Lecture 7: Risk and Mistakes

17-313 Fall 2022

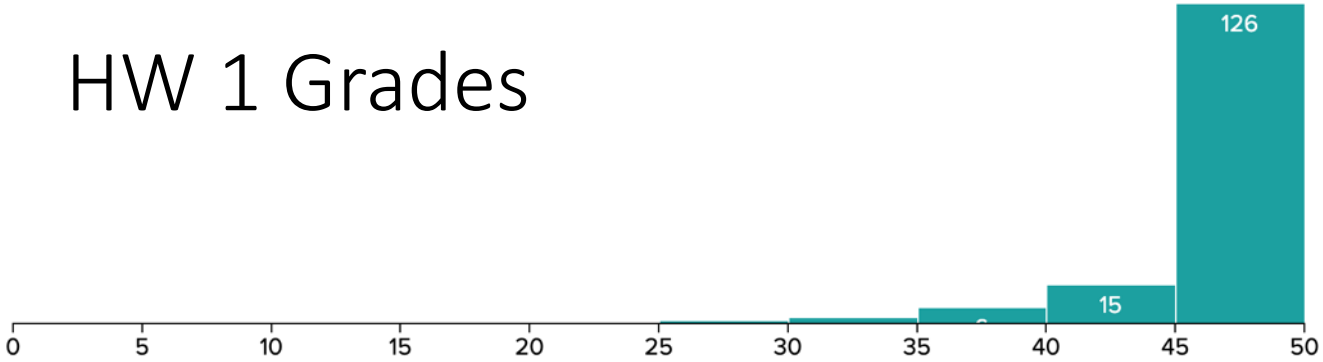
Learning Goals

- Learn to discuss risk in a project
- Strategize about ways to mitigate risk
- Learn to get early feedback to reduce risk
- Find ways to catch our technical errors

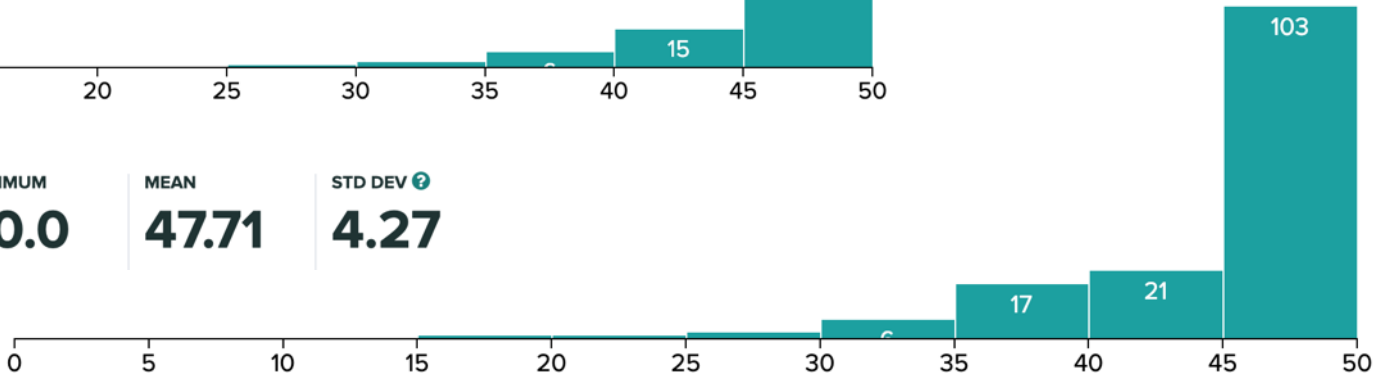
Administrivia

- Reminder: HW2 get feedback from TAs
- Participation activity: teamwork survey due Friday
- Repos will be public for HW 3
- HW 1 Grades Posted
- Statue of limitations for HW regrades is 1 week
- Participation activity to prepare for Class Thursday. Bring your laptop on Thursday.

