - they will know more about the skills of their team
    - and thus have different opinions about the estimates that should be assigned to each user story

Midcourse Adjustments (II)

- With this new information, you can
    - return to the remaining groups of user stories (i.e. iterations) and
    - rebalance them
        - stories will get new estimates
        - stories may get new priorities (low to high and vice versa)
        - new stories may get added
        - existing stories may get removed
            - “Our user doesn’t care about this anymore”
        - existing stories may get moved forward or pushed backward

Releases and Iterations

- An agile life cycle is thus broken down into planning releases and planning iterations
  - A release is some major group of functionality that can be put into production (used by its users)
  - A release is composed of many iterations which contain users stories that are going to be implemented during that iteration
- Iterations always last the same amount of time and produce a working system that can be reviewed by the customers
  - Customers provide feedback and midcourse adjustments are made
  - The next iteration begins
  - Reminder: A user story is complete when it passes its user-specified tests

Estimating User Stories

- Developers need to assign “points” to a story to indicate how long it will take to implement
    - Our user/customer **assigns priorities** to stories, *not estimates*
- There are a number of desirable properties for this approach
    - it allows us to change our minds about an estimate when new info arrives
    - works for both epic stories as well as smaller stories
    - doesn’t take a lot of time; we want to spend our time developing
    - provides useful information about our progress and work remaining
    - is tolerant of imprecision in estimates
    - can be used to plan releases

Story Points

- A point is a unit that can be defined by the development team
  - It might represent “eight hours of uninterrupted work” for one team
  - It might represent “forty hours of uninterrupted work” for another
  - Some use points to represent complexity (lots of points == complex)
- Think of one point as “one ideal work day”
  - where ideal means: a day with no interruptions and the developer can be maximally productive on the task
- Two benefits with this approach
  - it avoids getting too specific: “this story will take 39.5 hours”
  - it gives people confidence: “Yeah, that story is about two days of work”

Estimates belong to the Team

- It is important to have **the team create the estimates for each story**
  - The success of the project is attributed to the team not to individuals
    - to establish this perspective: make estimates together
      - if you get it wrong, it's the team that failed, not one individual
- In addition, when creating/estimating stories, it may not be clear who will be assigned to this particular story
  - therefore, the team works to create the estimate and then individuals assigned to the story later know
    - they had a voice in creating the estimate they are working against
    - the team is responsible if the estimate is wrong

The Process of Estimation

- One way to do estimation was developed by Barry Boehm
    - the Wideband Delphi approach
- Gather the development team and the customer/user(s)
    - Bring the stories that need estimates and blank index cards
    - Distribute the cards to the development team
- **Loop until all stories have estimates**
    - Read a story out-loud
    - **Loop until estimates have converged**
        - Engage in Q&A with customer/users about that story
        - Each developer writes an estimate; when ready, show all estimates
        - Developers discuss differences in estimates; raising questions/issues
            - New stories may be created due to this discussion

Triangulate

- After a set of stories have received estimates, developers need to review them and see if they are being consistent
    - Group the stories by number of points and discuss
        - For example, are these two point stories really twice as small as the four points stories?
            - If yes, continue estimating
            - If not, change the estimates
- This helps the team achieve consistency across the entire set of user stories
    - Later in a development project, the need for triangulation may go down as the team becomes more confident and knowledgable of their abilities

Velocity

- The term velocity is defined as “number of story points completed per iteration”
    - Agile software life cycles recommend that
        - before the first iteration begins, the team makes a guess at what their velocity will be
            - if a point means “ideal work day”, you can start with this formula
                - number of team members x number of days in iteration
        - then, your velocity for iteration N is the actual number of points completed for iteration N-1
            - if you completed 32 points in the previous iteration, your velocity for planning the next iteration is 32.

