

# Intro To Process

## Milestones, Estimation, Planning

17-313 Fall 2024

Foundations of Software Engineering

<https://cmu-17313q.github.io>

Eduardo Feo Flushing

# Administrivia

- Project 2A due on Thursday (Sep 12th) at midnight
- Meet with your teams!
- Extra credit: Go out with your teams socially.
  - Share a photo/screenshot of your team activity with your CA **before** Saturday night.

# Smoking Section

- Last full row



# 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

# Software Development... before Software Engineering



by DALL-E



HOW TO "READ" FM TUNER SPECIFICATIONS

## Popular Electronics

PROJECT BREAKTHROUGH!  
World's First Minicomputer Kit  
to Rival Commercial Models...  
"ALTAIR 8800" SAVE OVER \$1000



ALSO IN THIS ISSUE:

- An Under-\$90 Scientific Calculator Project
- CCD-TV Camera Tube Successor?
- Thyristor-Controlled Photoflashers

TEST REPORTS:

- Sylvania 250 Speaker System
- Pioneer RT-1011 Drive-Head Recorder
- Penn-Scandair 45
- Edward Scientific
- Hewlett-Packard

ENTIRE ISSUE \$3.95 (U.S. & CANADA)



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.**

# Outline

- Software Processes and why we need them
- Software Process Models
  - Agile and Scrum
- Planning: Task and progress estimation

