

# Intro To Process: Milestones, Estimation, Planning

17-313: Foundations of Software Engineering

<https://cmu-313.github.io>

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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.

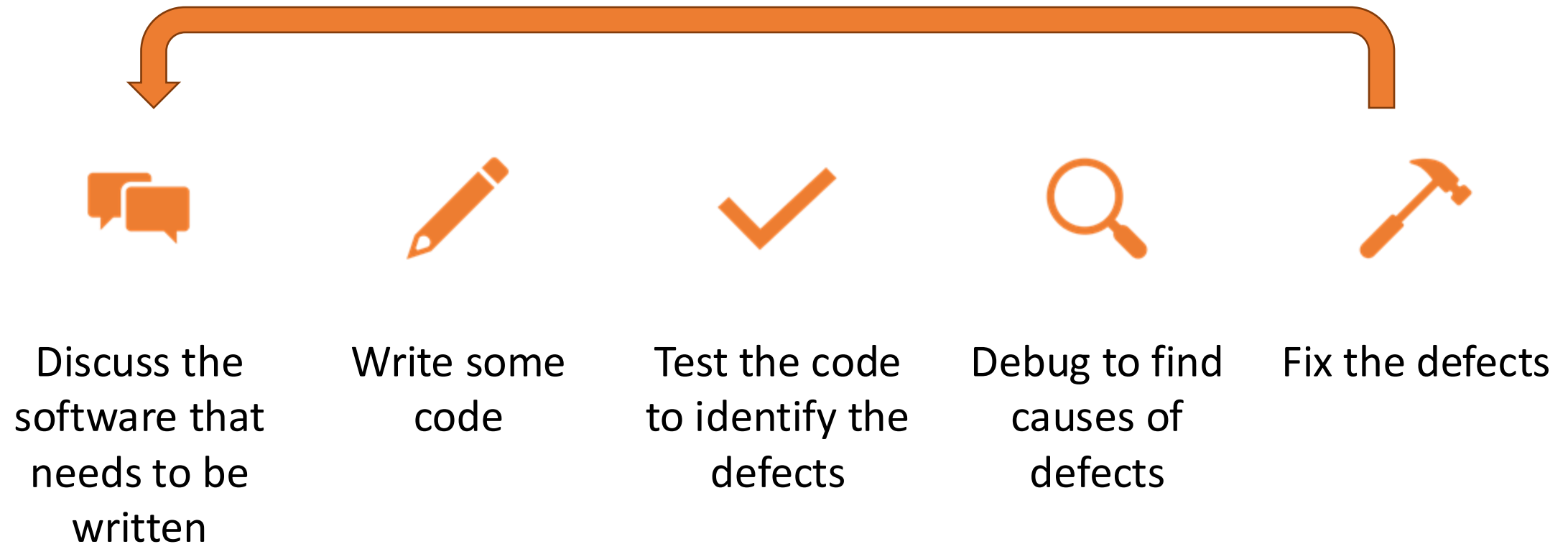
**Software Engineering Principles,  
practices (technical and non-  
technical) for confidently building  
high-quality software.**

