Intro To Process: Milestones, Estimation, Planning

17-313: Foundations of Software Engineering

https://cmu-313.github.io

Michael Hilton and Chris Timperley

Fall 2025

Smoking Section

- Last full row

HW1 Retrospective

Today's Learning Goals

- Recognize the importance of process
- Identify why software development has project characteristics
- Understand the elements of Scrum
- Create and evaluate user stories
- Use milestones for planning and progress measurement
- Understand the difficulty of measuring progress

Activity: Estimate Time

Task: iOS app of the Monopoly board game with Pittsburgh street names with online play

Developer Team: just you

Justify your estimates

Estimate in 8h days (20 work days in a month, 220 per year)

What does this mean?
What else can we do apart from coding?
Processes are **key** concerns.

Software En[illegible] Principles, practices (technical and non-technical) for confidently building high-quality software.

Software Process

“The set of activities and associated results that produce a software product”

Sommerville, SE, ed. 8

How to develop software???

Discuss the software that needs to be written

Write some code

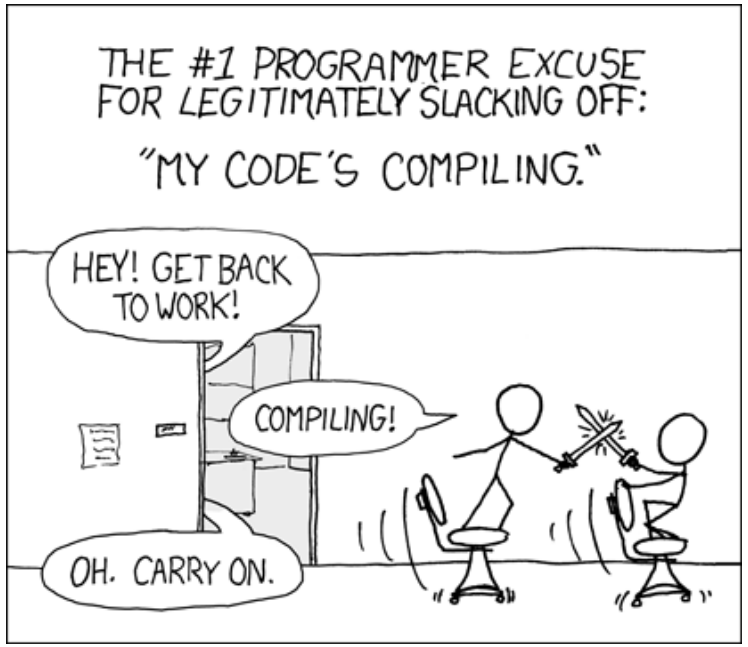
Test the code to identify the defects

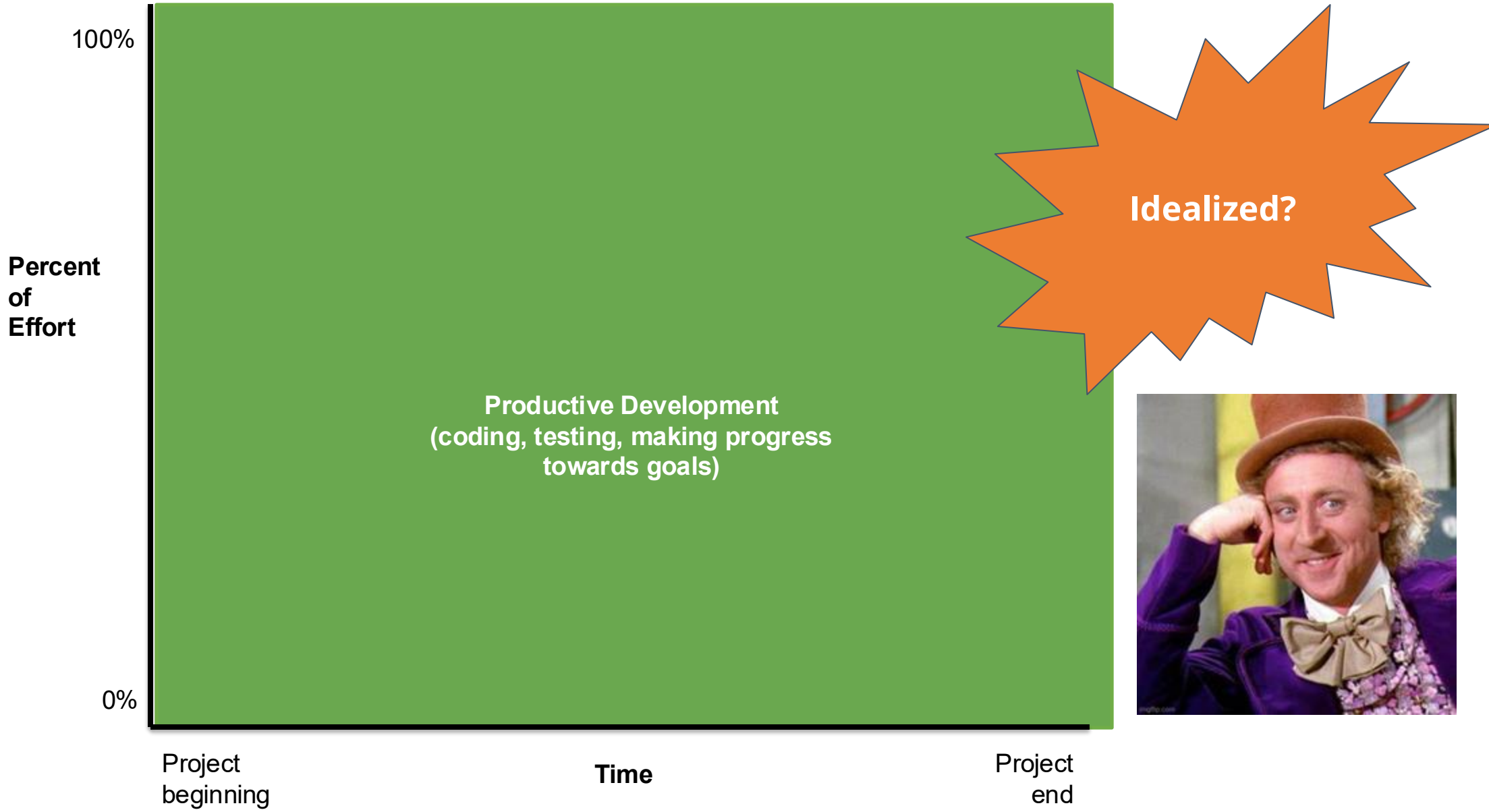
Debug to find causes of defects

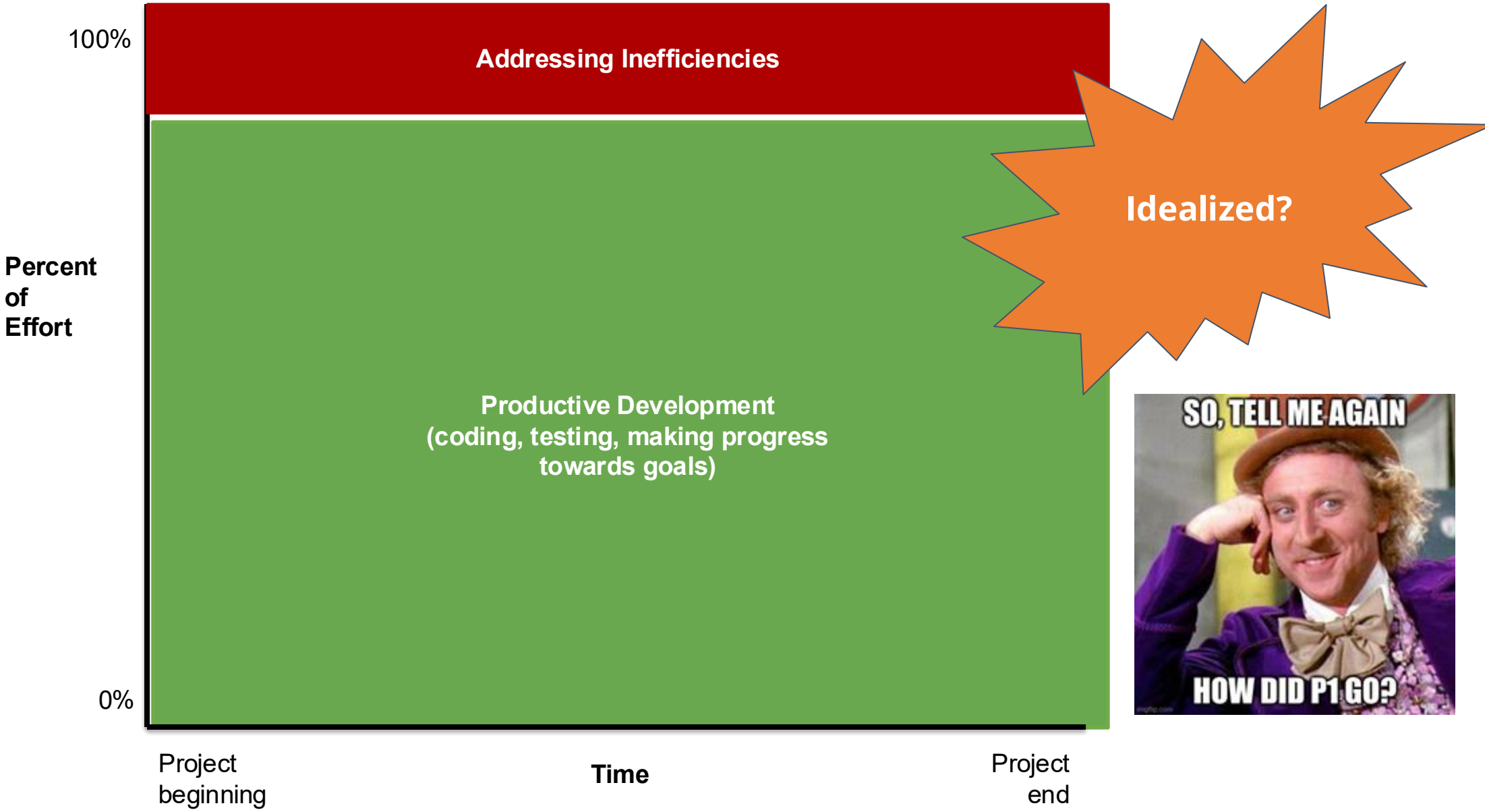
Fix the defects

What does a software engineer's day look like?