# 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



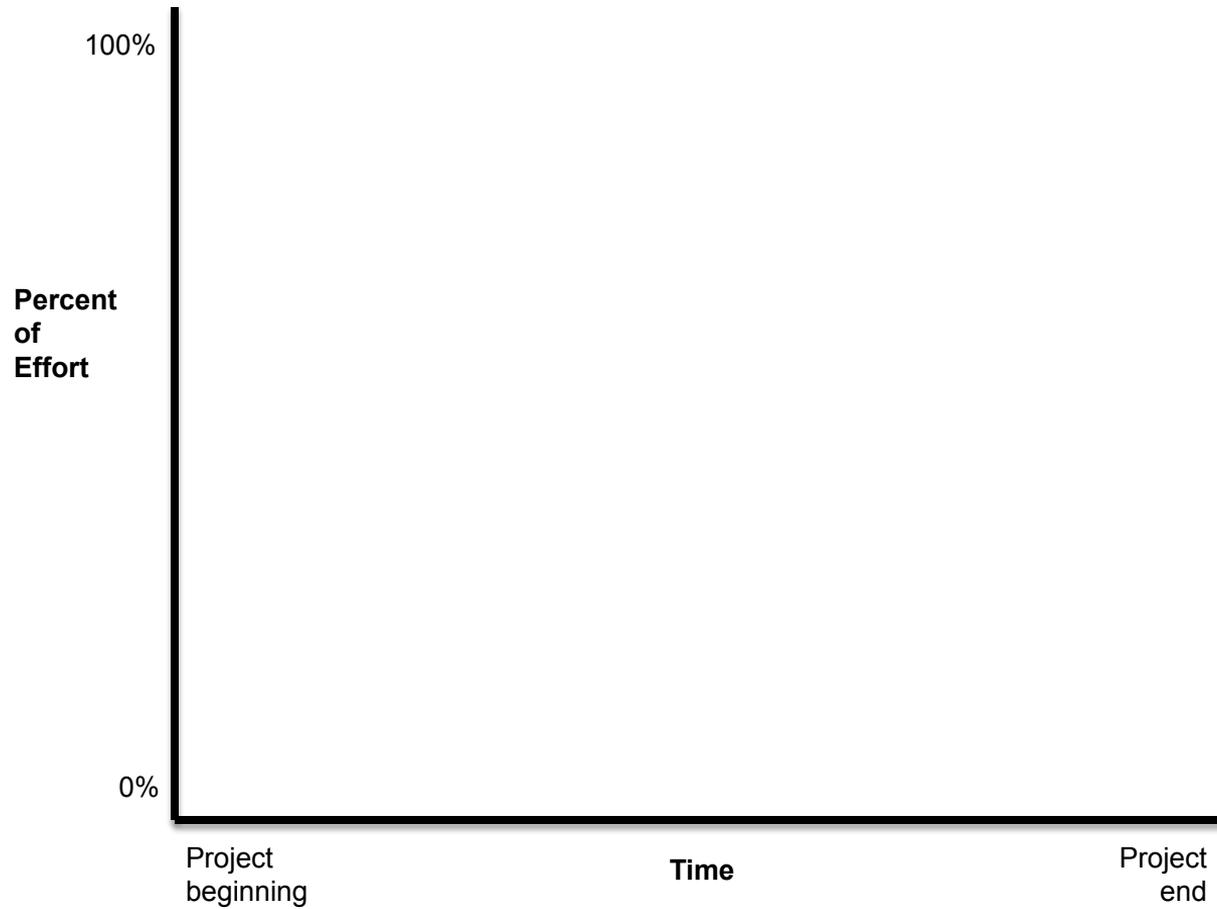
Test the code to identify the defects

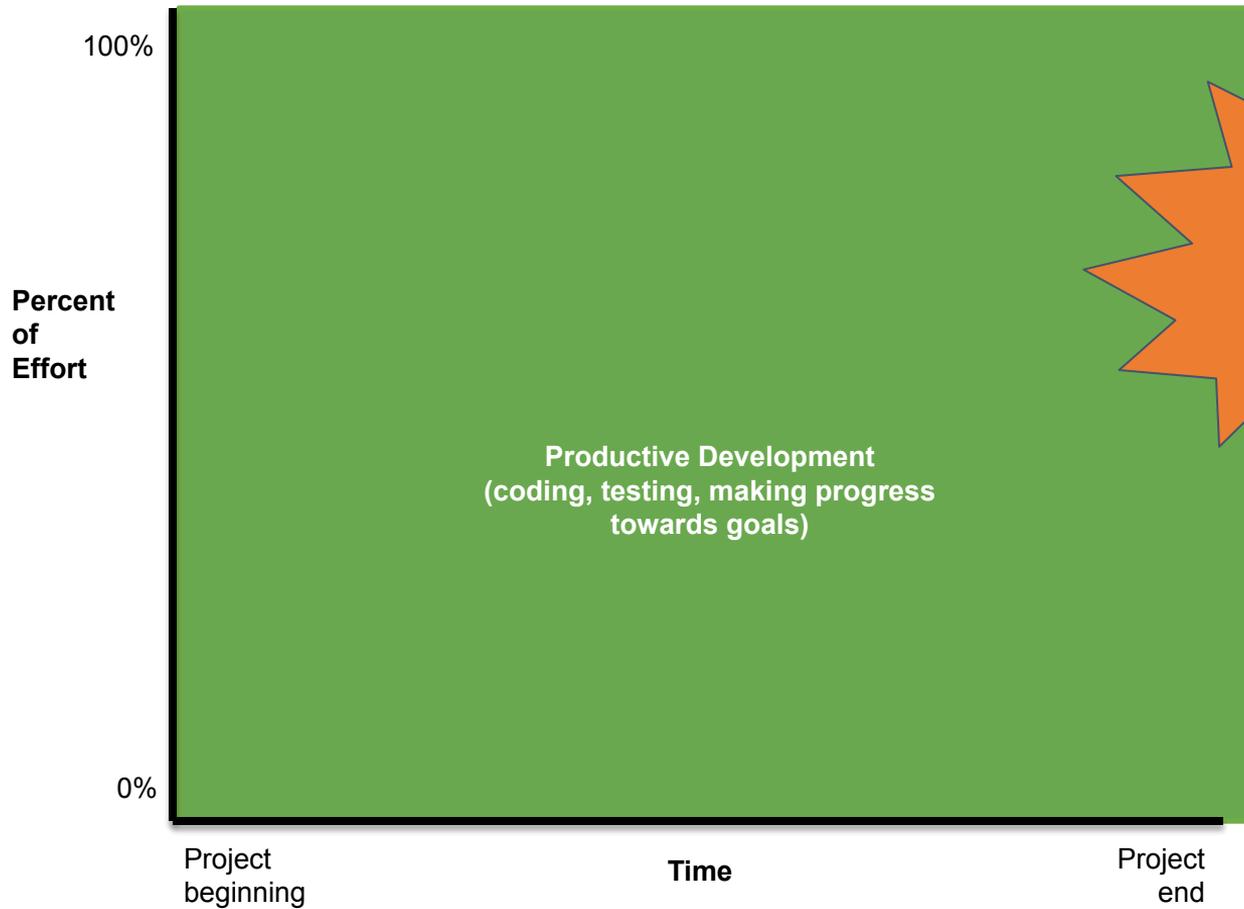


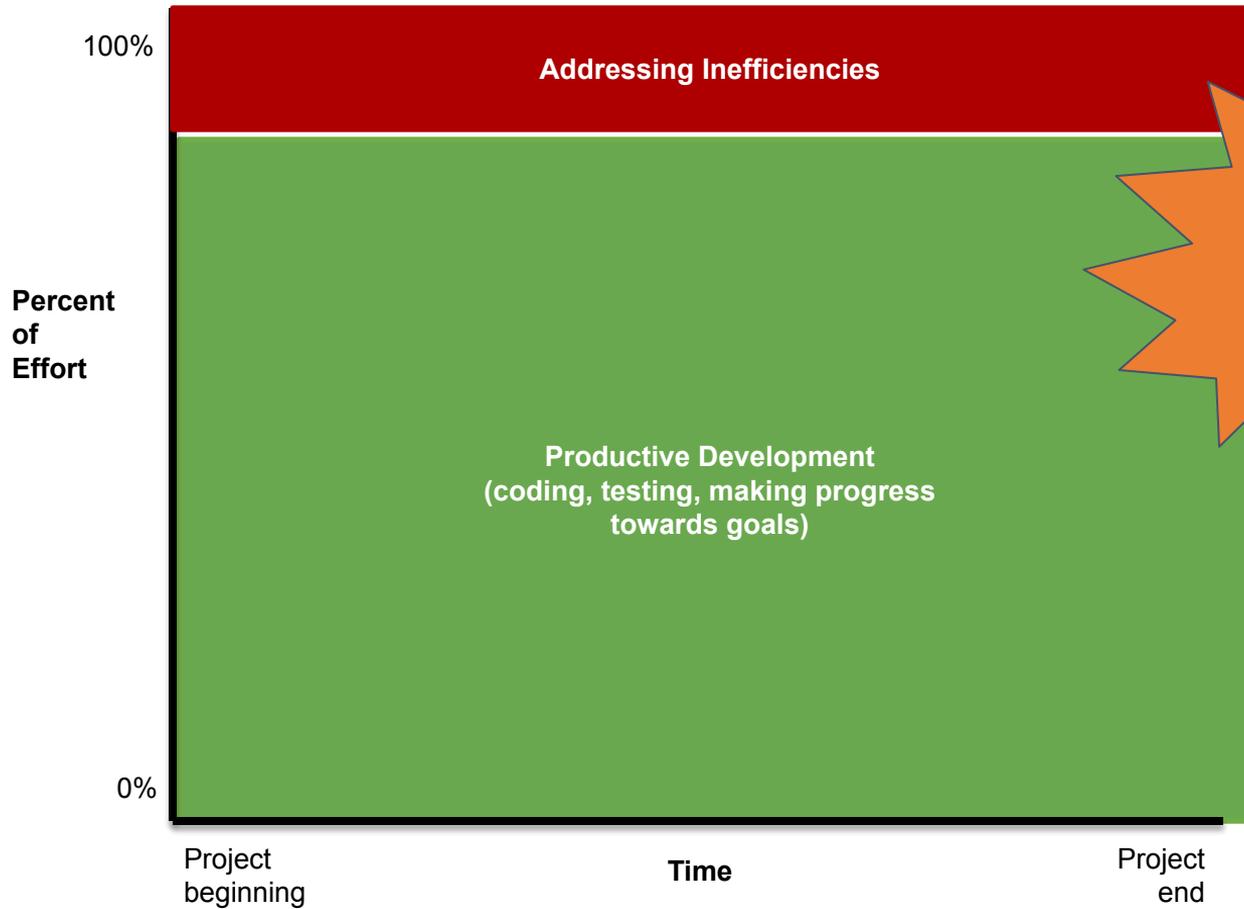
Debug to find causes of defects



Fix the defects

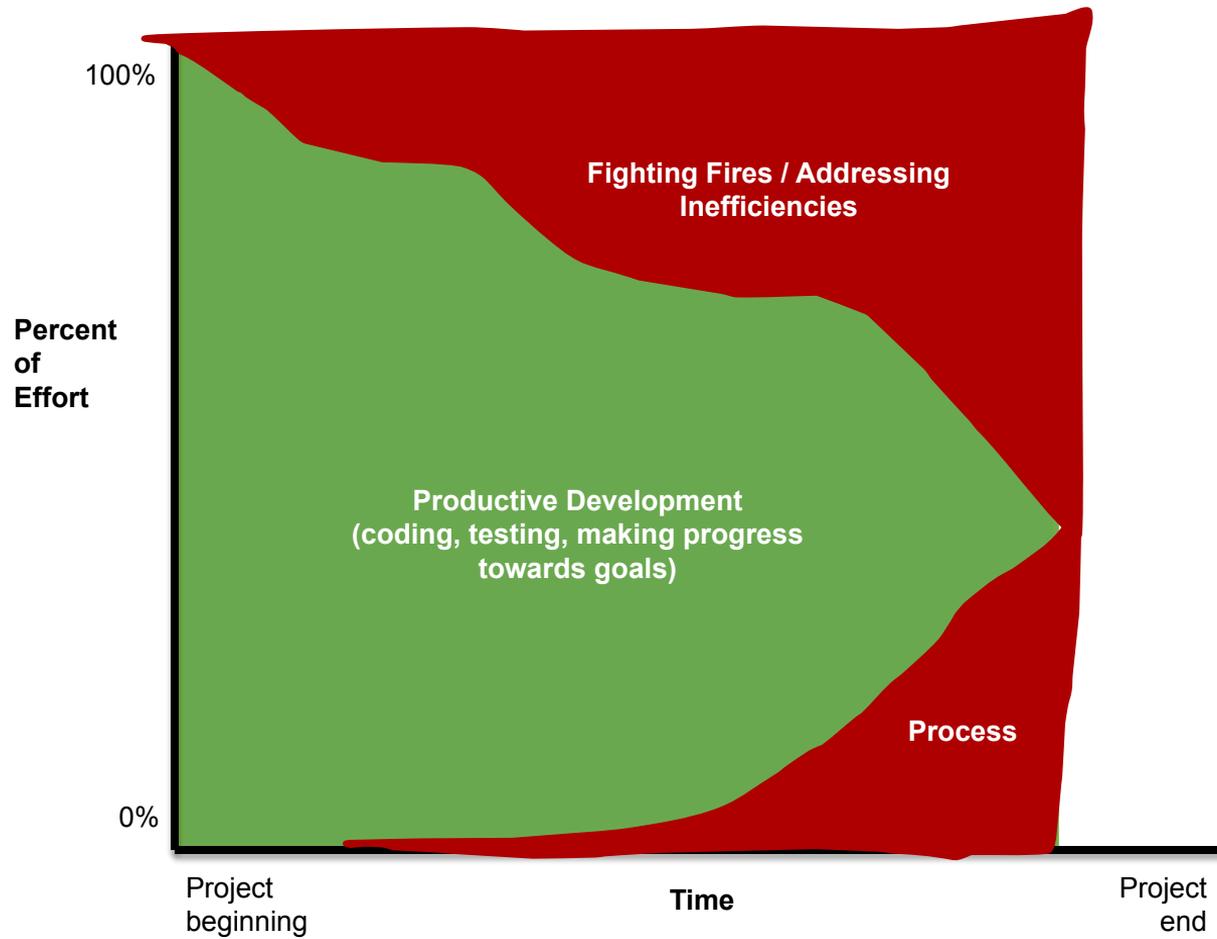






# What happens when ...

- Mid-project informal agreement to changes suggested by customer or manager. Project scope expands 25-50%