# Software Process

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

Sommerville, SE, ed. 8

# How to develop software???

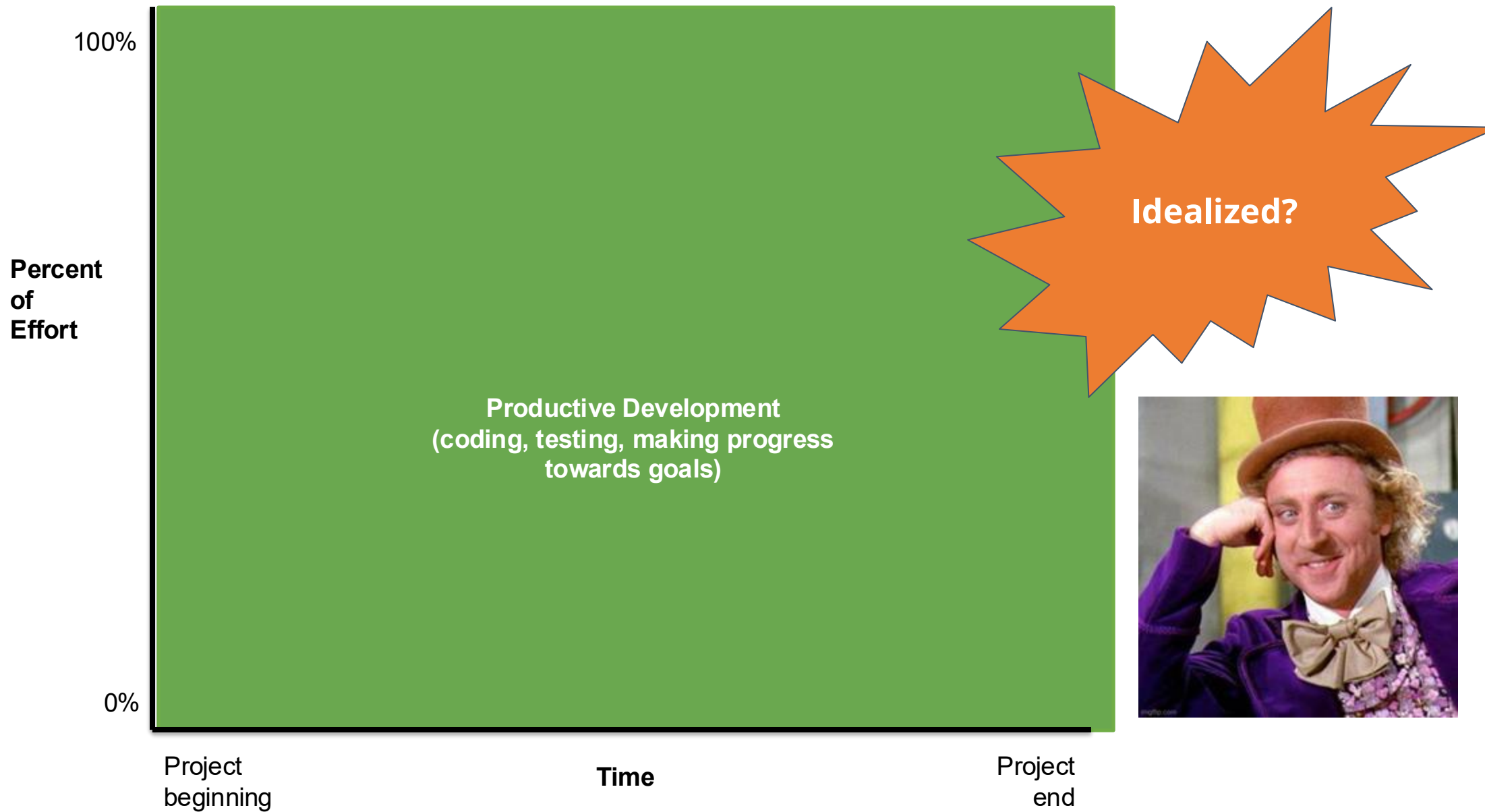


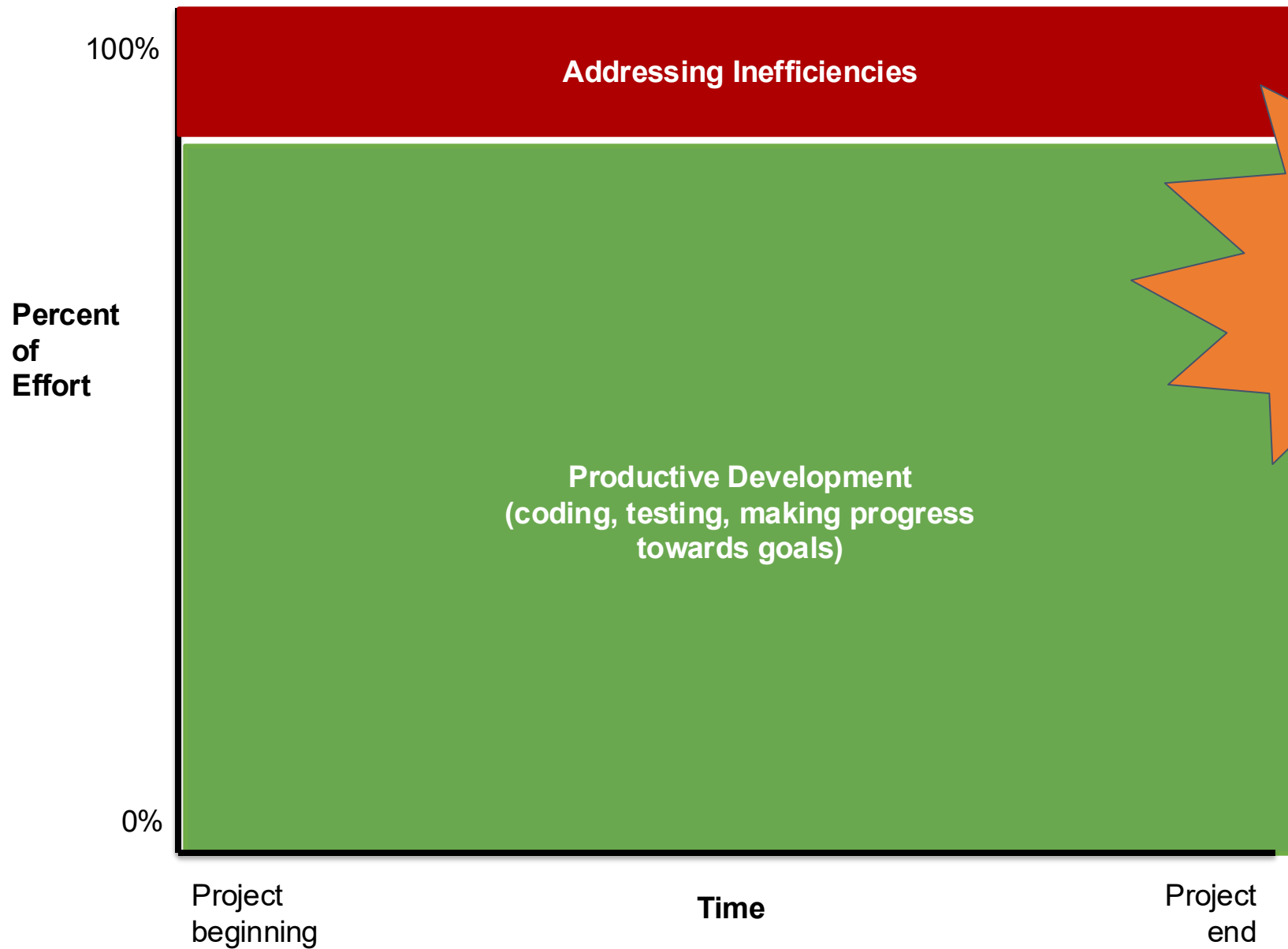


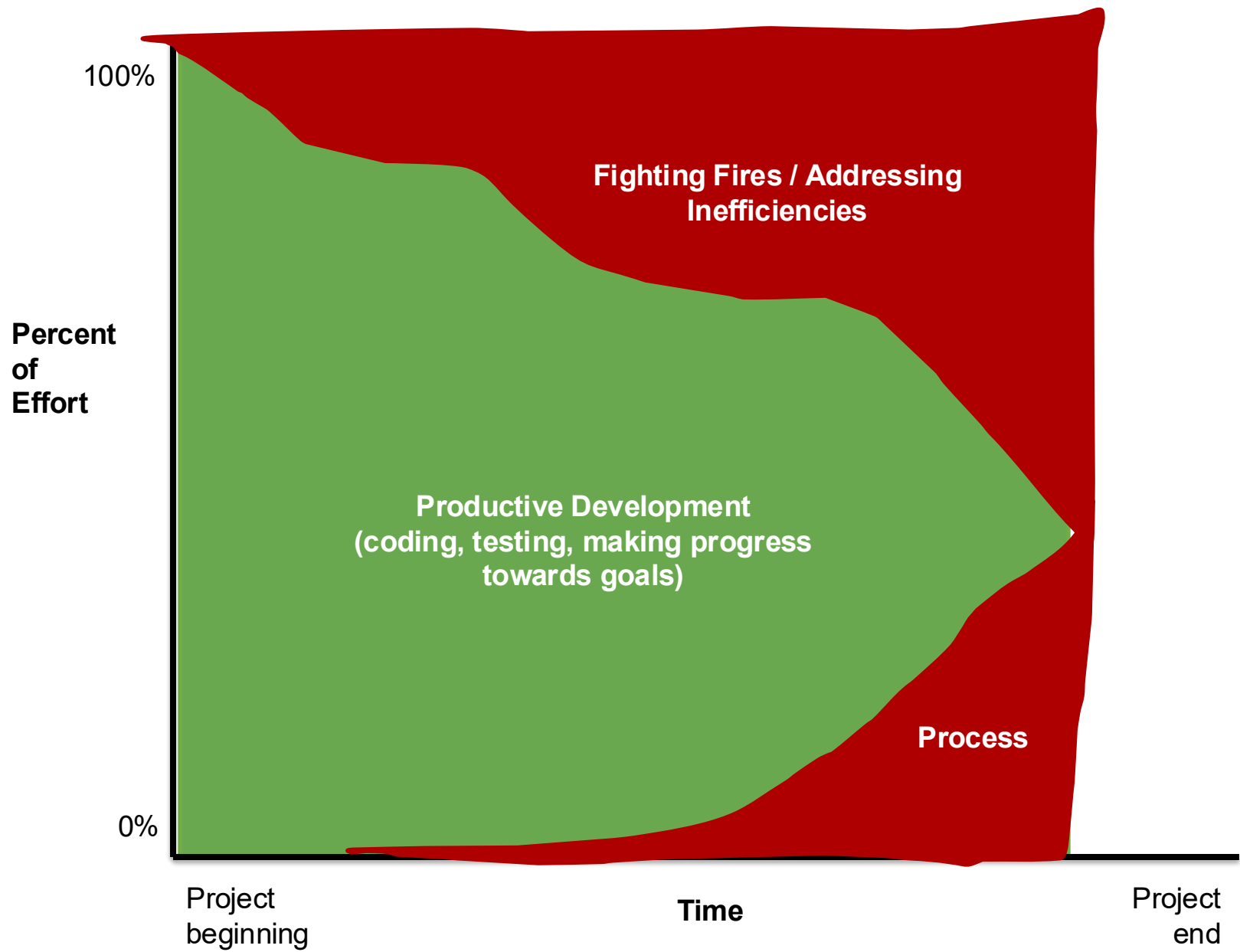
# What does a software engineer's day look like?