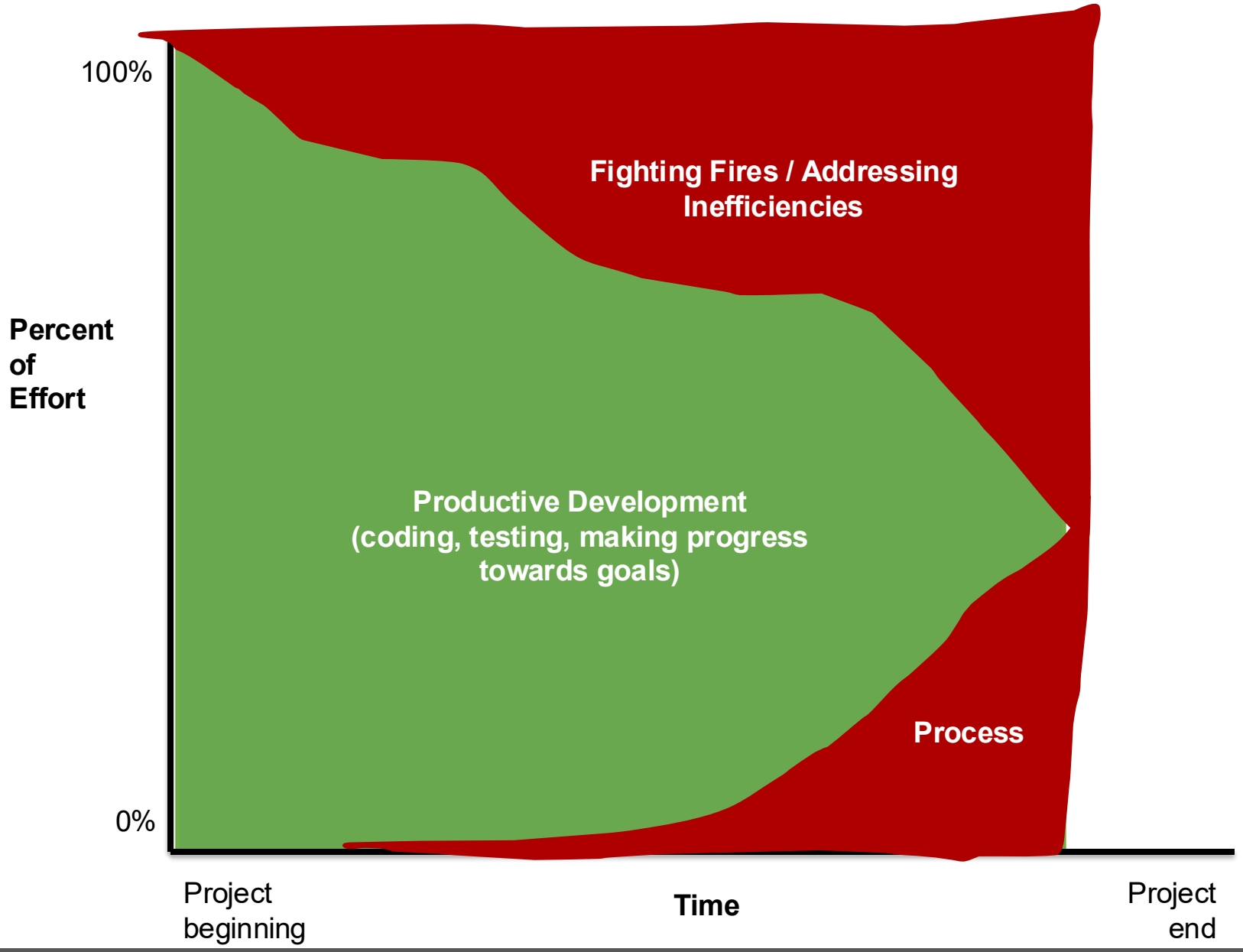
- How many hours do they spend in meetings, coding, testing, debugging, etc.?




100%
Percent of Effort
0%
Productive Development (coding, testing, making progress towards goals)
Idealized?
Project beginning
Time
Project end


100%
Addressing Inefficiencies
Idealized?
Percent of Effort
Productive Development
(coding, testing, making progress towards goals)
0%
Project beginning
Time
Project end

SO, TELL ME AGAIN
HOW DID P1 GO?

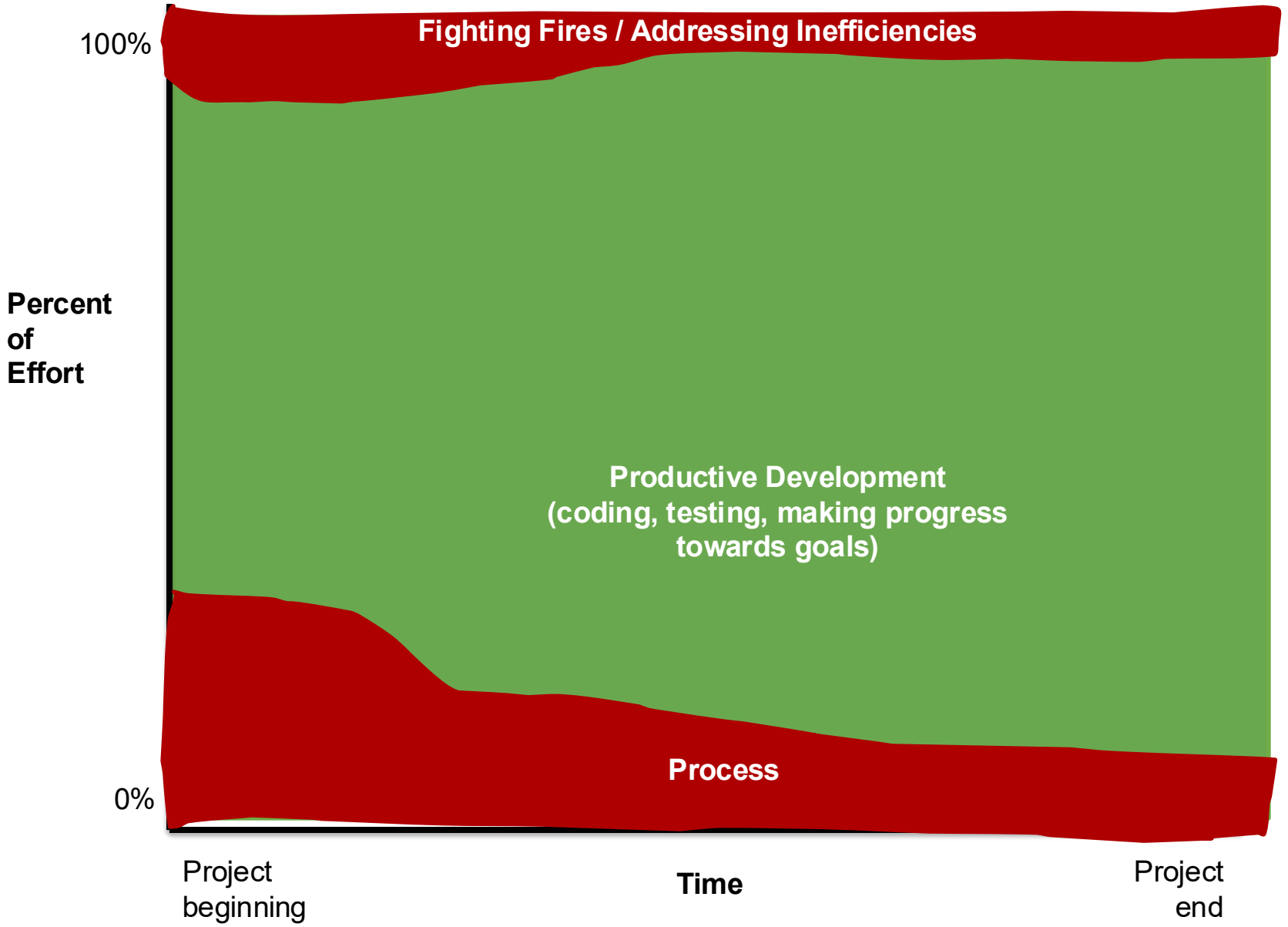

100%
Percent of Effort
0%
Fighting Fires / Addressing Inefficiencies
Productive Development (coding, testing, making progress towards goals)
Process
Project beginning
Time
Project end

Let’s improve the reliability of this process

- Writing down all requirements
  - Review requirements
  - Require approval for all changes to requirements
- Use version control for all changes
  - Code Reviews
- Track all work items
  - Break down development into smaller tasks
  - Write down and monitor all reported bugs
  - Hold regular, frequent status meetings
- Plan and conduct quality assurance
- Employ a DevOps framework to push code between developers and operations