Release Planning

- A release is a version of the system under development that is going to be deployed and put into production use
    - Release planning in software development involves having a release roadmap in which the next several releases have been identified
        - and the functionality for each release has been specified at a high level
- With a release roadmap, you need to engage in release planning
    - users/customers need to assign priorities to estimated user stories
    - all stakeholders need to work together to identify the length of an iteration
    - Issues include dealing with risk and determining velocity

Assigning Priorities

- One prioritization scheme that may be better than the typical "low/medium/high" approach
  - Must have
  - Should have
  - Could have
  - Won't have (for this release)
- This approach divides stories into clear buckets that can then be used to assign stories to iterations within the release
  - If a customer can't assign a priority to a user story, this (typically) indicates that the story needs to be split until clear priorities can be assigned

Risky Stories

- The issue here is what approach should agile projects take
  - tackle risky stories first
  - or go after “low hanging fruit”
- Agile life cycles like to go after low-hanging fruit
  - ***high-value functionality that is straightforward to implement***
- This allows time for more information to be gathered about high-risk stories
  - and this additional information may reduce the risk associated with them
- I think you need to balance this with the common issue of “problem avoidance”; make sure you’re clear on what the risks are => such information may produce action items that can reduce the risk and make it feasible

Iteration Length and Expected Duration

- Iteration length is typically from one week to four weeks
  - Agile life cycles recommend selecting shorter lengths to increase the feedback loop with the customer
- The important thing is once the length is selected: **DON'T CHANGE IT!**
  - Your team needs to settle into a comfortable development pace
    - Arbitrary changes to the iteration length will hinder that goal
- Once you have an iteration length, an initial velocity, and a set of prioritized, estimated user stories, you can make initial "ballpark" predictions about how long it will take to create a release
  - round_up(number of points / velocity) == number of iterations
  - number_of_iterations * iteration_length == number of days until release

Velocity, revisited

- Previously we suggested
  - number of team members x number of days in iteration
- is a good formula for picking an initial velocity
- However, you need to take into account that “number of days” means “number of **IDEAL** days”
  - You need to include a conversion factor between an IDEAL day and an ACTUAL day
    - An actual day won’t be eight hours of uninterrupted work due to meetings, interruptions, illness, turnover, etc.
- Ideal velocity for six people with two week iteration (10 business days): 60
- Converting to an ACTUAL day: 6 x 10 x .5 = 30; 6 x 10 x .25 = 15!

Iteration Planning (I)

- The points-based approach to release planning works well
    - It provides enough planning to make progress on the project
    - It lacks enough detail to avoid giving a false sense of accuracy
        - People will be aware that there can be errors made in the estimates and can react once new information is available to make the errors clear
- In iteration planning, you need to engage in more detail to help create accurate work plans over the days allocated to an iteration
    - An iteration planning meeting occurs “between iterations”
        - If it occurs “during” an iteration, then you need to include the time spent on it in your other estimates (perhaps by adjusting your velocity down by a point or two to account for it)

Iteration Planning (II)

- All developers and the customer/user must be present for an iteration planning meeting
    - The developers are required to help identify tasks and make estimates
    - The customer/user is required to answer questions about the stories
- The process involves
    - For each story in the iteration
        - engage in Q&A with customer/user about the story
        - convert story into tasks that need to be completed to finish the story
        - assign each task to a single developer
    - Each developer then estimates each assigned task; performs sanity check
        - if a developer is overloaded, rebalancing or more planning is needed

Tasks

- Task identification takes a story that is written in a customer perspective and transforms it into a set of steps that are written from a developer's perspective (finally!)
- "A job seeker can search for jobs" might be transformed into
    - Code basic search interface
    - Write controller to handle submissions from search interface and perform the search
        - Ensure that controller can access the database correctly
    - Write a view that will display the results
- Working on this step will require "design thinking" either to come up with an initial design for a system or to integrate this feature into the existing design