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



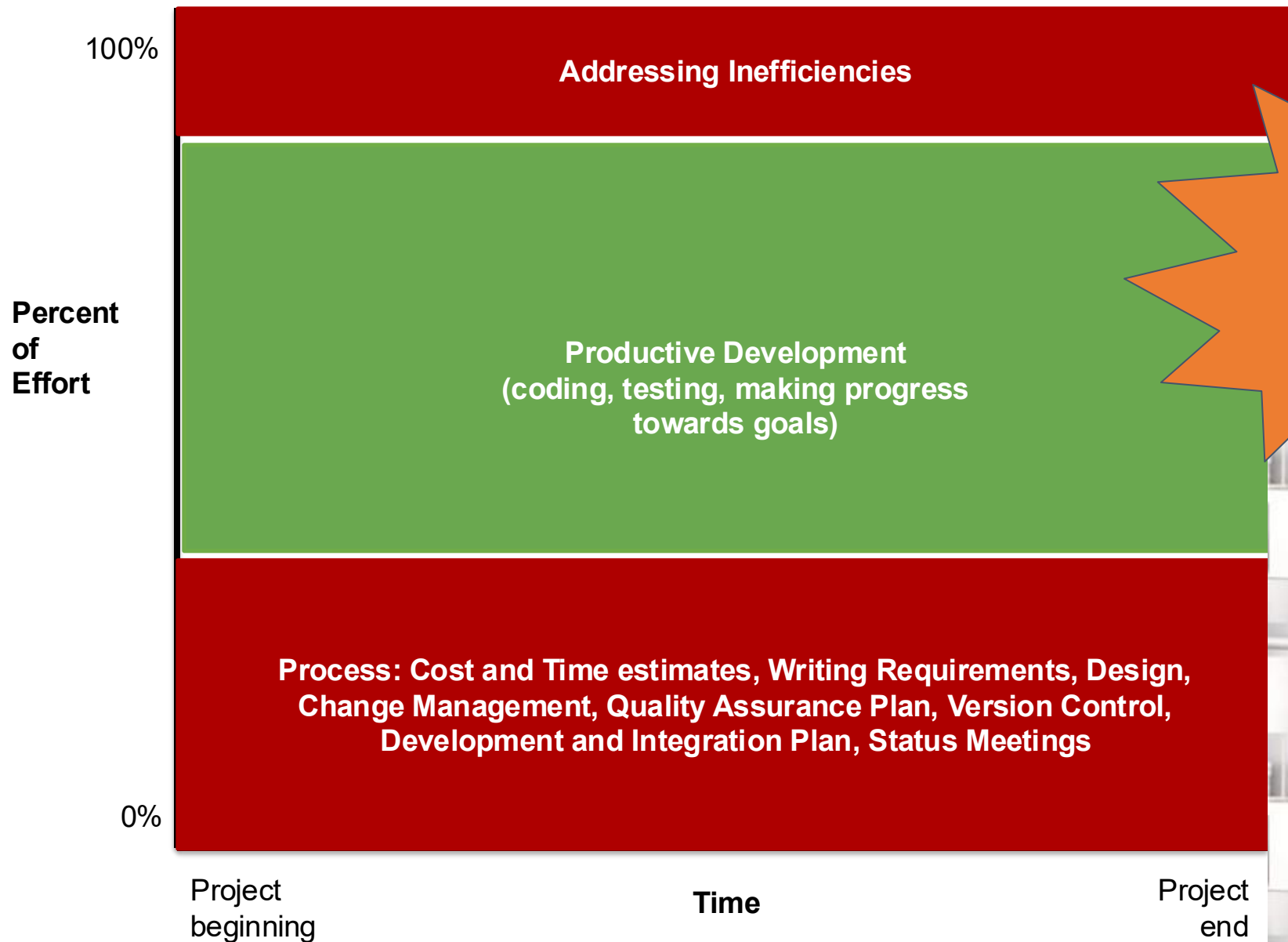


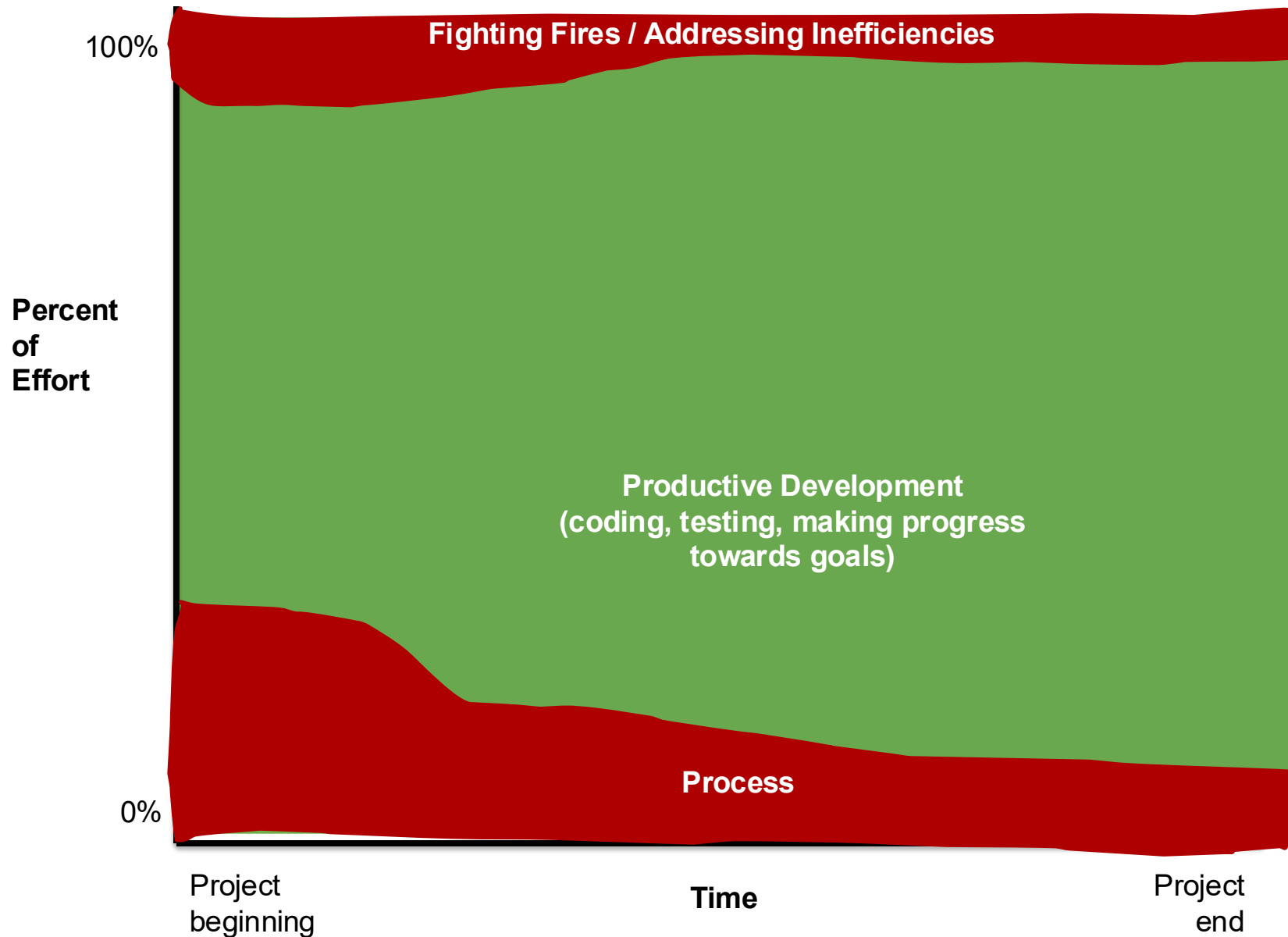




# Let's improve the reliability of this process

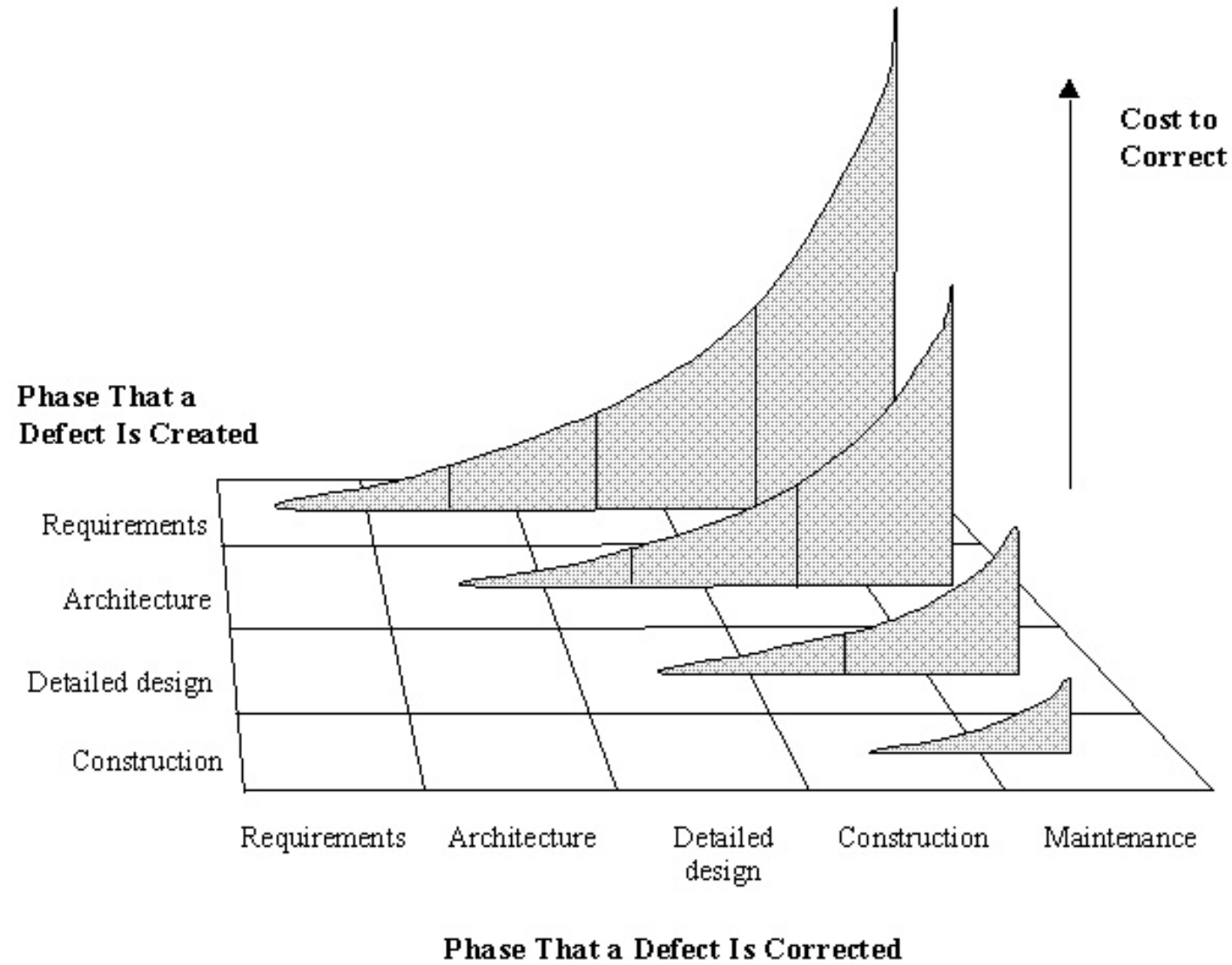
- Writing down all requirements
  - Review requirements
  - Require approval for all changes to requirements
- Use version control for all changes
  - Code Reviews
- Track all work items
  - Break down development into smaller tasks
  - Write down and monitor all reported bugs