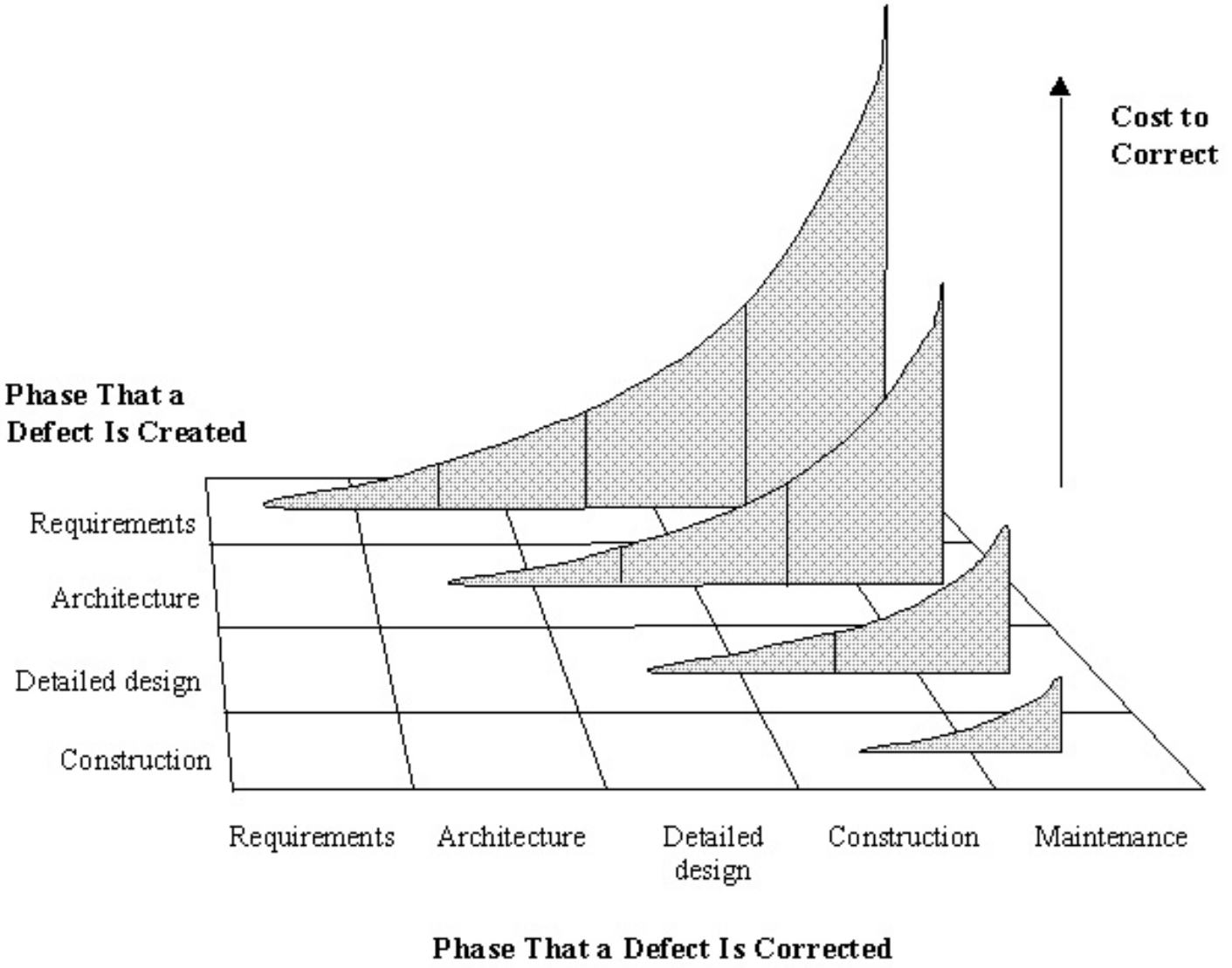

100%
Addressing Inefficiencies
Productive Development
(coding, testing, making progress
towards goals)
Process: Cost and Time estimates, Writing Requirements, Design,
Change Management, Quality Assurance Plan, Version Control,
Development and Integration Plan, Status Meetings
0%
Percent
of
Effort
Project
beginning
Time
Project
end


Negative
View of
Process
ACCEPT JOB AS SENIOR ENGINEER
8 HOURS OF MEETINGS A DAY
Posted in r/ProgrammerHumor
reddit