- Late detection of requirements and design issues.
- Bug reports collected informally, forgotten
- Integration of independently developed components at the very end of the project. Interfaces out of sync.
- Accidentally overwritten changes, lost work.
- When project is behind, developers are asked weekly for new estimates.

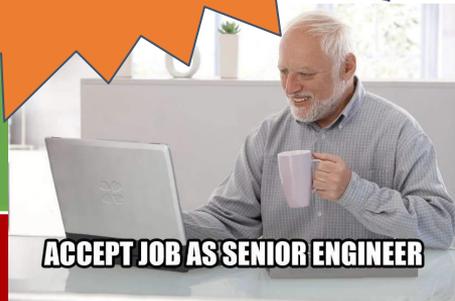


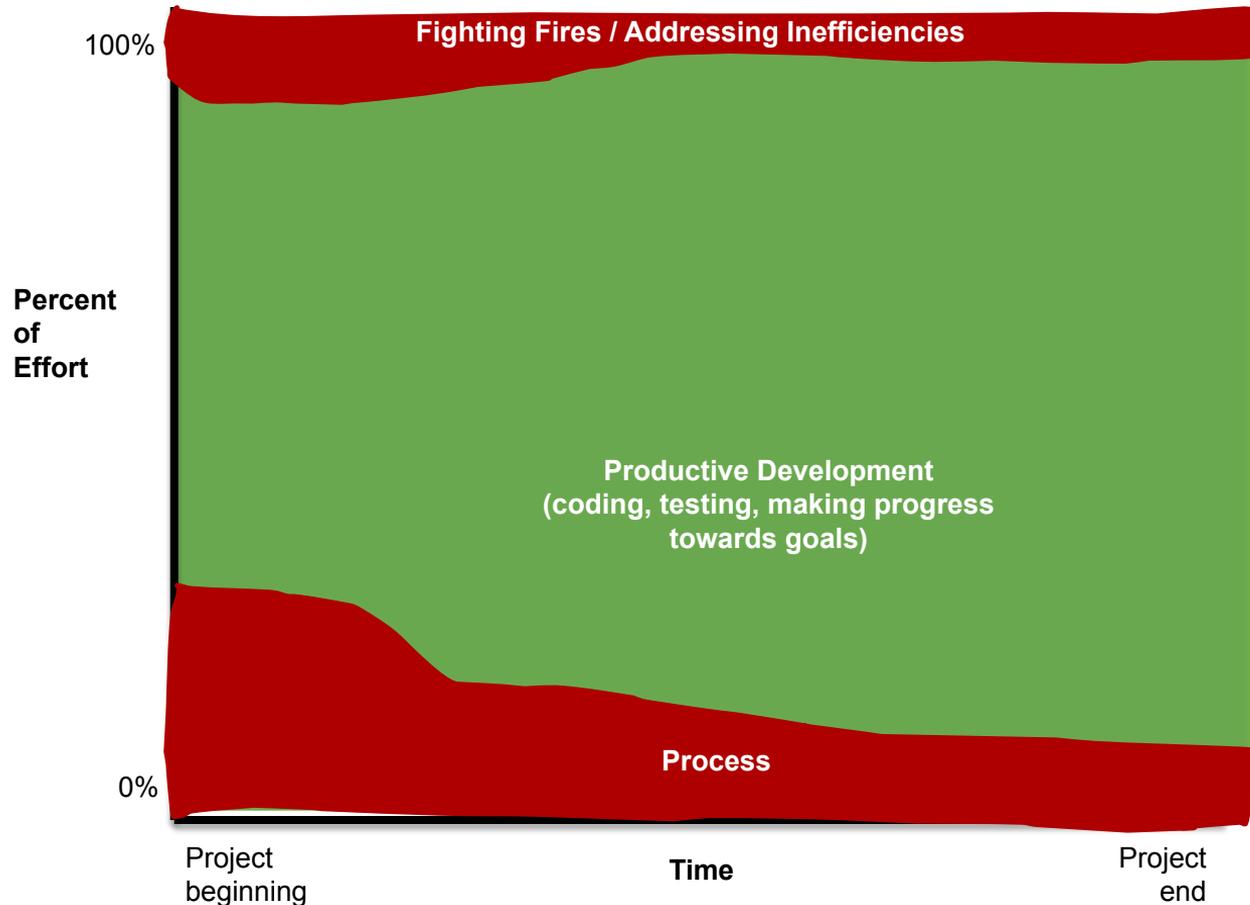
# Let's improve the reliability of this process