HW 1 Grades



MEDIAN	MAXIMUM	MEAN	STD DEV
50.0	50.0	47.71	4.27



MEDIAN	MAXIMUM	MEAN	STD DEV
47.0	50.0	44.8	6.68

Risk

Risk


Tony Webster
@webster
Follow
I appreciate the honesty.
Pick a password
Don't reuse your bank password, we didn't spend a lot on security for this app.
At least 6 characters
your password
Continue
8:20 PM - 15 Sep 2018
5,868 Retweets 15,672 Likes
58
5.9K
16K

Definition: Risk

Risk is a measure of the potential inability to achieve overall program objectives within defined cost, schedule, and technical constraints.

Conrow, E. 2003. Effective Risk Management: Some Keys to Success, 2nd ed. Reston, VA, USA: American Institute of Aeronautics and Astronautics (AIAA).

Risk is defined by two key components

The probability (or likelihood) of failing to achieve a particular outcome

The consequences (or impact) of failing to achieve that outcomes

Conrow, E. 2003. Effective Risk Management: Some Keys to Success, 2nd ed. Reston, VA, USA: American Institute of Aeronautics and Astronautics (AIAA).

Internal vs. External Risk

Risks that we can control

Risks that we cannot control

Levels of Risk Management

1. **Crisis management:** Fire fighting; address risks only after they have become problems.
2. **Fix on failure:** Detect and react to risks quickly, but only after they have occurred.
3. **Risk mitigation:** Plan ahead of time to provide resources to cover risks if they occur, but do nothing to eliminate them in the first place.
4. **Prevention:** Implement and execute a plan as part of the software project to identify risks and prevent them from becoming problems.
5. **Elimination of root causes:** Identify and eliminate factors that make it possible for risks to exist at all.

"Rapid Development: Taming Wild Software Schedules," Steve McConnell, 1996

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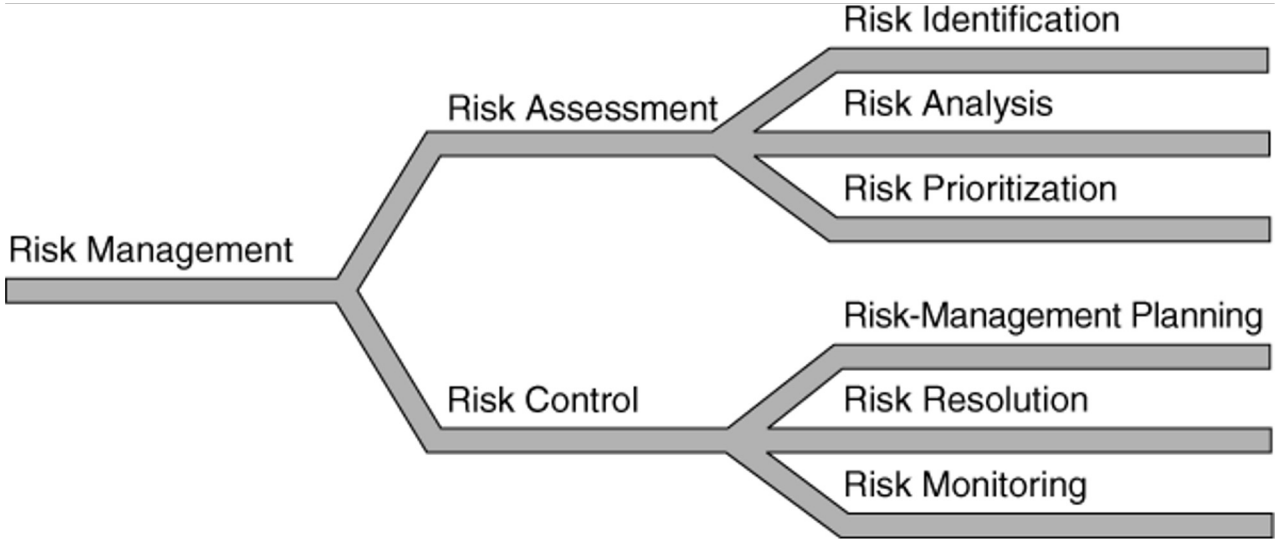
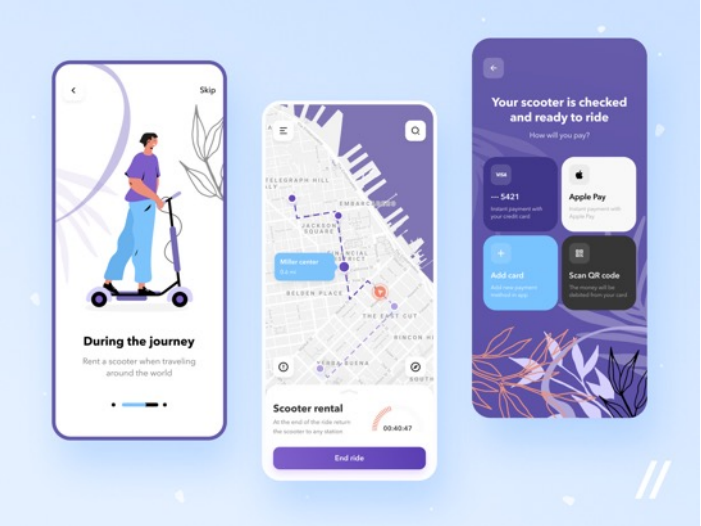
Risk Management