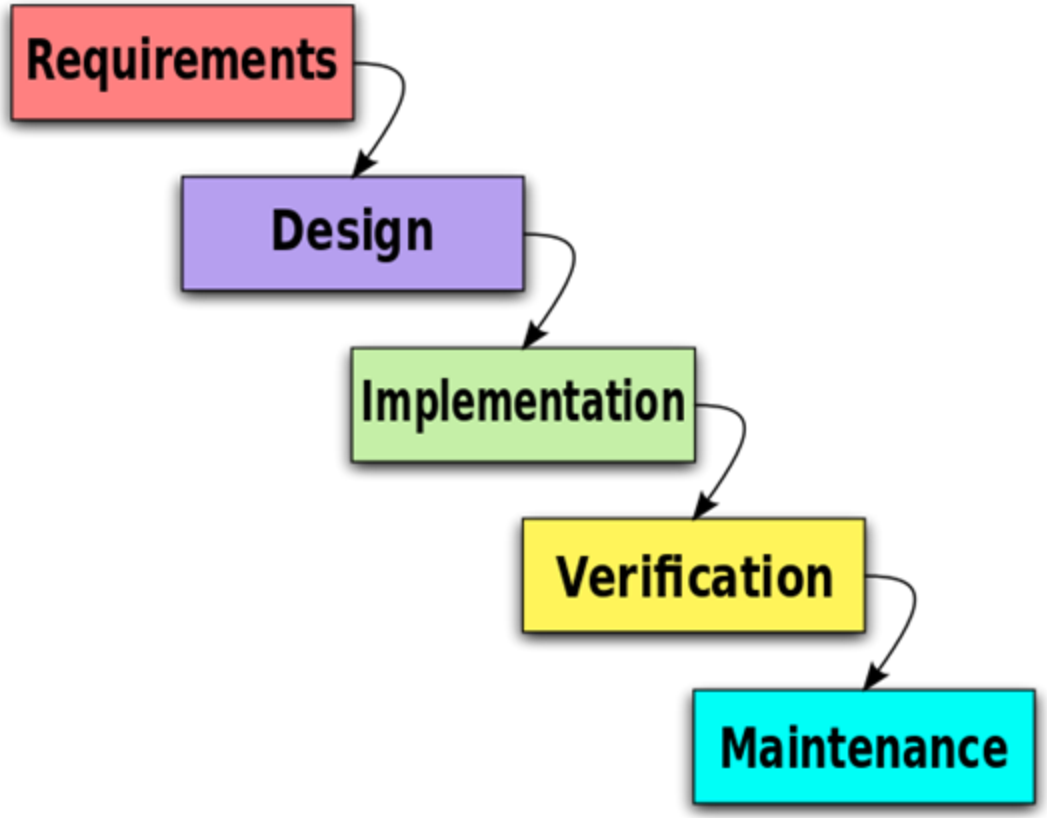


Hypothesis: Process increases flexibility and efficiency

Ideal Curve: Upfront investment for later greater returns

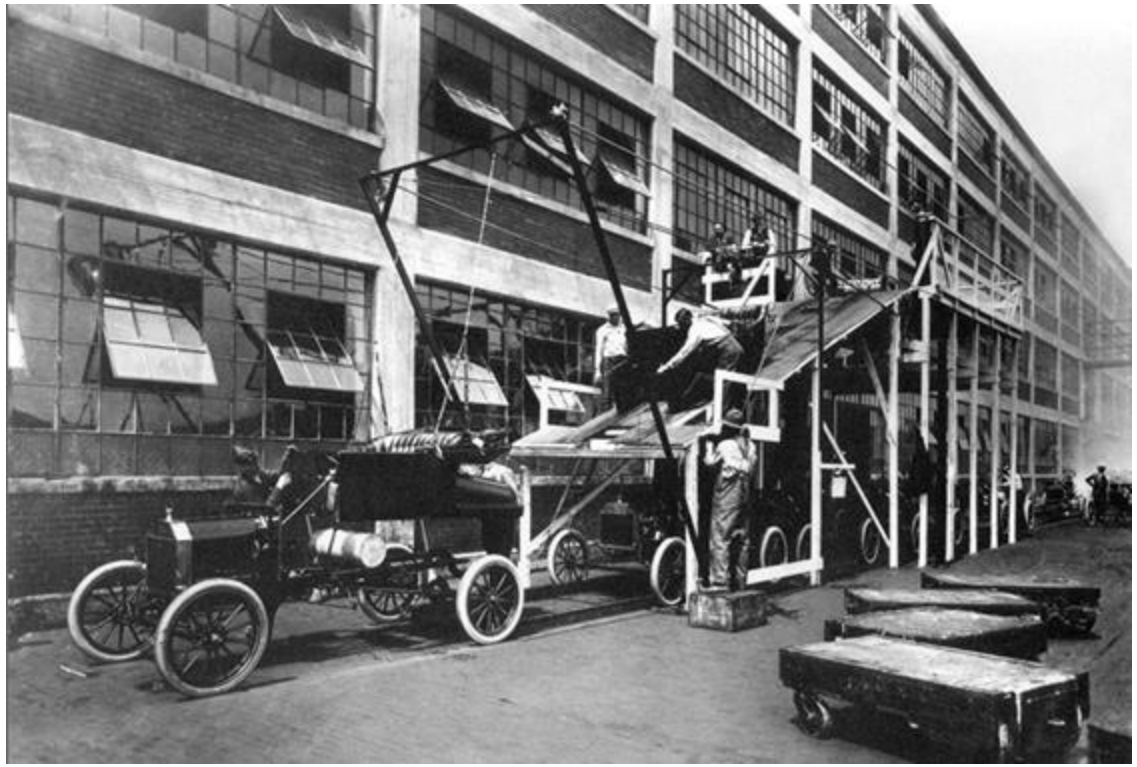


Waterfall model was the original software process

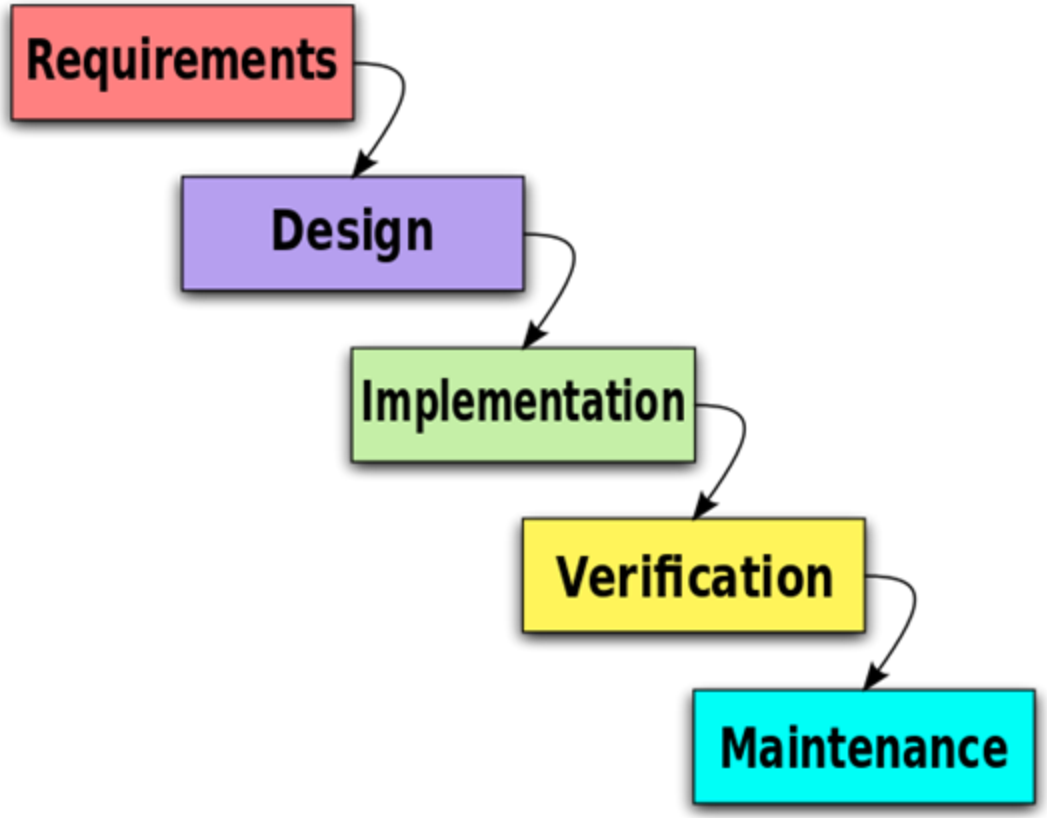


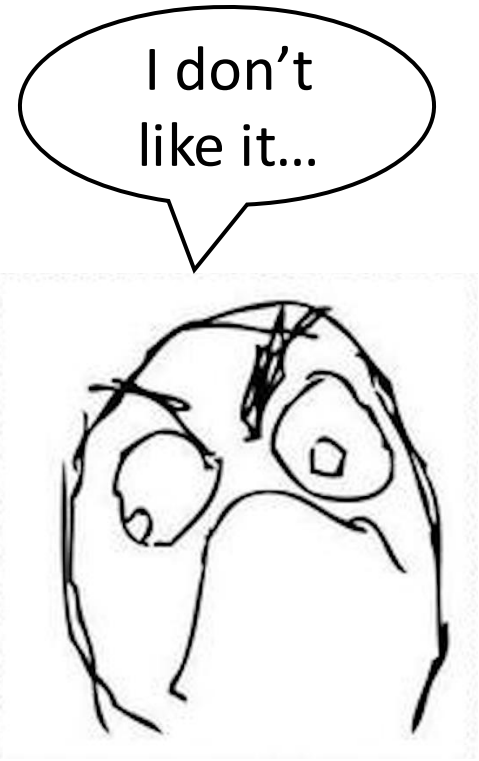
Waterfall diagram CC-BY 3.0 **Paulsmith99** at **en.wikipedia**

… akin to processes pioneered in mass manufacturing (e.g., by Ford)



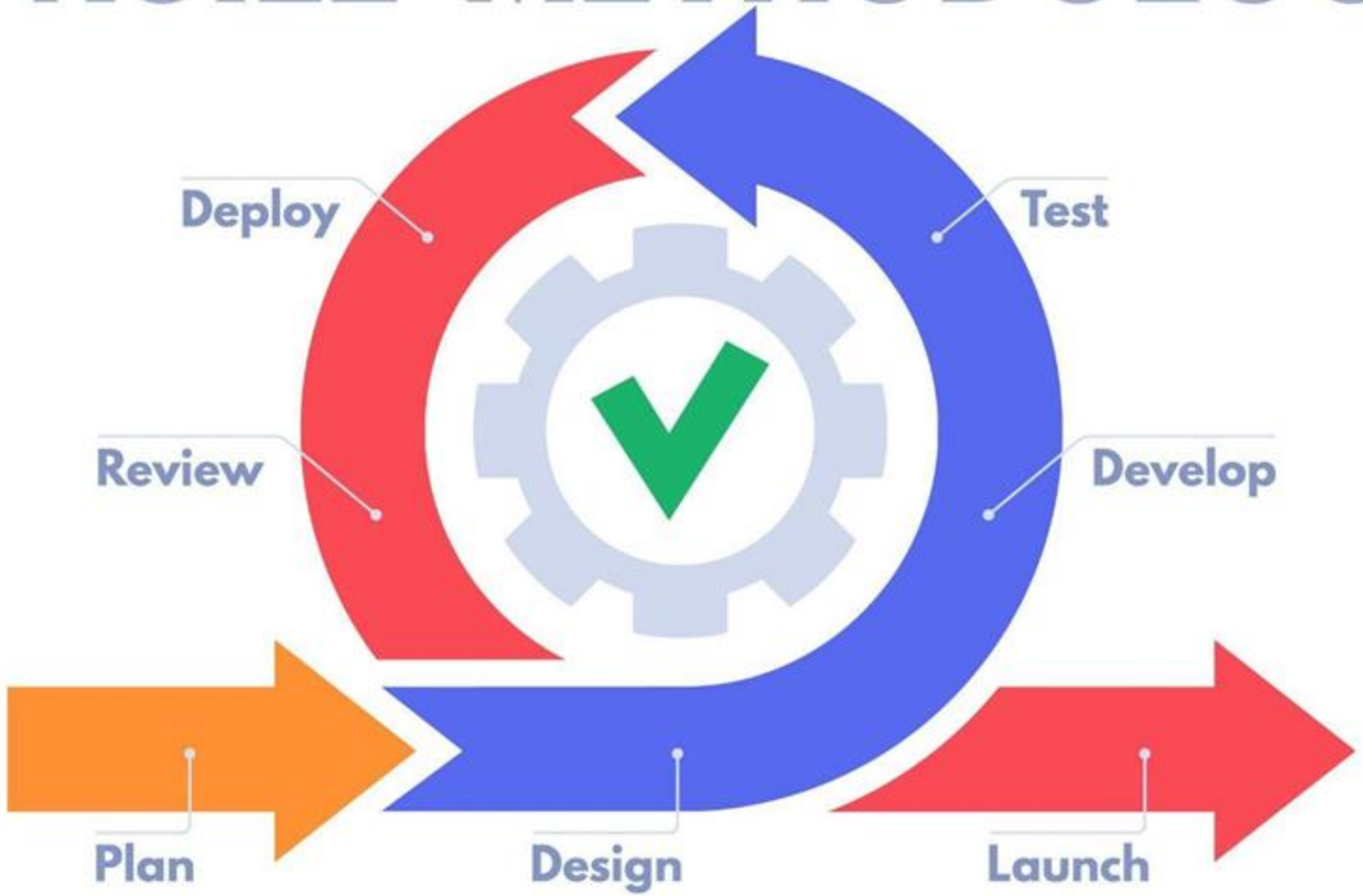
What could go wrong?