- 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



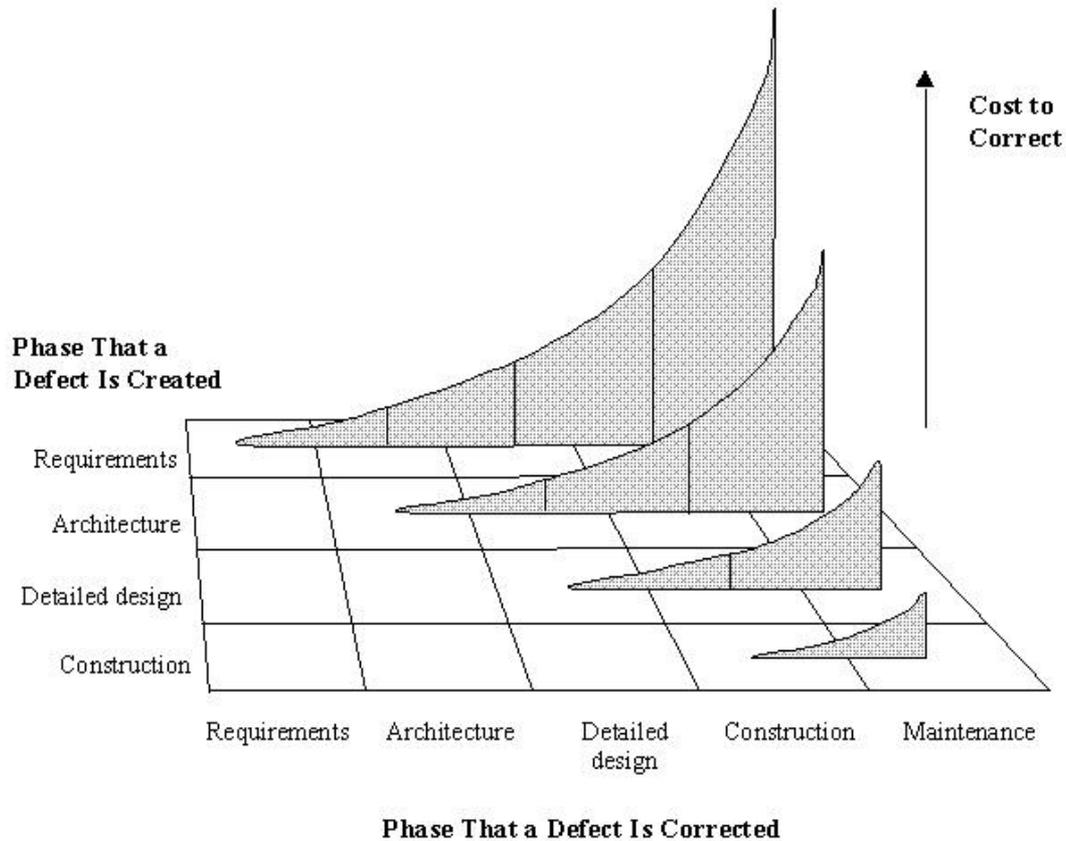
Negative View of Process





**Hypothesis:** Process increases flexibility and efficiency

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

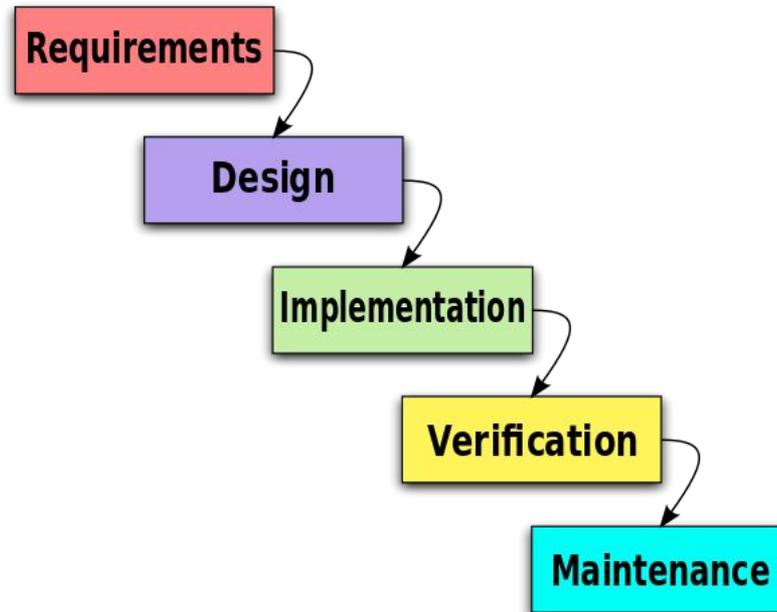


Copyright 1998 Steven C. McConnell. Reprinted with permission from *Software Project Survival Guide* (Microsoft Press, 1998).