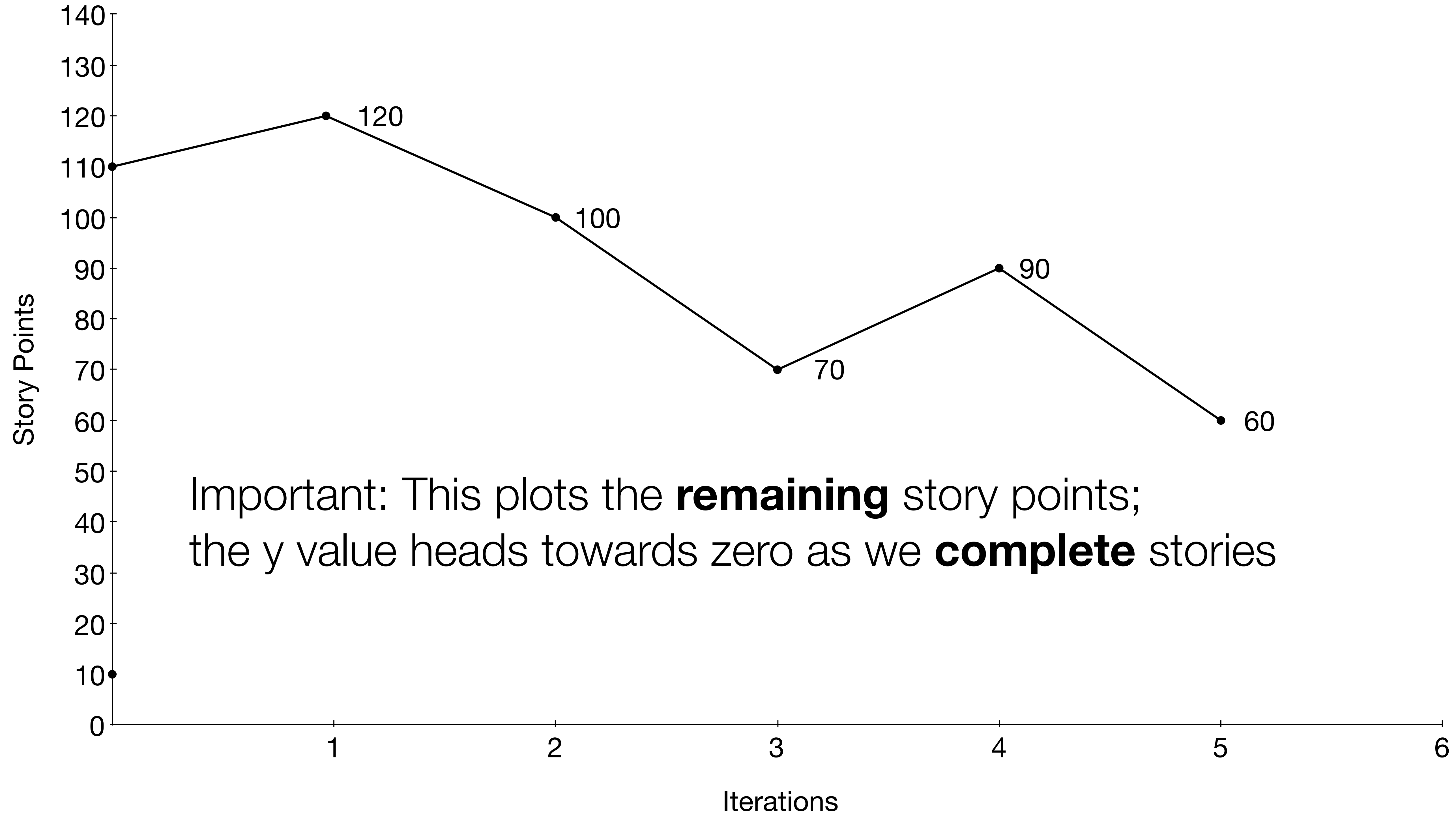
Task Estimation

- In release planning, we worked with “ideal days”
    - With task planning, we work with “ideal hours”
- Once a developer has their assigned tasks, they estimate the number of hours it will take to complete each one
    - They then add those hours up to perform a sanity check
    - They can also include a factor to transform ideal hours into actual hours
- Sanity Check
    - Compare number of hours with the length of the iteration
    - If the number of hours to complete the tasks is greater than the number of available hours, then rebalancing is needed
- A team perspective is needed to make this successful