Waterfall diagram CC-BY 3.0 **Paulsmith99** at **en.wikipedia**

AGILE METHODOLOGY



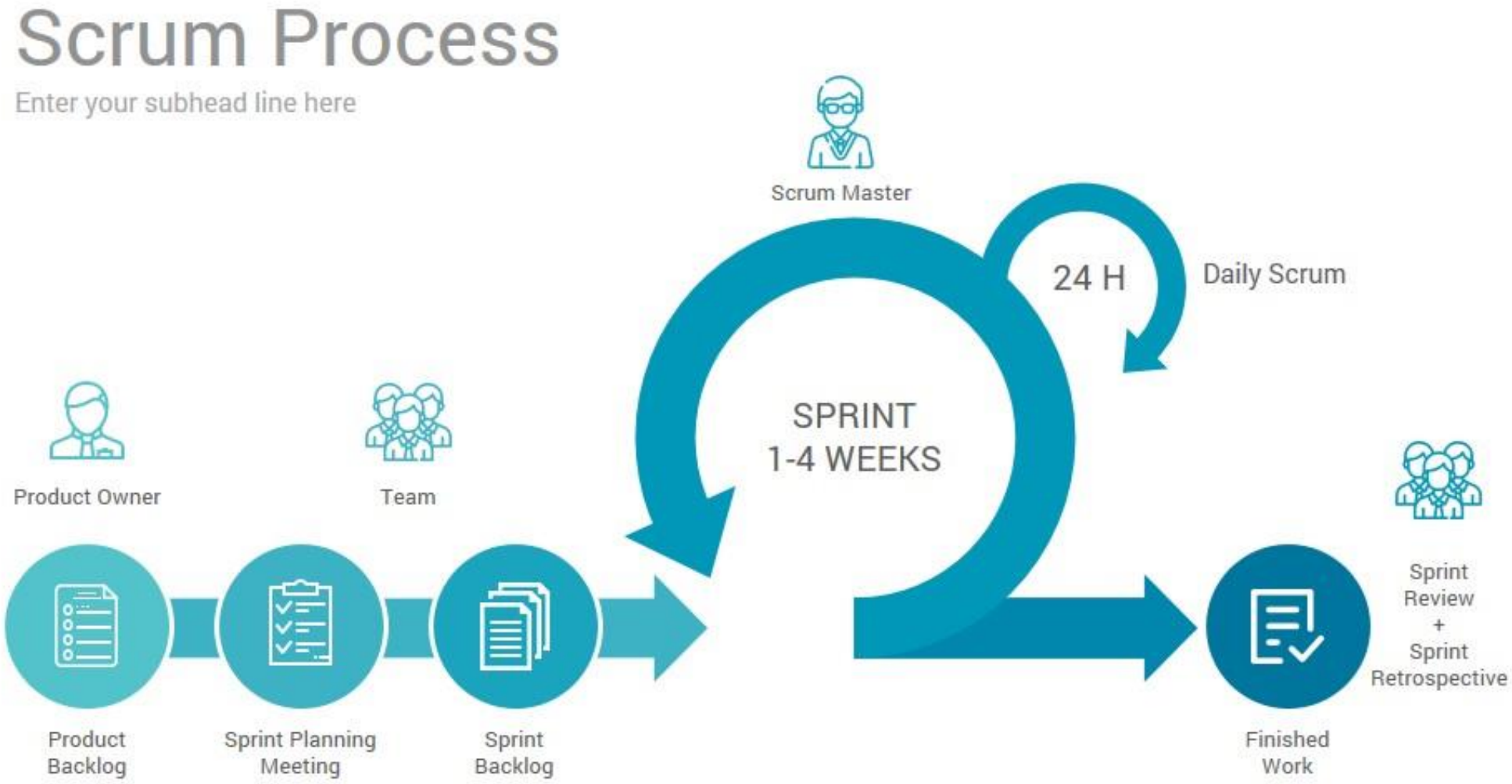
Agile manifesto

- Twelve high-level principles
- e.g., *“Working software is the primary measure of progress”*

Scrum

(Only a brief intro)

Elements of Scrum



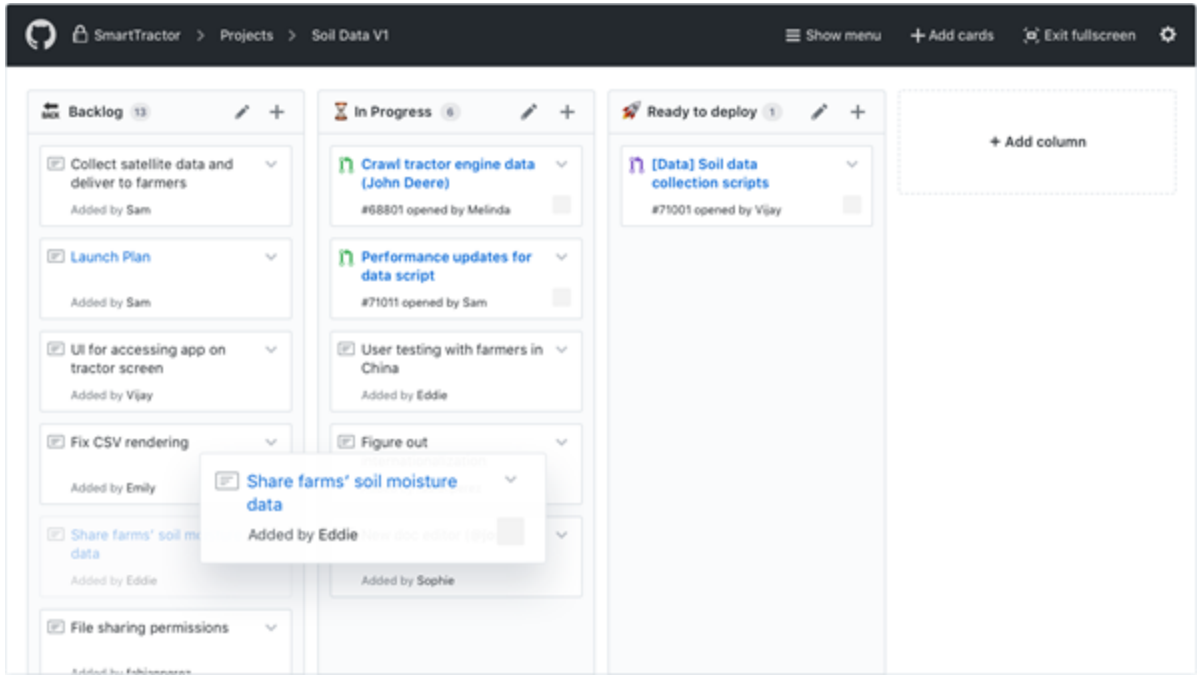
Backlogs

The **product backlog** is all the features for the product
The **sprint backlog** is all the features that will be worked on for that sprint. These should be broken down into discrete tasks:

- Fine-grained
- Estimated
- Assigned to individual team members
- Acceptance criteria should be defined

User Stories are often used

Kanban boards



Scrum Meetings

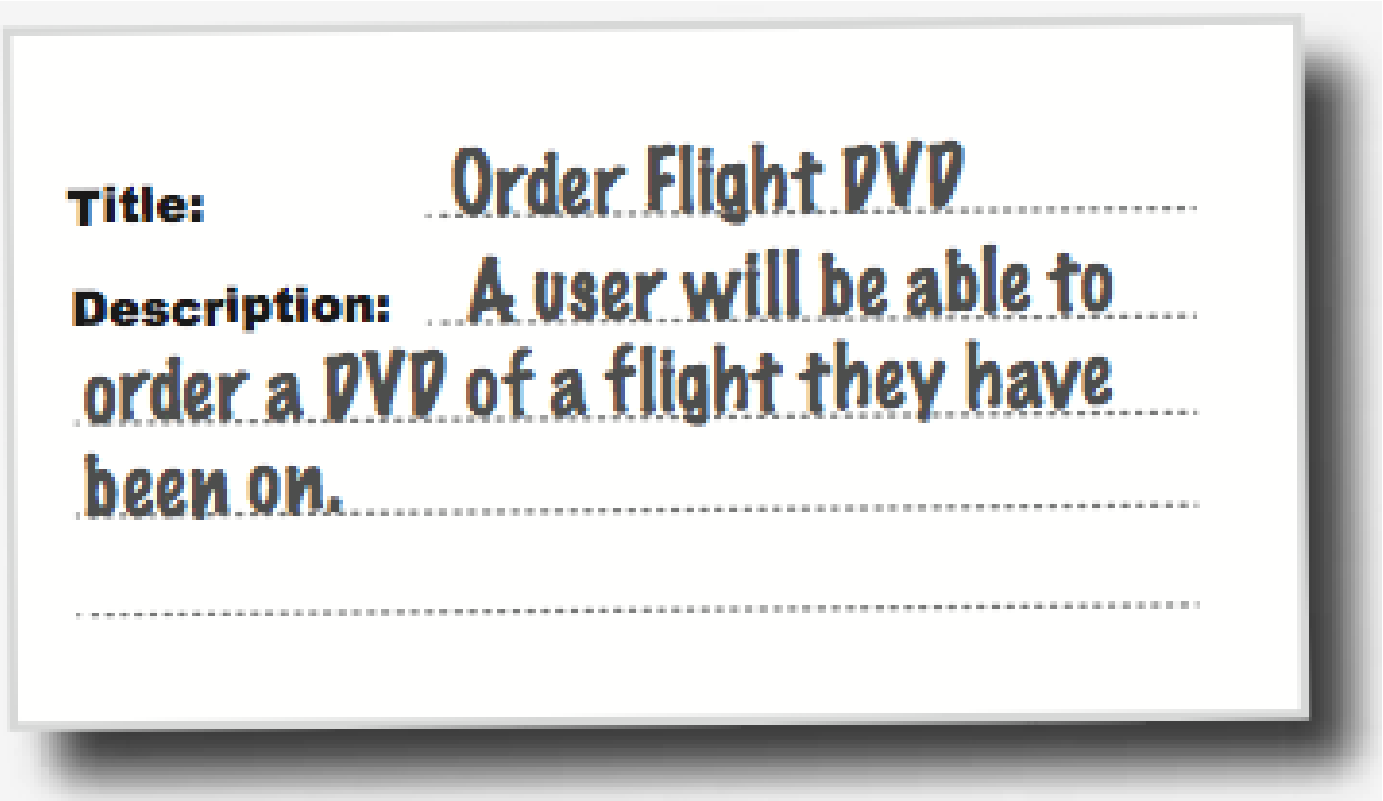
- Sprint Planning Meeting
  - Entire Team decides together what to tackle for that sprint
- Daily Scrum Meeting
  - Quick Meeting to touch base on :
    - What have I done? What am I doing next? What am I stuck on/need help?
- Sprint Retrospective
  - Review sprint process
- Sprint Review Meeting
  - Review Product