  - Hold regular, frequent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





**Hypothesis:** Process increases flexibility and efficiency

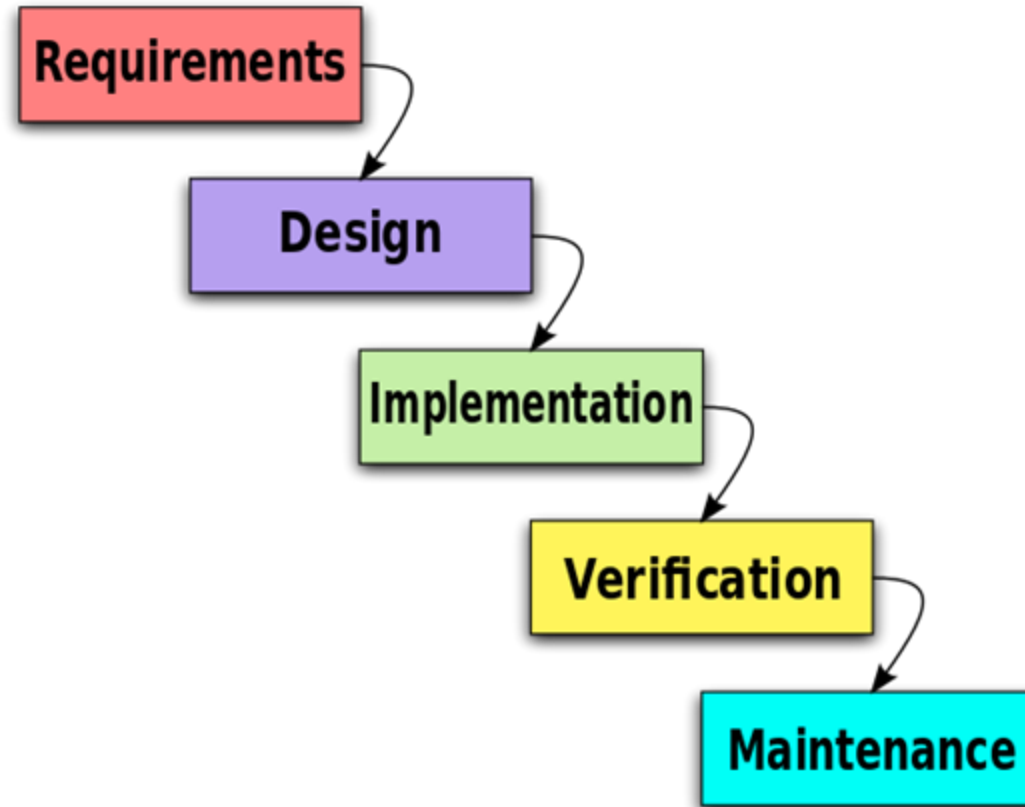
**Ideal Curve:** Upfront investment for later greater returns



Copyright 1998 Steven C. McConnell. Reprinted with permission  
from *Software Project Survival Guide* (Microsoft Press, 1998).



# Waterfall model was the original software process

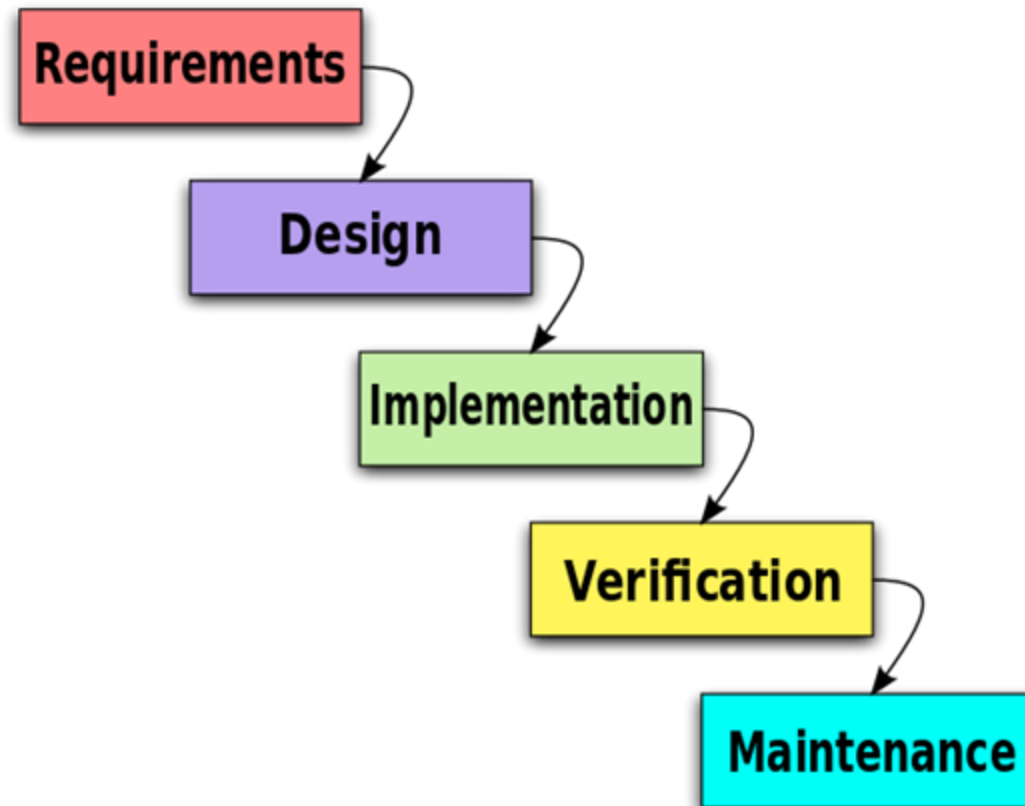


Waterfall diagram CC-BY 3.0 [Paulsmith99](#) at [en.wikipedia](#)