# Outline

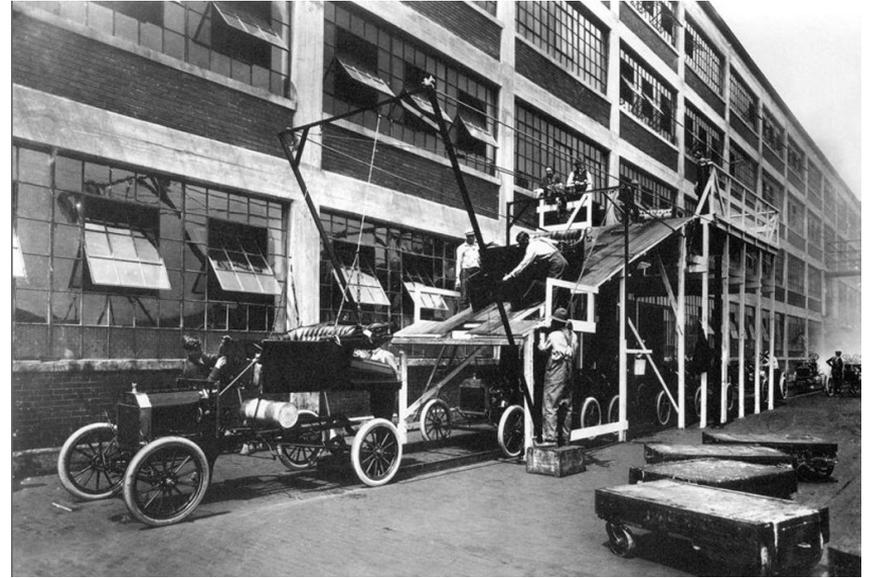
- Software Processes and why we need them
- **Software Process Models**
  - **Agile and Scrum**
- Planning: Task and progress estimation

# 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)



# Lean production adapts to variable demand

## Toyota Production System (TPS) Late 1940s

Build only what is needed, only when it is needed.

Use the “pull” system to avoid overproduction. (Kanban)

Stop to fix problems, to get quality right from the start (Jidoka)

Workers are multi-skilled and understand the whole process; take ownership

Enabling teams to have autonomy and control to change/improve quickly/continuous improvement (kaizen)

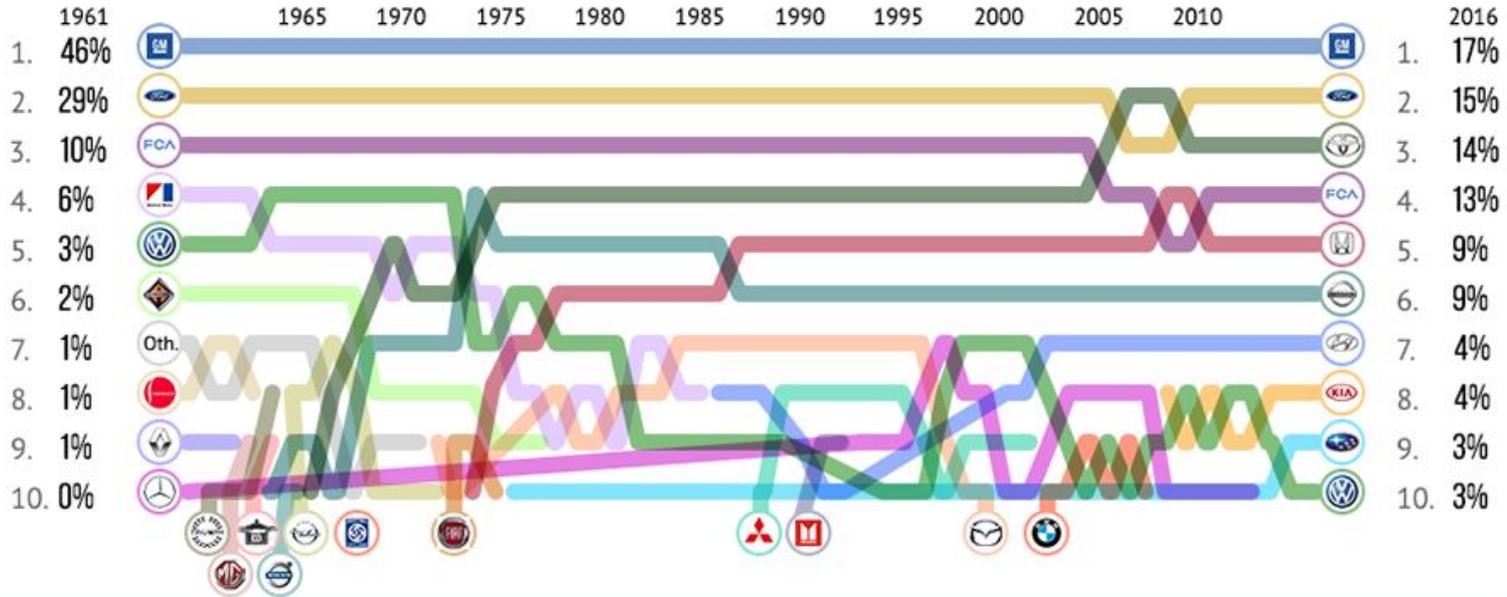


Taiichi Ohno

# US vehicle sales market share; 1961—2016 (source: knoema.com)

## Top-10 Vehicle Companies by US Market Share

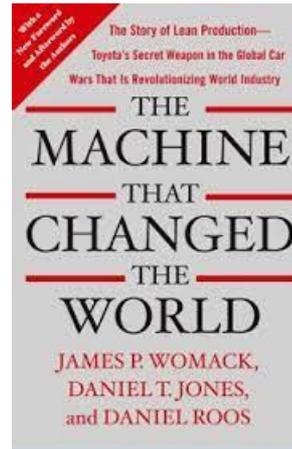
% share of total vehicle sales in US in 1961-2016