Standups

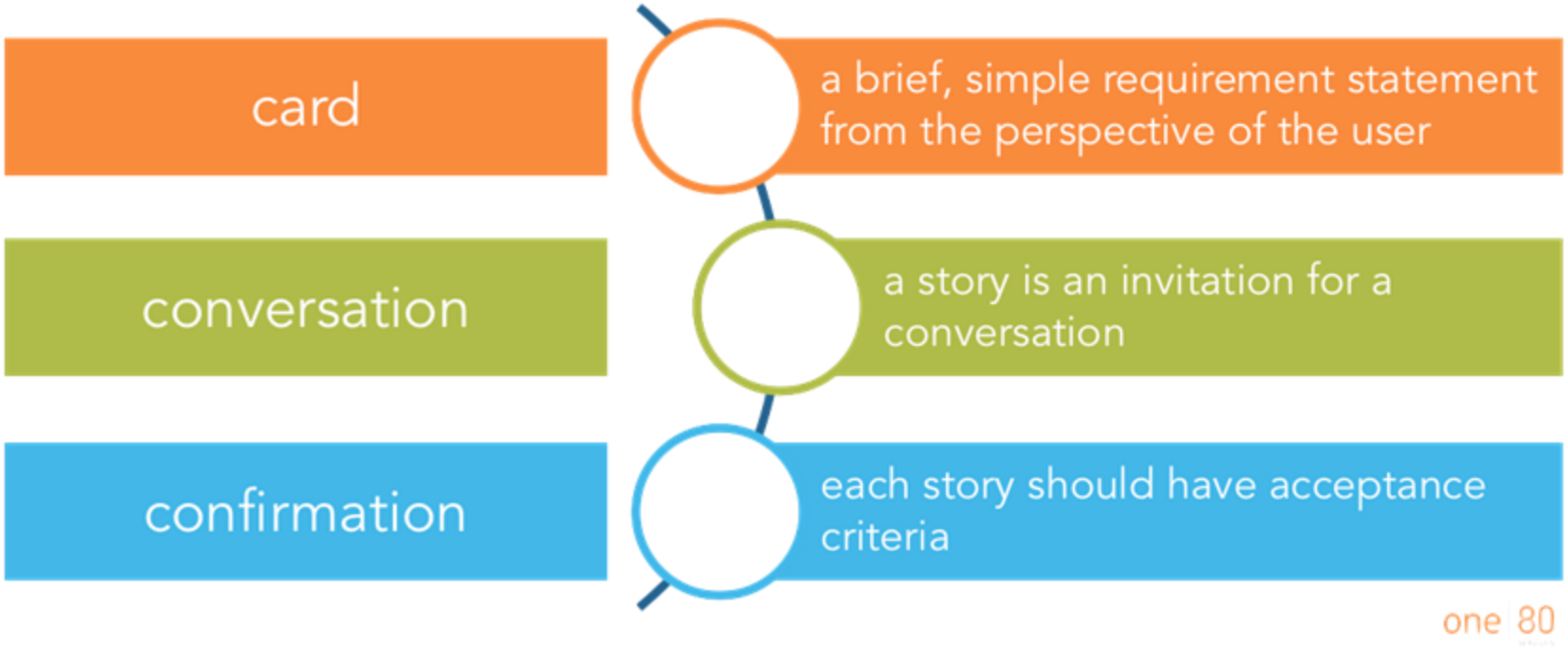
User stories

- Plan using units of customer-visible functionality

Example


Title:
Order Flight DVD
Description:
A user will be able to order a DVD of a flight they have been on.

User Stories



User story cards (3”x5”)

“As a [role], I want [function], so that [value]”

Conversation

- Developers, product managers, etc.
- Is it clear to everyone?
- What must a developer do to implement this user story?

Confirmation

- How can we tell that the user story has been achieved?
- It’s easy to tell when the developer finished the code.
- But, how do you tell that the customer is happy?

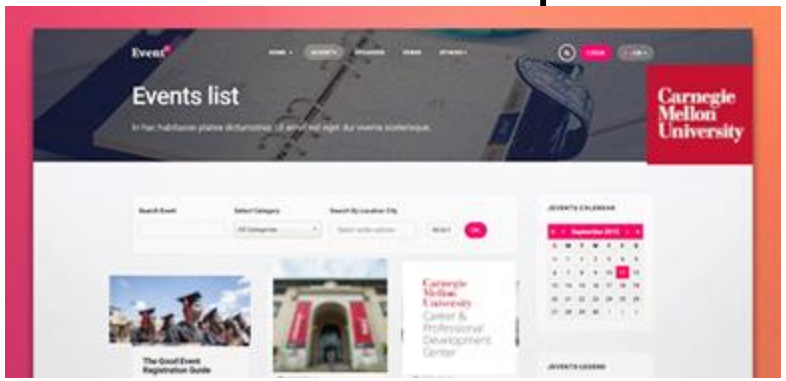
How to evaluate user story?

Source: http://one80services.com/user-stories/writing-good-user-stories-hint-its-not-about-writing/

one 80

Example

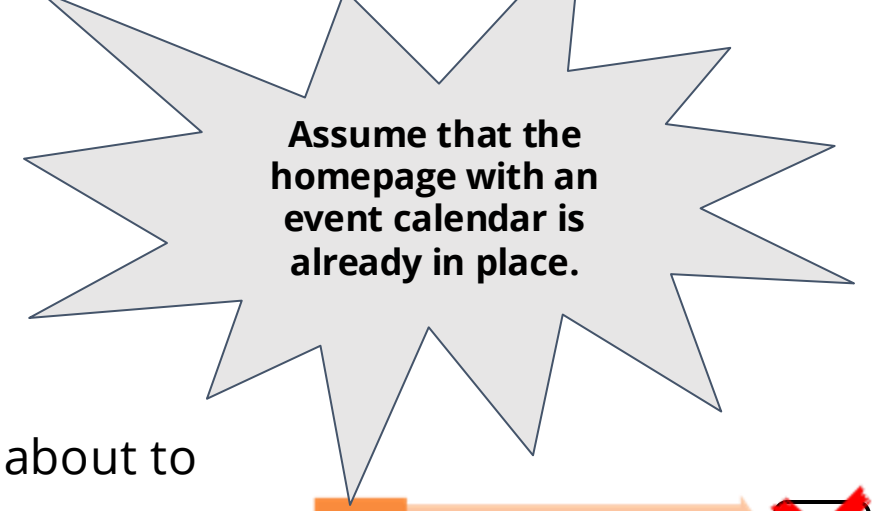
The university is looking to enhance student and staff engagement by creating an online platform where all university-related events are easily accessible. The goal is to provide a user-friendly website that serves as a central hub for information on various activities, ranging from academic seminars to sports events and club meetings.



Independent

- Schedule in any order.
- Not always possible

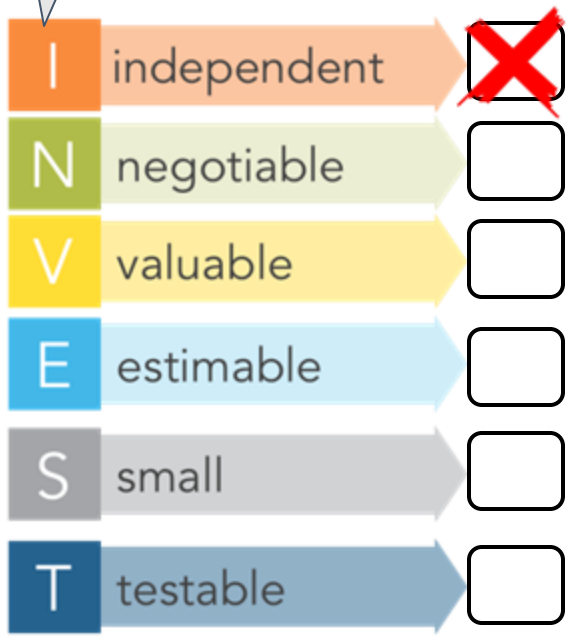
Counterexample



As a student, **I want to** receive notifications for events that are about to start, for those I have shown interest in, **so I** don't miss them.

Acceptance Criteria:

- An option is provided to 'Set a Reminder' for each event.
- Notifications are sent to users who have opted for reminders, shortly before the event starts.



Negotiable

- Details to be negotiated during development
- Good Story captures the essence, not the details

Counterexample

As a student, **I want to** view the upcoming events at the university, **so I** can decide which ones to attend.

Acceptance Criteria:

- Add an interactive grid layout of upcoming events at the top of the homepage.
- Each event card in the grid is visible for a 2 seconds before automatically rotating to display the next set of events.
- Each card in the grid includes the event's name, type (e.g., seminar, sports game), duration, a brief description, and scheduled times.
- This grid of events is displayed under a prominent H1 heading that reads “Discover What’s Happening on Campus!”

Valuable

- This story needs to have value to someone (hopefully the customer)
- Easy to forget *why* you are doing what you are doing

Counterexample

As the Events Coordinator, **I want** a database to store details of students and staff interested in university events.

Acceptance Criteria:

- A database is constructed to manage user information.
- The database stores details such as name, email, phone number, favorite event types, date of birth, and history of event attendance or registrations.

Estimable

- Helps keep the size small
- It should provide enough details to estimate the amount of effort needed
- More on estimates later…

Counterexample

As an undergraduate student, **I want to** be able to filter university events, **so I** can choose the ones that align with my interests.

Acceptance Criteria:

- Filters are added to the event listings on the website.

Small

- Fit on 3x5 card
- At most two person-weeks of work (one sprint)
- Too big == unable to estimate

Counterexample

As a student, **I want to** easily find information about upcoming events, **so I** can participate in activities that interest me.

Acceptance criteria:

- A homepage is created displaying the university's name, motto, location, email, and contact information.
- The homepage features a calendar of upcoming university events.
- The event calendar includes details such as the event title, type (e.g., seminar, sports game, club meeting), a brief description, location, date, and time.
- Users can filter the event list by event type, date, and hosting department or club.
- The admin can update the event calendar as new events are planned or existing events are modified.

Testable

- Ensures understanding of task
- We know when we can mark task “Done”
- Unable to test == do not understand

Counterexample

As a student, **I want to** easily view promotional videos or trailers of university events, **so I** can decide which events to attend.