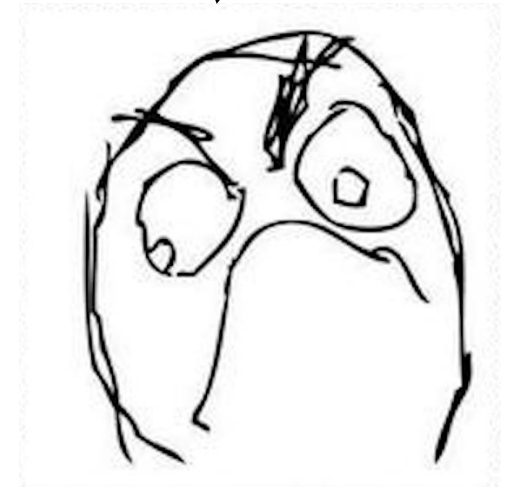
**... akin to processes pioneered in mass manufacturing (e.g., by Ford)**



# What could go wrong?

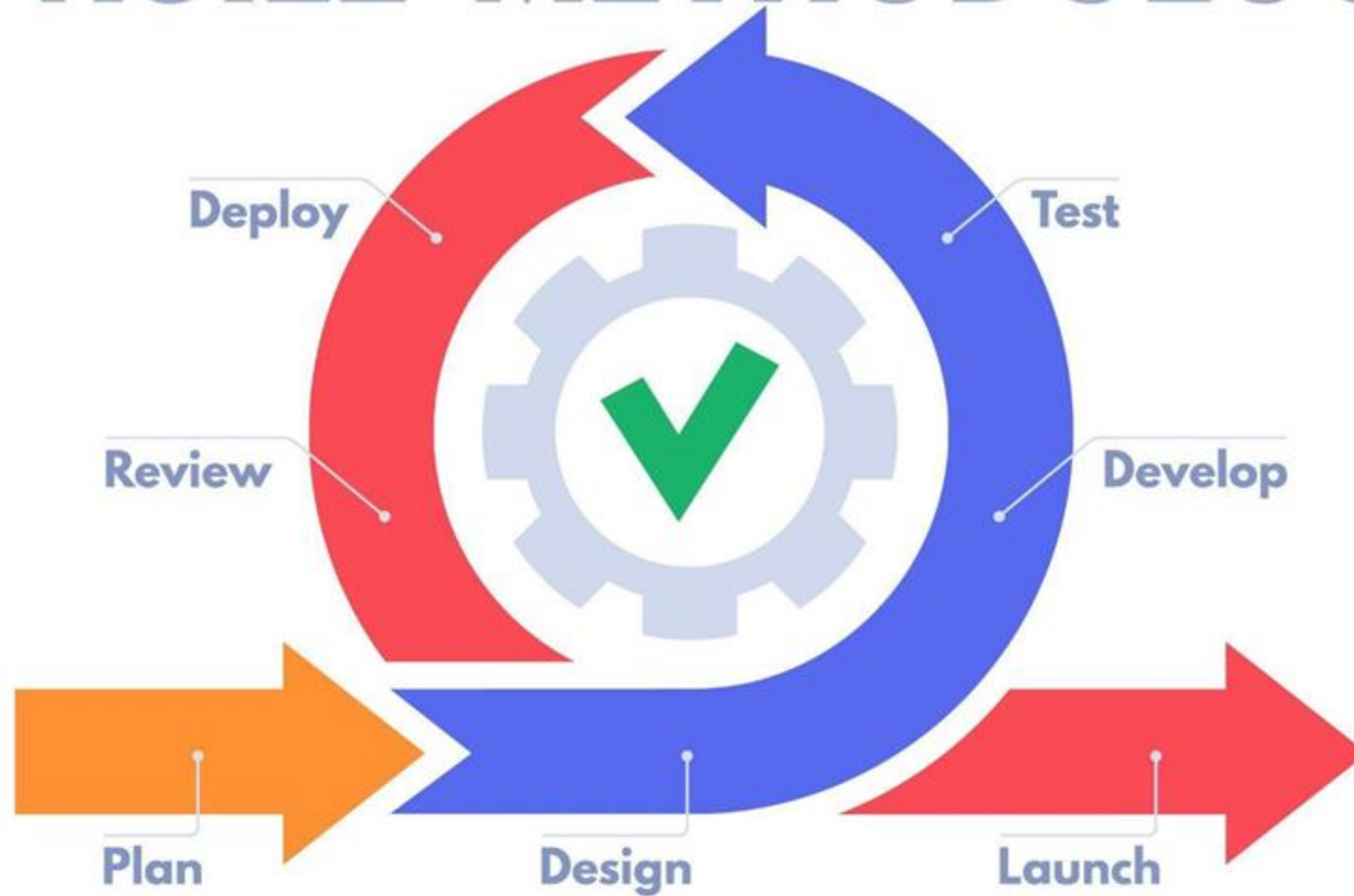


I don't like it...



Waterfall diagram CC-BY 3.0 [Paulsmith99](#) at [en.wikipedia](#)