# From TPS to Agile



1986

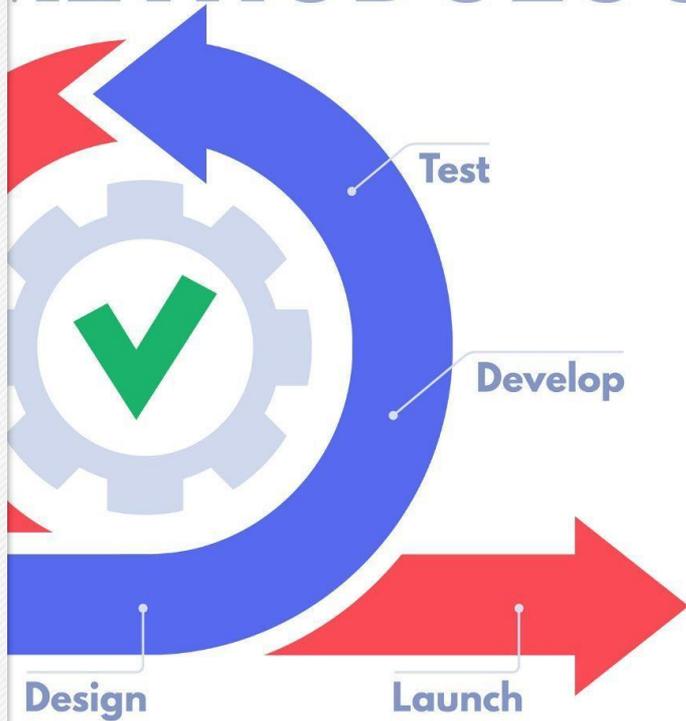


1990



2001

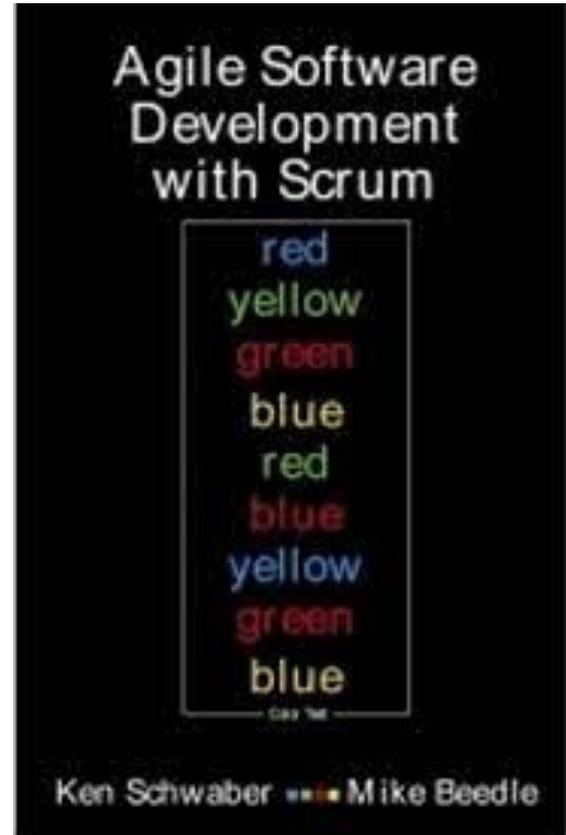
# METHODOLOGY



SOURCE: SHAWN DANIEL FOR TECHNOLOGY. ART: FREDERICKSQUITY IMAGES ©2014 REDHAWK. ALL RIGHTS RESERVED. TechTarget

# Scrum

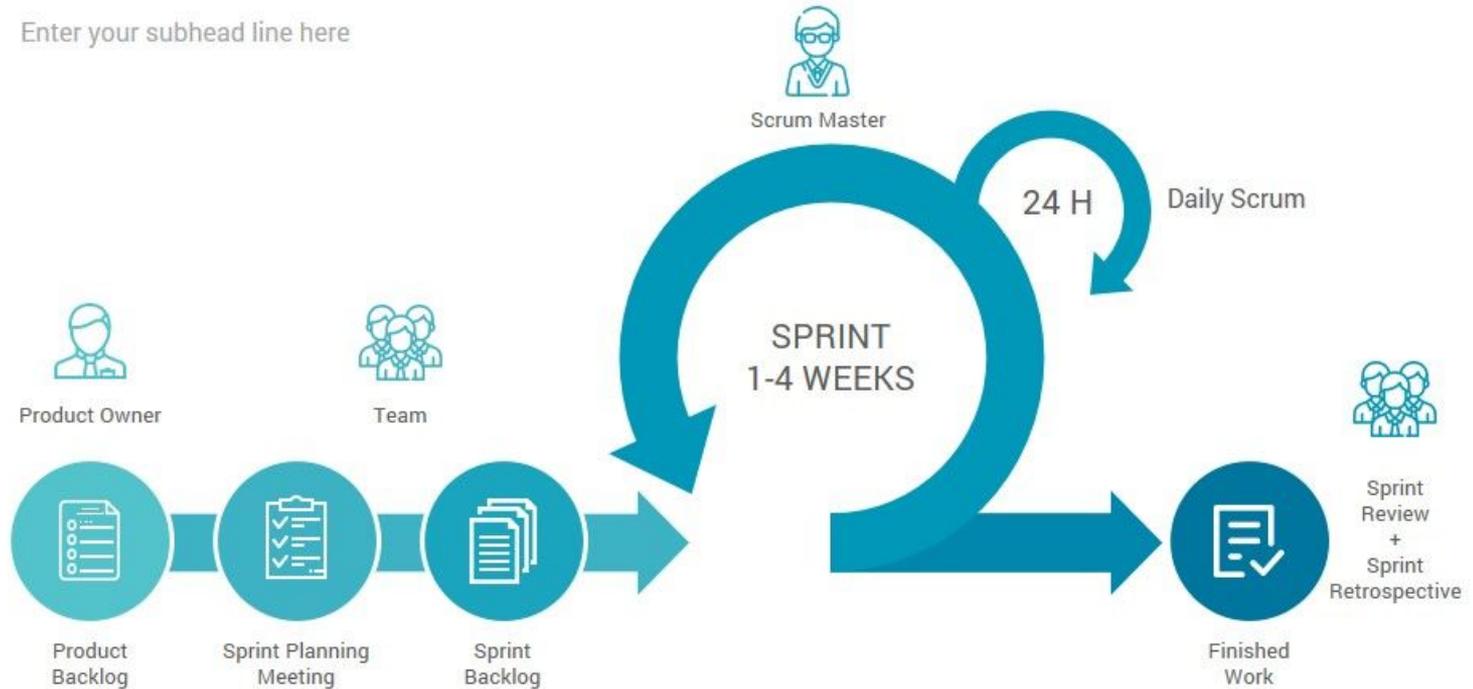
(Only a brief intro)



# 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

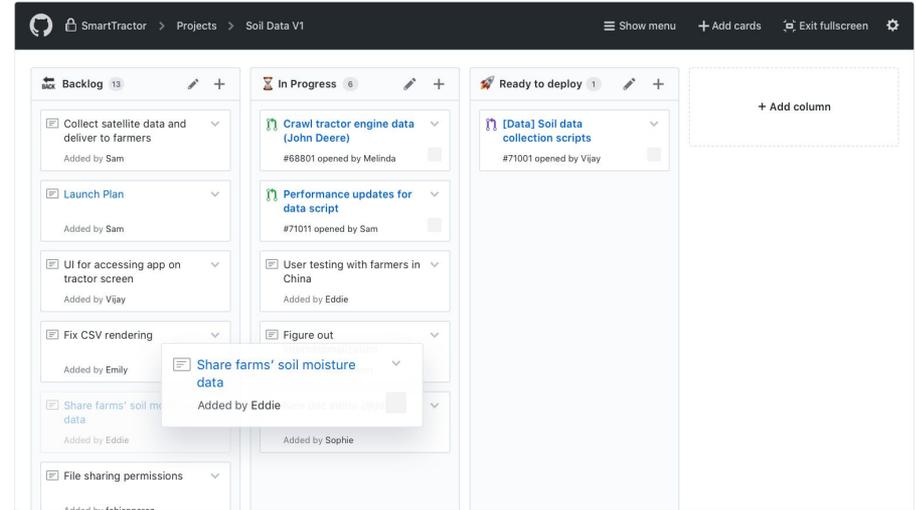
- Estimated

- 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?