Measuring and Monitoring Velocity

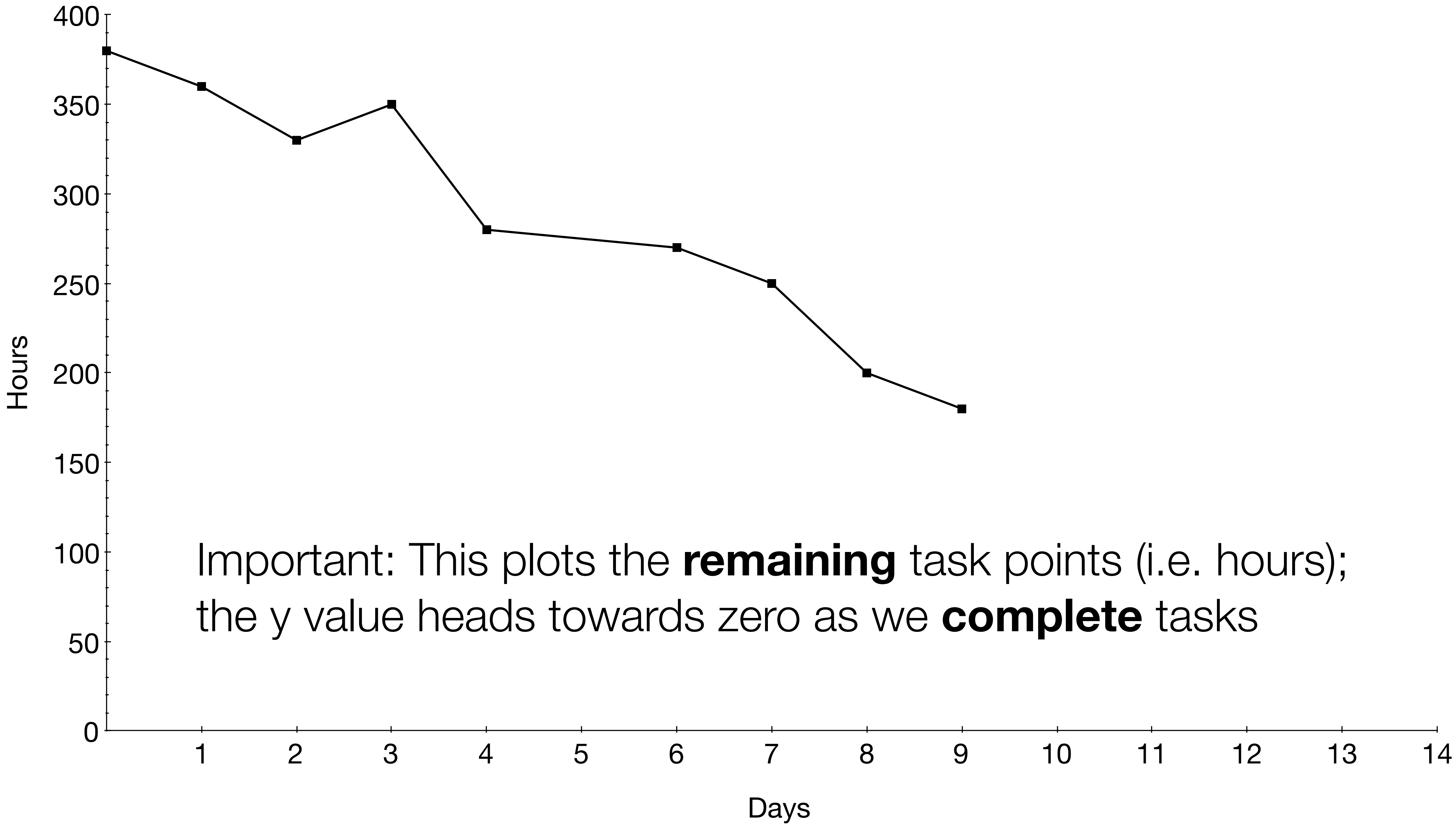
- Once points/priorities have been assigned and releases and iterations have been planned, the most important metric for an agile life cycle is velocity
    - velocity tracks how much work is completed in an iteration
        - before the iteration it is a “guess”
            - a guess that we have increased confidence in over time
        - after an iteration it is an actual metric that can be used in assessment
- How do we measure velocity?
    - The number of points associated with **completed** stories
        - Incomplete stories are not included (***velocity is an integer not a float***)
- With velocity measured, we can chart our progress in a variety of ways

Iteration Burndown Charts



Important: This plots the **remaining** story points;
the y value heads towards zero as we **complete** stories

Daily Burndown Charts



Important: This plots the **remaining** task points (i.e. hours); the y value heads towards zero as we **complete** tasks

Summary

- In executing an agile life cycle, you must
  - estimate your stories
  - plan your releases
  - plan your iterations
  - measure your progress
- We have looked at various recommendations for performing these tasks
  - using “ideal days” (stories) and “idea hours” (tasks) for estimates and then using a conversion factor to get to “actual days” and “actual hours”
  - saw example charts to measure actual progress
    - Agile life cycles are brutal; if you fall behind, you’ll know it fast
      - the good news is that you’ll deal with schedule delays quickly and hopefully before they become a problem