# AGILE METHODOLOGY

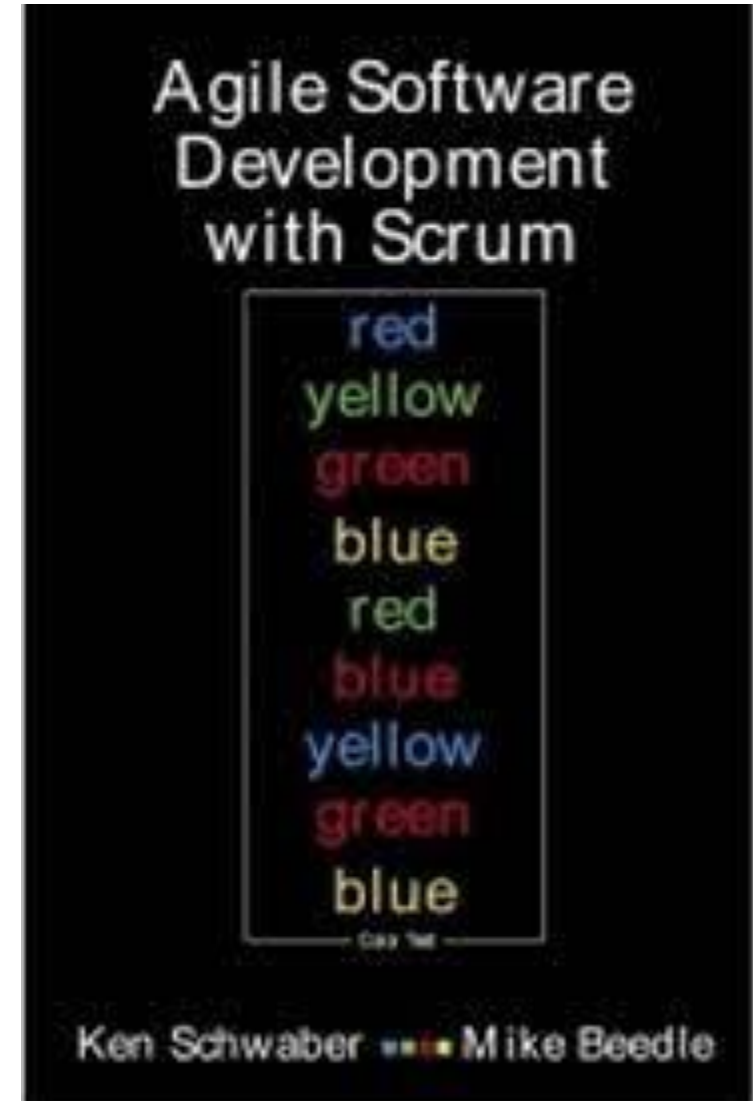


# Agile manifesto

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

# Scrum

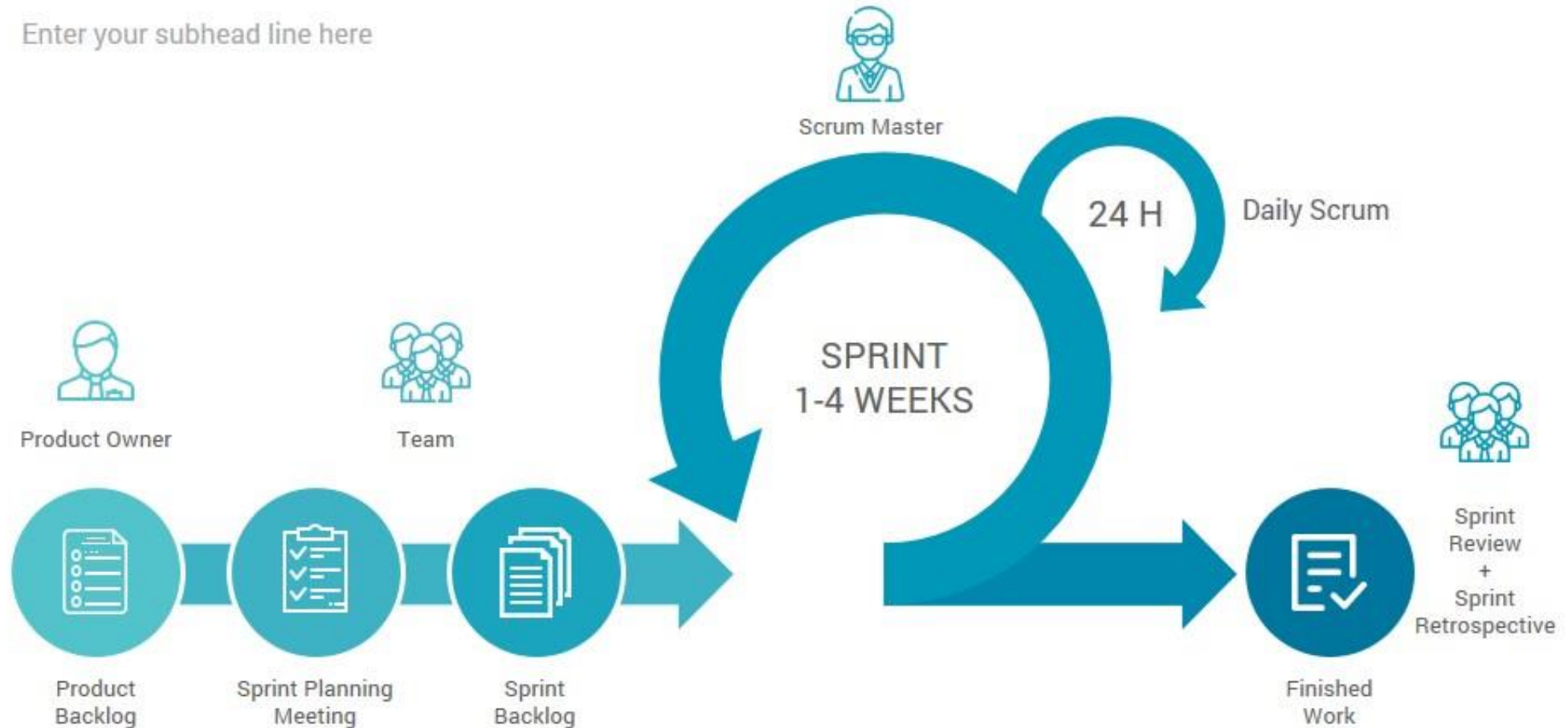
(Only a brief intro)



# Elements of Scrum

## Scrum Process

Enter your subhead line here





# 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

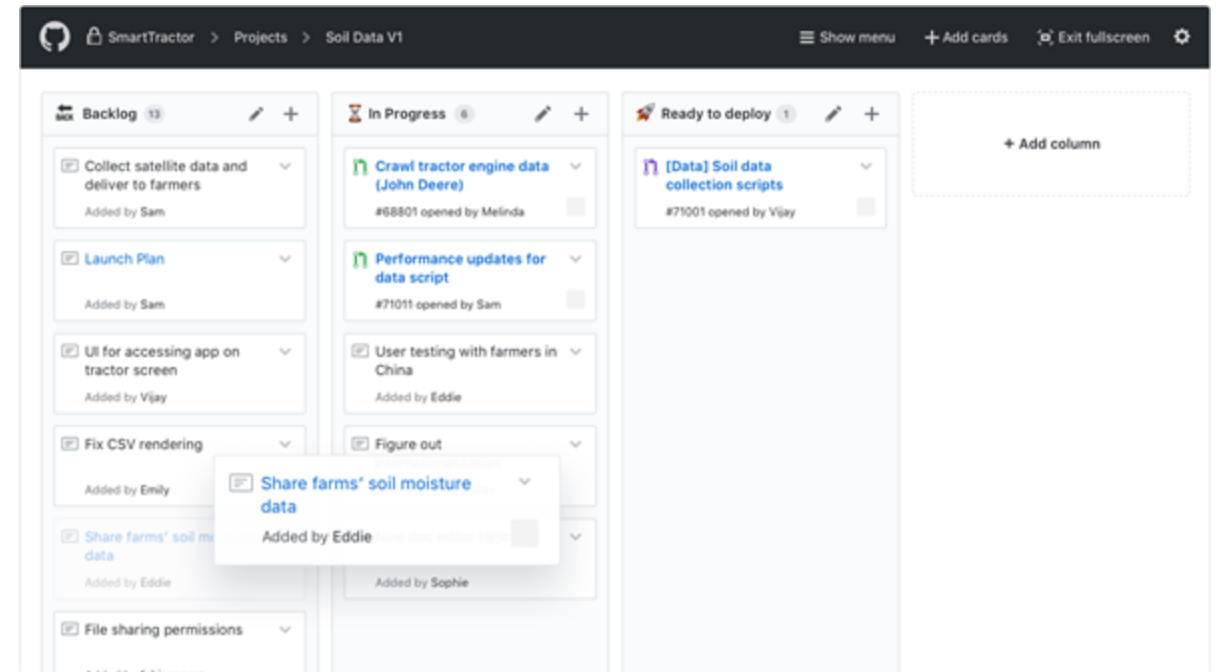
- Assigned to individual team members

- 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



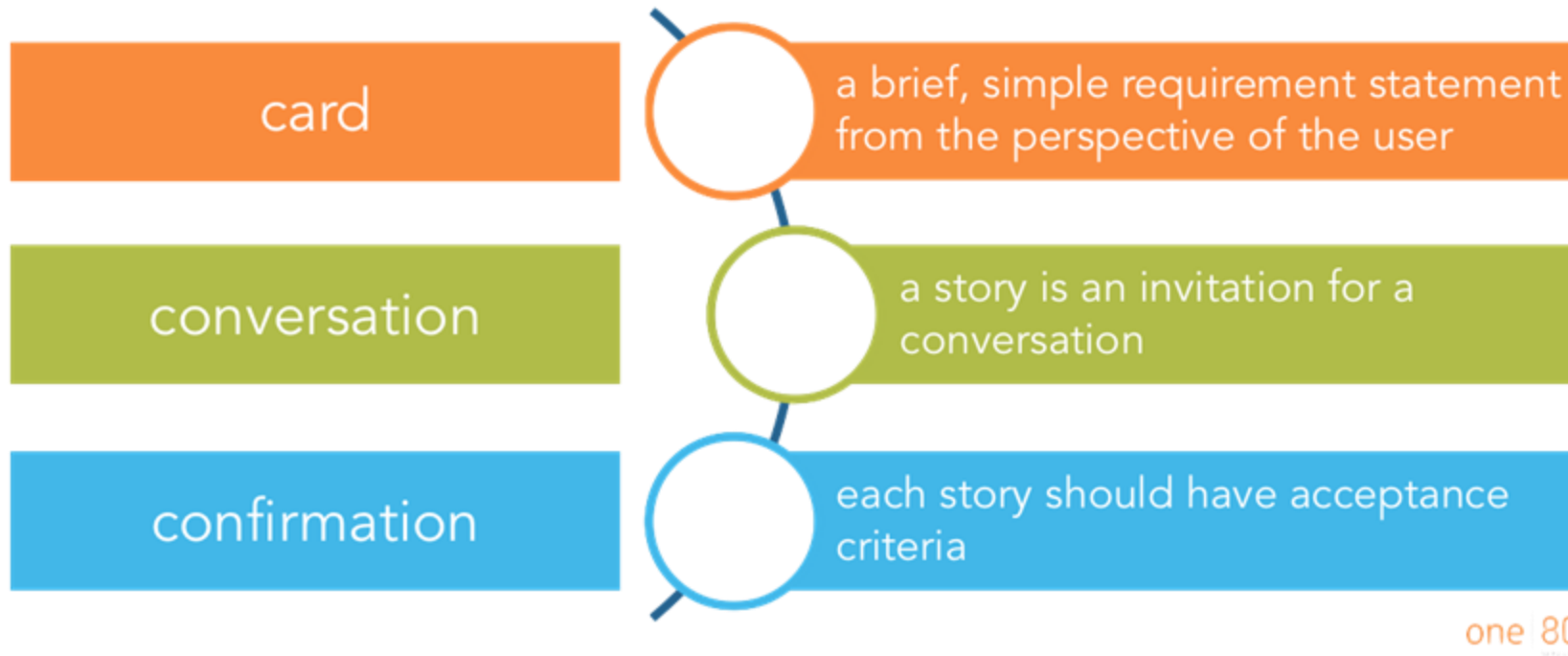
# Example

**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?

Follow the INVEST  
guidelines for good  
user stories!