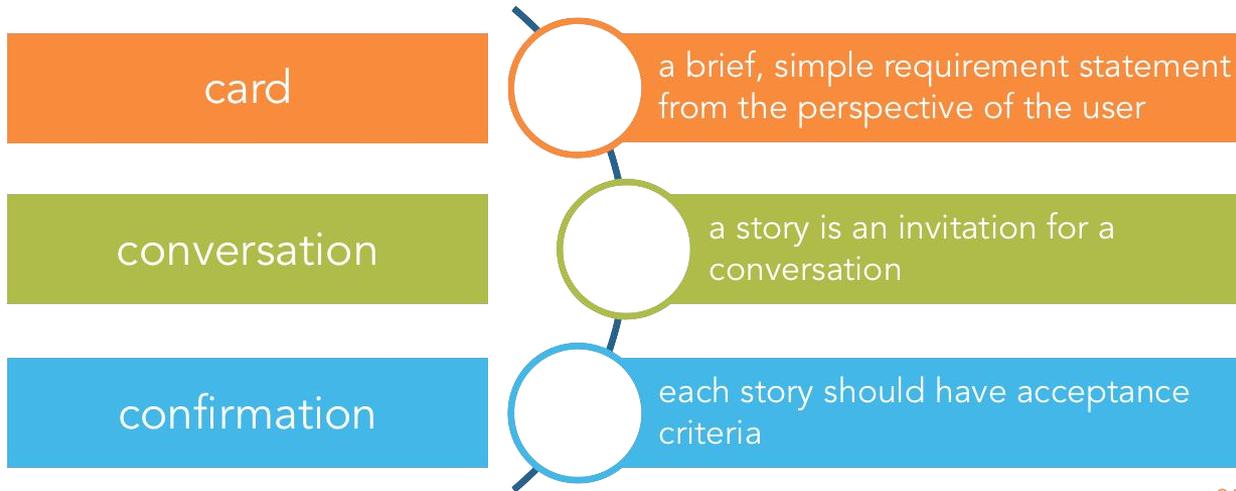
## Sprint Retrospective

Review sprint process

## Sprint Review Meeting

Review Product

# User Stories



one 80

User story cards (3"x5")

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

# Conversation

- 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!



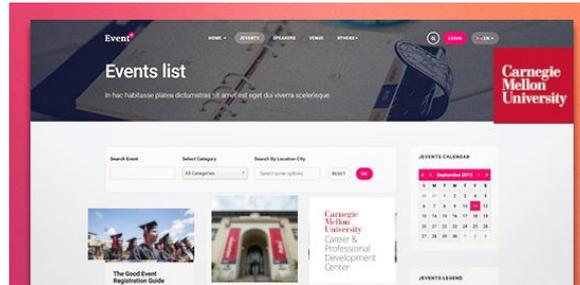
Source:

<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

**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.

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

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)

# 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.

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 checked="" type="checkbox"/>
T	testable	<input type="checkbox"/>

# 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.

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 checked="" type="checkbox"/>
T	testable	<input type="checkbox"/>

# Activity: Evaluate using INVEST

Follow the INVEST  
guidelines for good  
user stories!



one|80  
SERVICES



# User Story #1

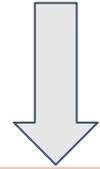
**As** the Events Coordinator, **I want** the website to seamlessly integrate with various academic calendars and departmental schedules, **so that** event information is always synchronized and accurate.

## 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

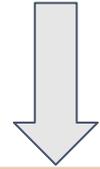
**As** a student, **I want** the website to have an intuitive navigation system **so that** I can find events effortlessly.

## 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"/>

Discuss in pairs. Compare your answers with each other

## 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.

## 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:

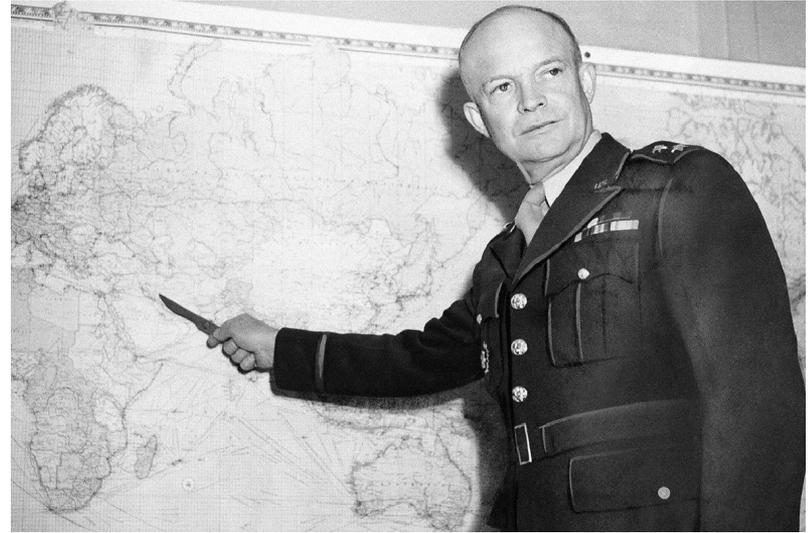
- The website's navigation is intuitive to users.
- Users can find events with minimal effort.
- The navigation system feels natural and easy to understand.