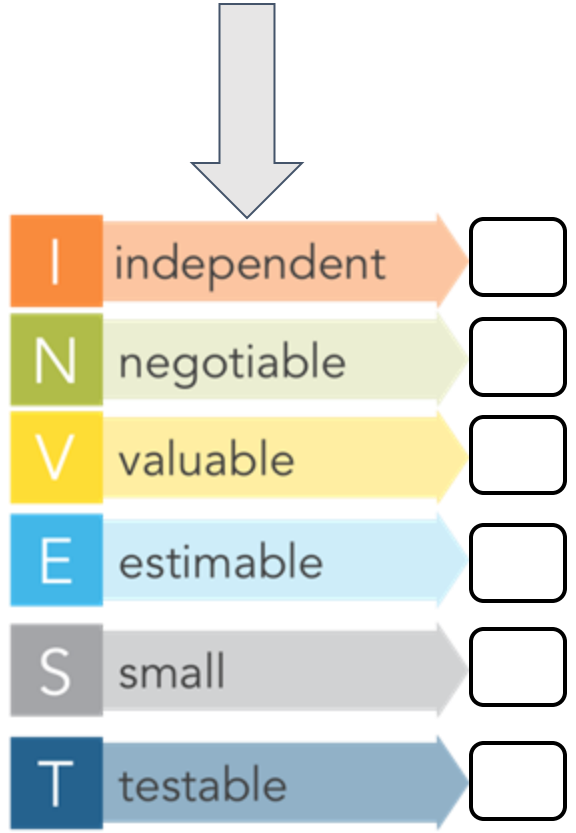
Acceptance Criteria:

- Promotional videos can be embedded on each event detail page.
- Videos are of high quality.
- The embedded video is well-integrated into the page design.
- The video size is large enough to ensure clarity.
- The video controls are user-friendly.

Activity: Evaluate using INVEST

User Story #1

Select the most serious flaw



As the Events Coordinator, **I want** the website to seamlessly integrate with various academic calendars and departmental schedules, **so that** event information is always synchronized and accurate.

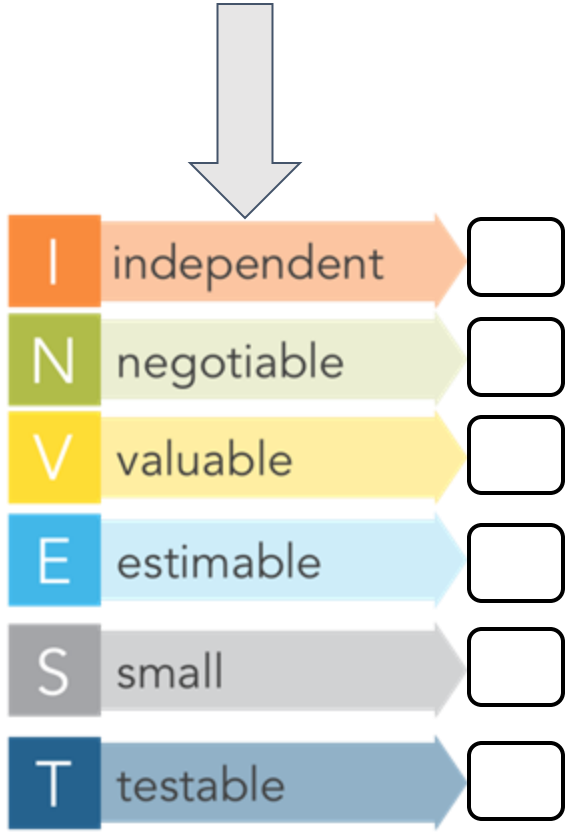
Acceptance Criteria:

- The website integrates with different academic and departmental calendars.
- Event information on the website reflects real-time updates from these calendars.

How can you fix it?

User Story #2

Select the most serious flaw



As a student, **I want** the website to have an intuitive navigation system **so that** I can find events effortlessly.

Acceptance Criteria:

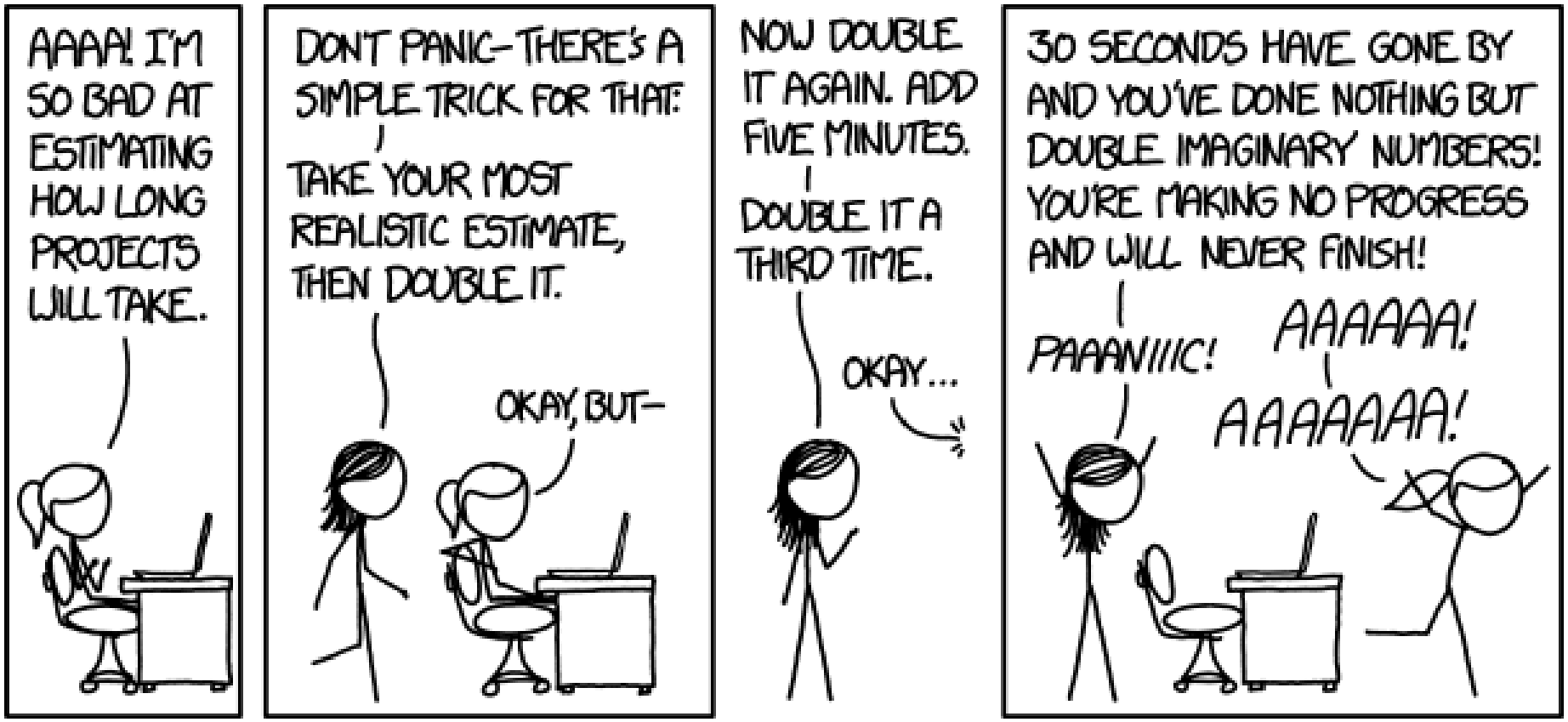
- The website's navigation is intuitive to users.
- Users can find events with minimal effort.
- The navigation system feels natural and easy to understand.

How can you fix it?

“Plans are nothing, planning is everything”