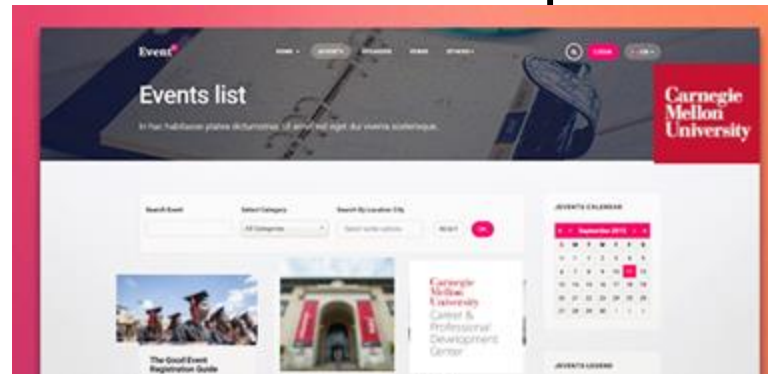


Source: <http://one80services.com/user-stories/writing-good-user-stories-hint-its-not-about-writing/>

one 80  
services

# 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

Assume that the homepage with an event calendar is already in place.

**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.

I	independent	<input checked="" type="checkbox"/>
N	negotiable	<input type="checkbox"/>
V	valuable	<input type="checkbox"/>
E	estimable	<input type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

# 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!"

I	independent	<input checked="" type="checkbox"/>
N	negotiable	<input checked="" type="checkbox"/>
V	valuable	<input type="checkbox"/>
E	estimable	<input type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

# 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.

I	independent	<input checked="" type="checkbox"/>
N	negotiable	<input checked="" type="checkbox"/>
V	valuable	<input checked="" type="checkbox"/>
E	estimable	<input type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

# 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.

I	independent	<input checked="" type="checkbox"/>
N	negotiable	<input checked="" type="checkbox"/>
V	valuable	<input checked="" type="checkbox"/>
E	estimable	<input checked="" type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

# 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

Follow the INVEST  
guidelines for good  
user stories!



one | 80  
SERVICES





# User Story #1

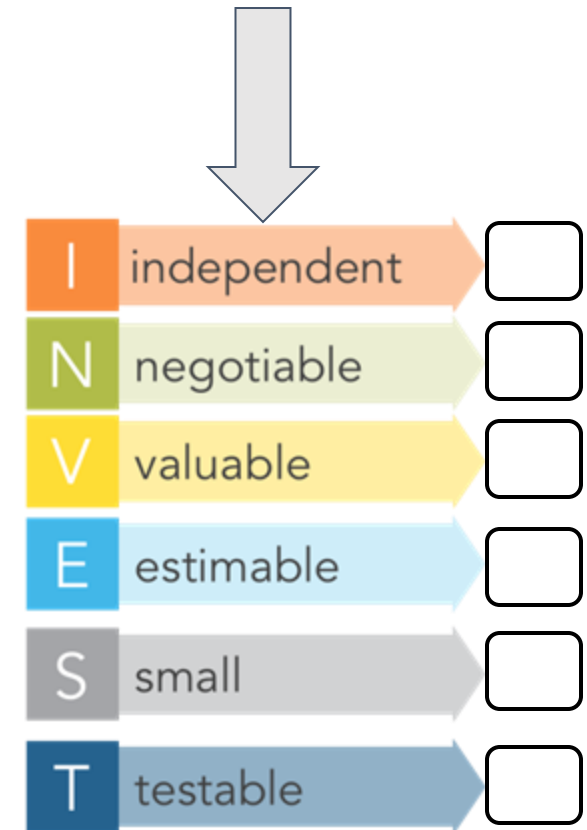
**As** the Events Coordinator, **I want** the website to seamlessly integrate with various academic calendars and departmental schedules, **so that** event information is always synchronized and accurate.

## 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?

Select the most serious flaw



I	independent	<input type="checkbox"/>
N	negotiable	<input type="checkbox"/>
V	valuable	<input type="checkbox"/>
E	estimable	<input type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

# User Story #2

**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?

Select the most serious flaw



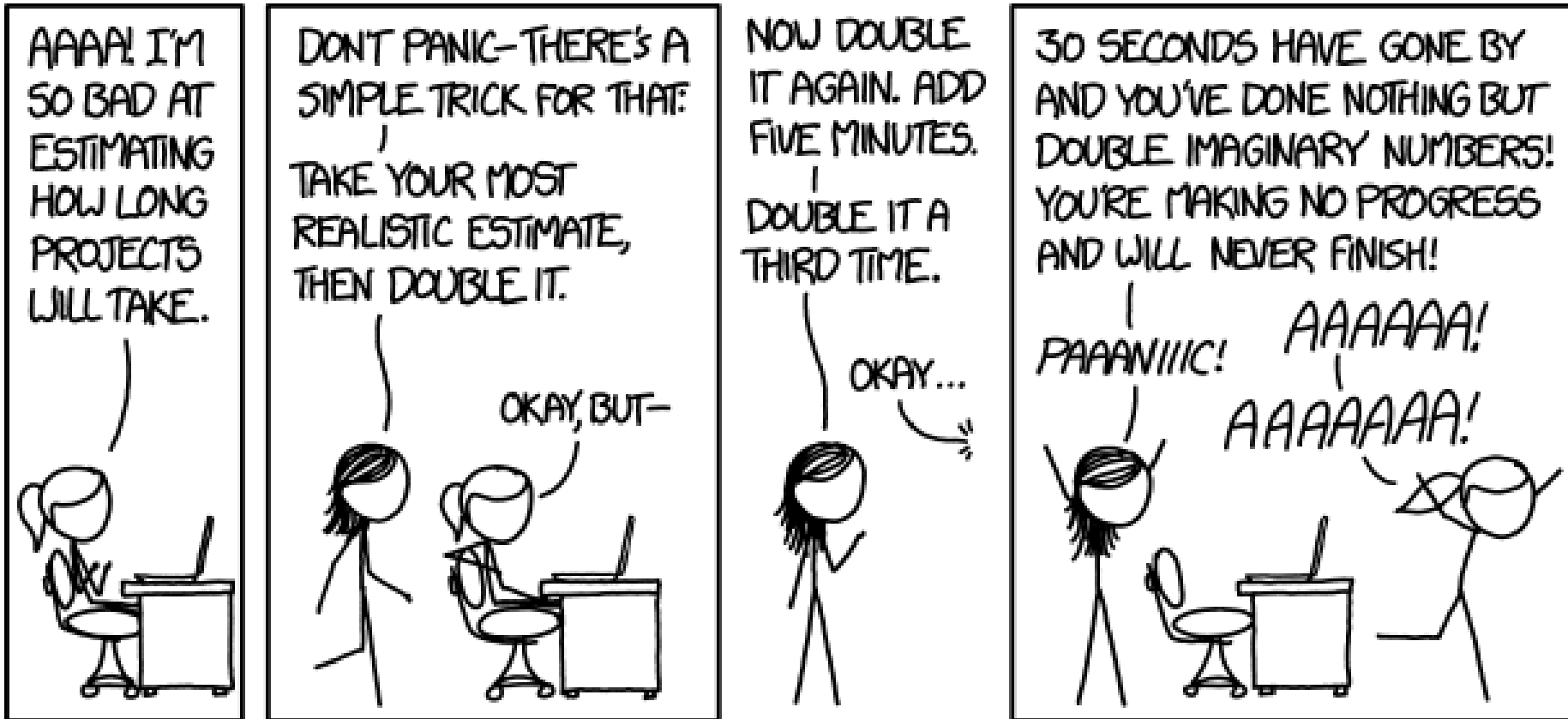
I	independent	<input type="checkbox"/>
N	negotiable	<input type="checkbox"/>
V	valuable	<input type="checkbox"/>
E	estimable	<input type="checkbox"/>
S	small	<input type="checkbox"/>
T	testable	<input type="checkbox"/>