# Outline

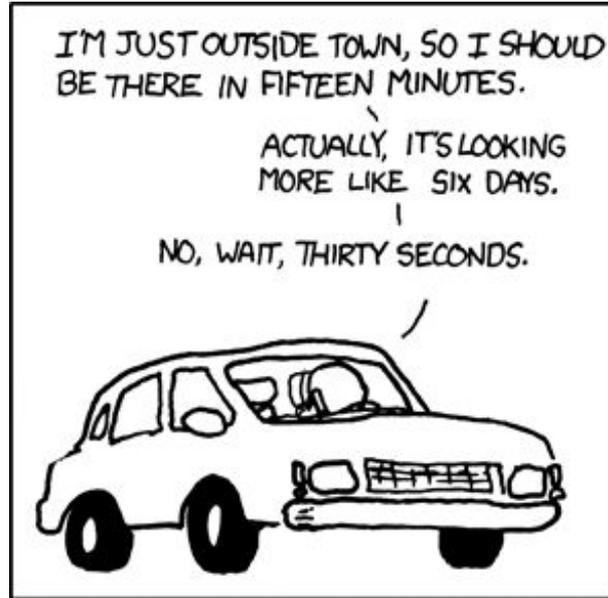
- Software Processes and why we need them
- Software Process Models
  - Agile and Scrum
- **Planning: Task and progress estimation**

*“Plans are nothing,  
planning is everything”*

-Dwight D. Eisenhower



# Time estimation



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

# Activity: Estimate Time

Enter your answer here:

<https://bit.ly/313-estimation-f24>

**Only the number of days**

Task A: Simple web version of the Monopoly board game with Doha street names

Developer Team: just you

Task B: Bank smartphone app

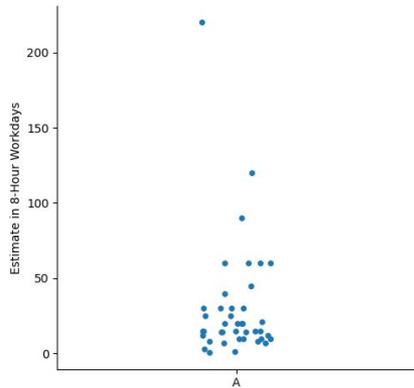
Developer Team: you with a team of 4 developers, one experienced with iPhone apps, one with background in security

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

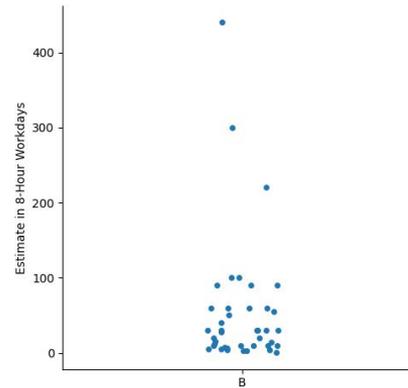


F24

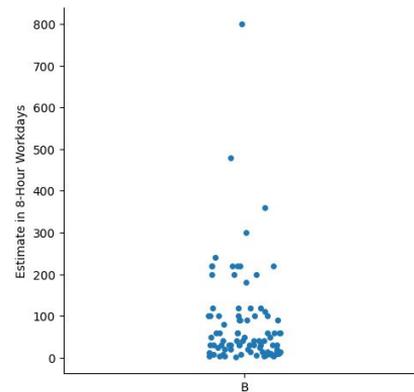
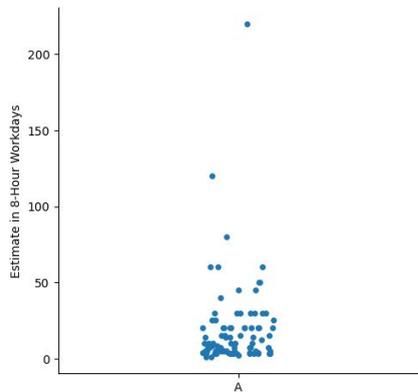
# Task 1



# Task 2



S24



# 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](http://codica.com)

# Is Estimation Evil?



[About](#) [Search](#) [Site Categories](#)

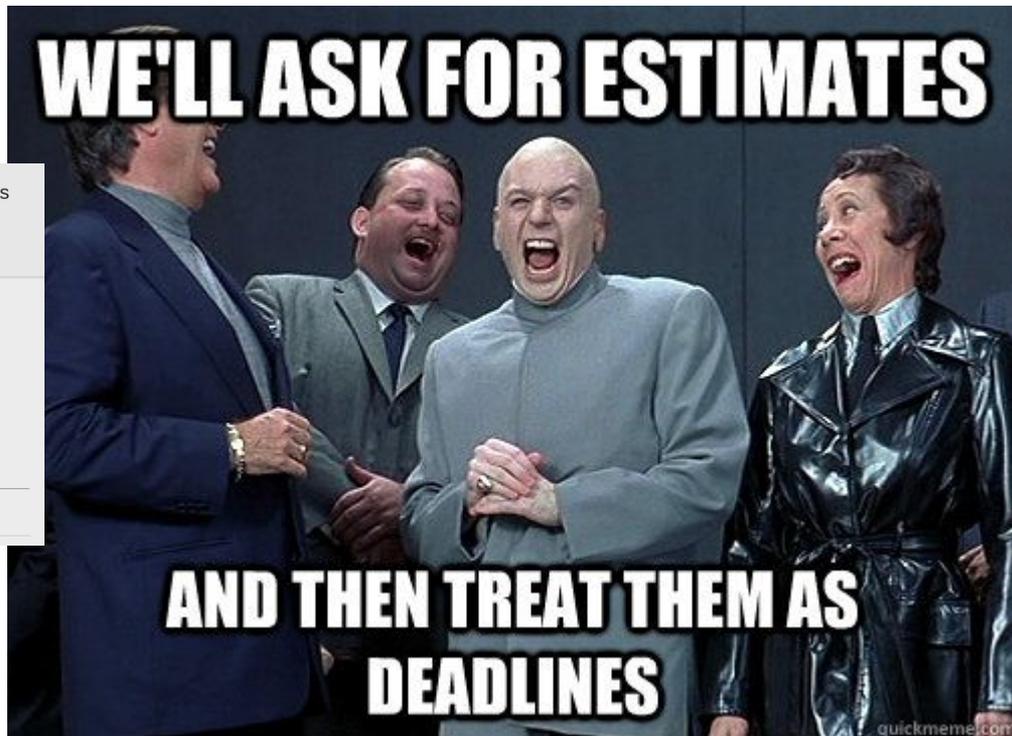
## Estimation is Evil

© 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](#)



# Measuring Progress?

- Developer judgment: x% done
- Lines of code?
- Functionality?
- Quality?



# Measuring Progress?

- “I’m almost done with the app. The frontend is almost fully implemented. The backend is fully finished except for the one stupid bug that keeps crashing the server. I only need to find the one stupid bug, but that can probably be done in an afternoon. We should be ready to release next week.”

# 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