-Dwight D. Eisenhower

Time estimation



https://xkcd.com/1658/

Time estimation

https://xkcd.com/612

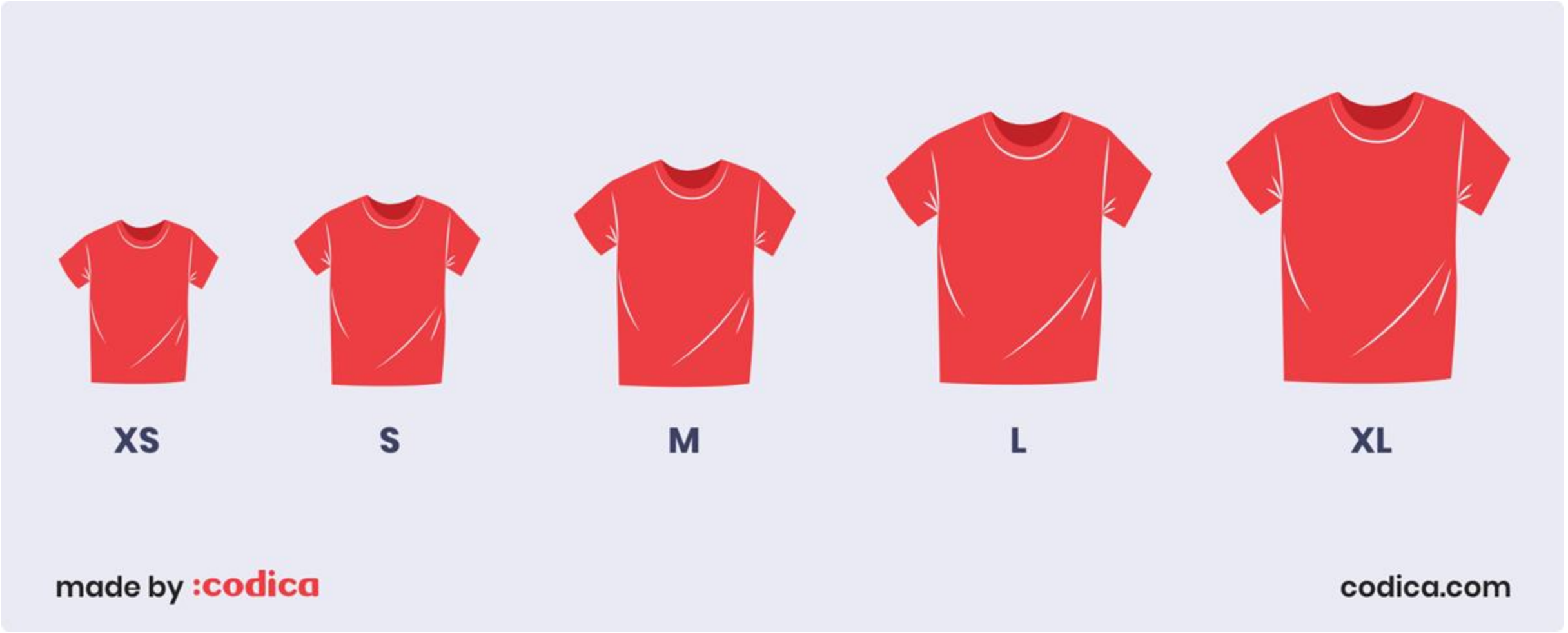
Activity: Estimate Time, part 2

Review your estimates

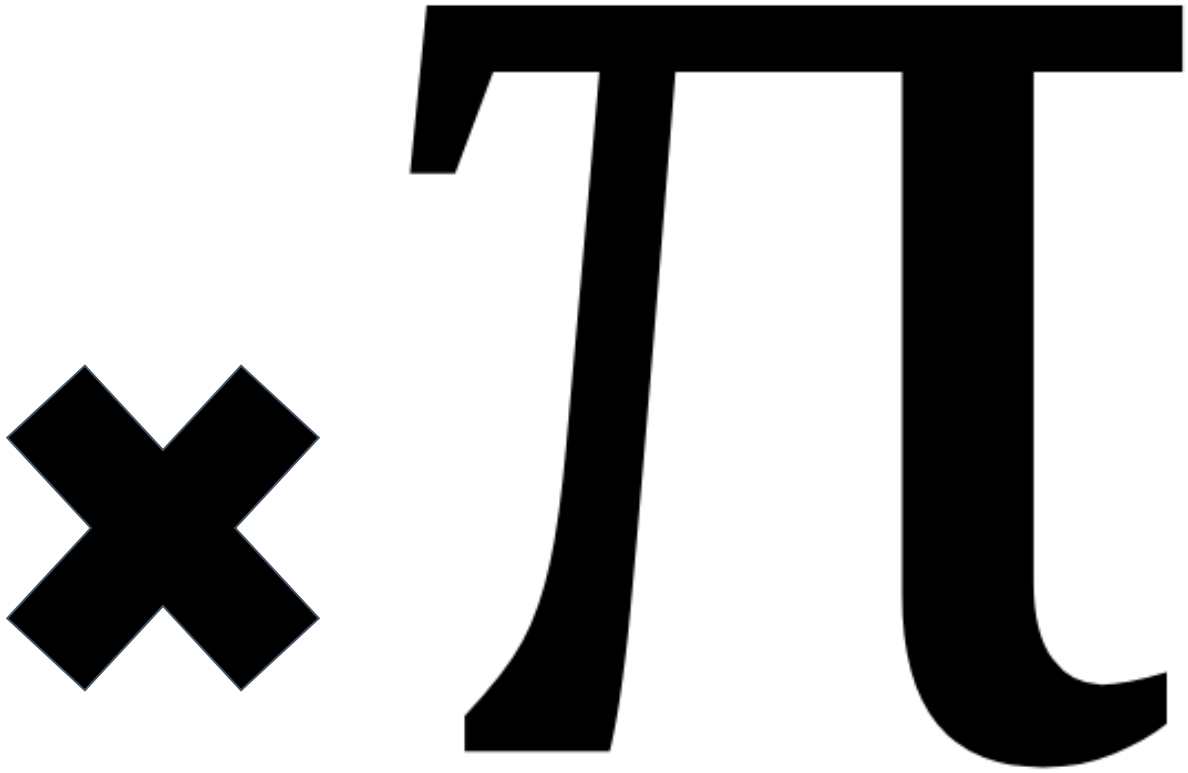
- Still think they are accurate?
- Any changes?
- Get feedback from 2 other people

Improving Time Estimates

- Prevent conformity bias
- Do you have a comparable experience to base an estimate on?
- How much design do you need for each task?
- Break down the task into smaller tasks and estimate them.

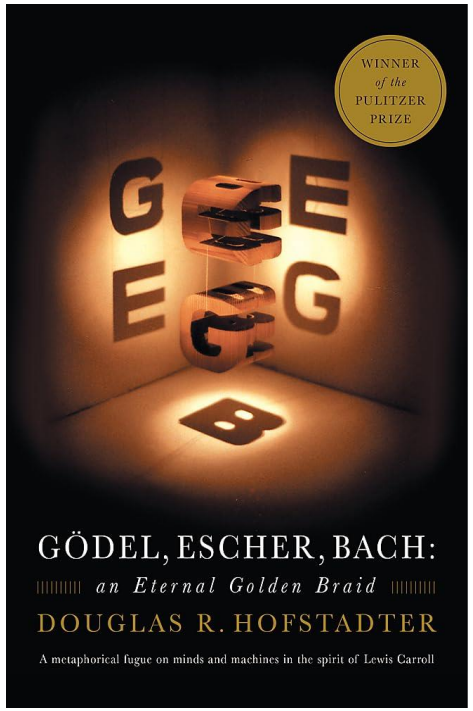

XS
S
M
L
XL
made by :codica
codica.com


1
2
3
5
8
13
21

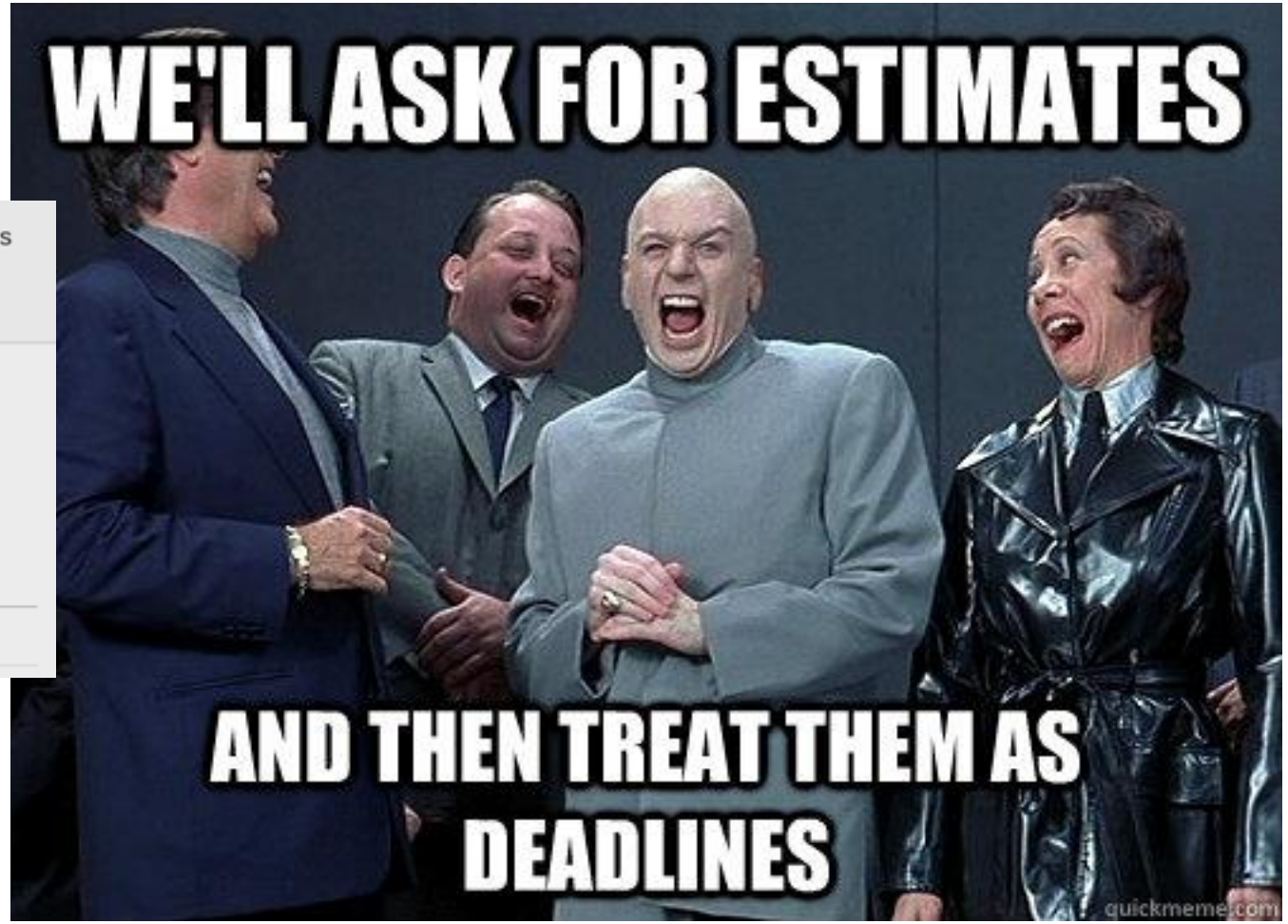


Hofstadter's Law

"It always takes longer than you expect, even when you take into account Hofstadter's Law"



Is Estimation Evil?



Ron Jeffries's essay [Estimation is Evil]

Milestones and deliverables make progress *observable*

Milestone: clear end point of a (sub)tasks

- For project manager
- Reports, prototypes, completed subprojects
- "80% done" is not a suitable milestone

Deliverable: Result for customer

- Similar to milestones, but for customers
- Reports, prototypes, completed subsystems

What you need to know

- Recognize the importance of having a software process
- Main ideas of Agile/Scrum
- Understand backlogs and user stories
- Understand the difficulty of estimating tasks and progress
- We use milestones for planning and progress measurement