***“Plans are nothing,  
planning is everything”***

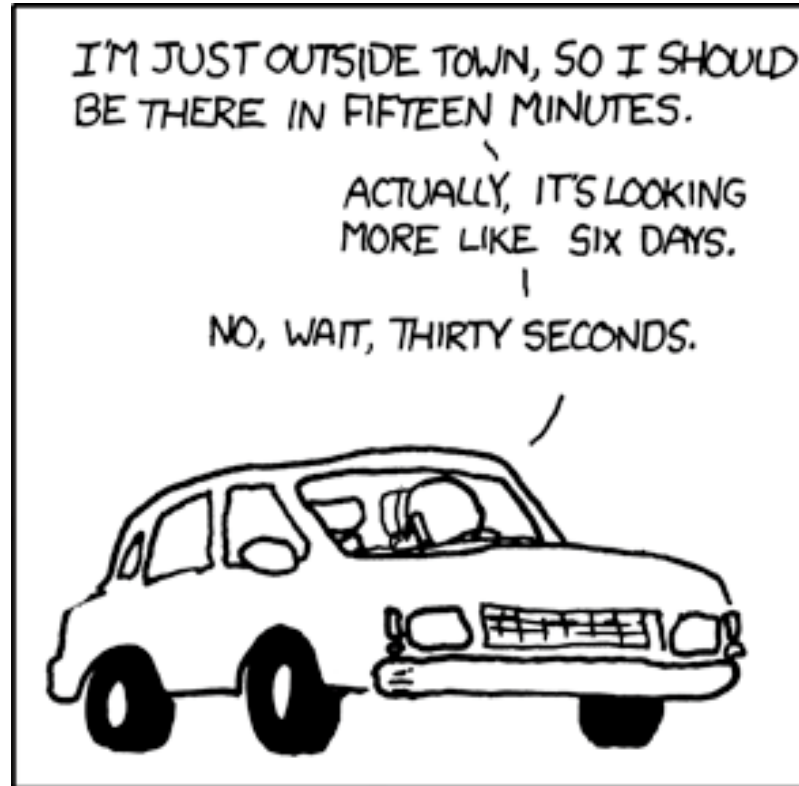
**-Dwight D. Eisenhower**



# Time estimation



# Time estimation



THE AUTHOR OF THE WINDOWS FILE  
COPY DIALOG VISITS SOME FRIENDS.

# 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](https://codica.com)

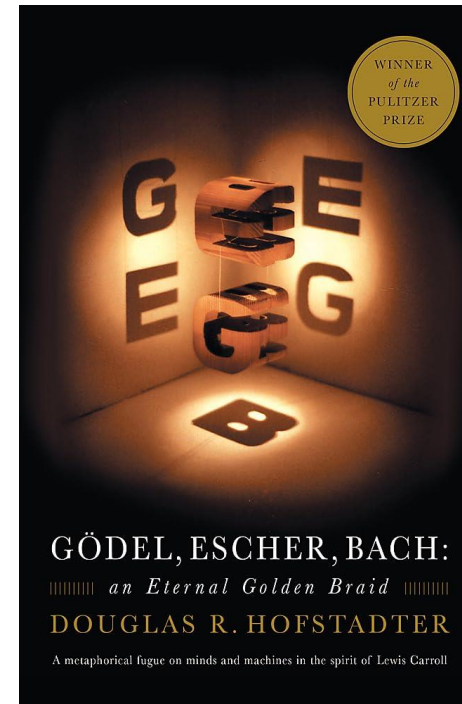




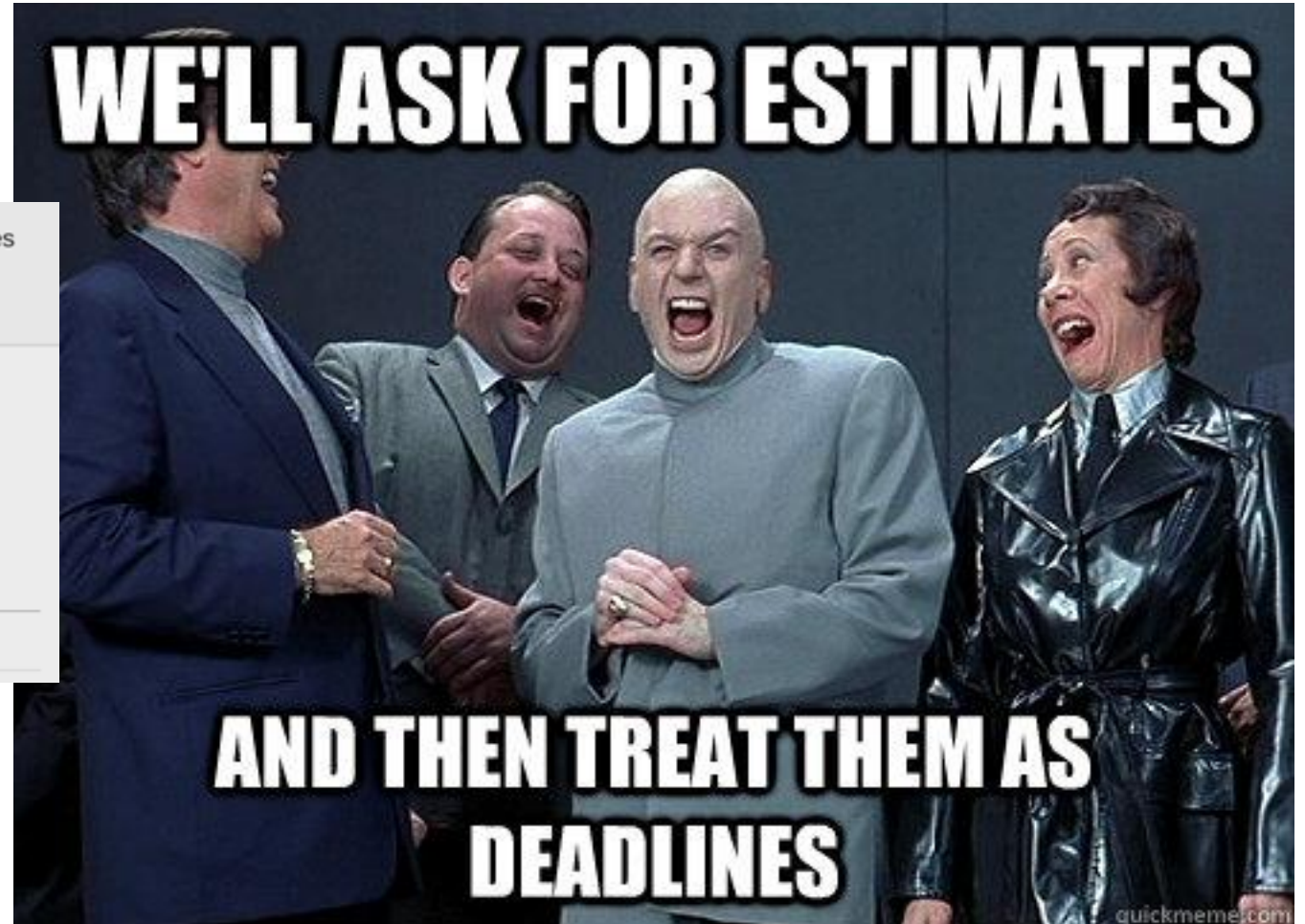
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# Hofstadter's Law

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



# Is Estimation Evil?



Ron Jeffries

About Search Site Categories

## Estimation is Evil

© Feb 1, 2013 • [Agile-Related, estimation]

The following article is recovered from the February 2013 issue of the Pragmatic Programmers magazine.

### Overcoming the Estimation Obsession

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