"Rapid Development: Taming Wild Software Schedules," Steve McConnell, 1996

Team Exercise: Risk Identification

- What risks exist for your scooter app?



Risk assessment matrix

TABLE III. Risk assessment matrix

RISK ASSESSMENT MATRIX				
SEVERITY / PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Remote (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			

- MIL-STD-882E

https://www.system-safety.org/Documents/MIL-STD-882E.pdf

Aviation failure impact categories

- **No effect** – failure has no impact on safety, aircraft operation, or crew workload
- **Minor** – failure is noticeable, causing passenger inconvenience or flight plan change
- **Major** – failure is significant, causing passenger discomfort and slight workload increase
- **Hazardous** – high workload, serious or fatal injuries
- **Catastrophic** – loss of critical function to safely fly and land

DO-178b, Software Considerations in Airborne Systems and Equipment Certification, RTCA, 1992

Risk Analysis

Risk	Probability (%)	Size of Loss (weeks)	Risk Exposure (weeks)
Overly optimistic schedule	50%	5	2.5
Additional features added by marketing (specific features unknown)	35%	8	2.8
Project approval takes longer than expected	25%	4	1.0
Management-level progress reporting takes more developer time than expected	10%	1	0.1
New programming tools do not produce the promised savings	30%	5	1.5
…	…	…	…
Total			12

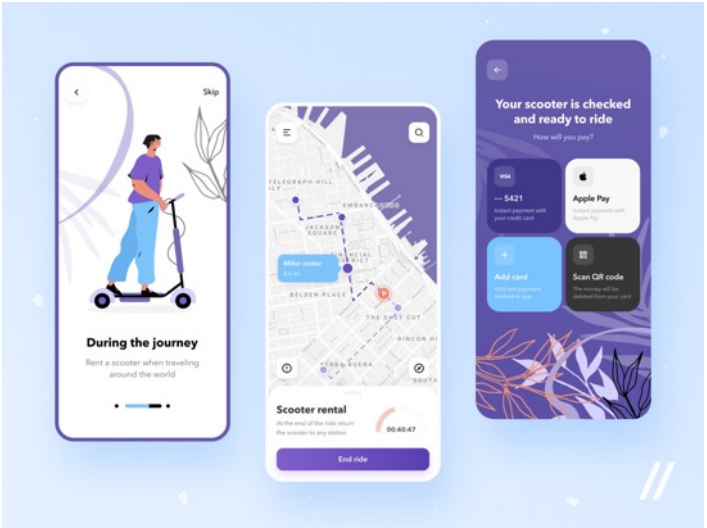
"Rapid Development: Taming Wild Software Schedules," Steve McConnell, 1996

Risk Analysis Estimations

- Size of Loss
  - Use consensus-based approaches that we discussed in previous lecture
- Probability
  - **This is much harder to estimate!**
  - Use a group-consensus approach (e.g., Planning Poker)
  - Use adjective calibration: Label each risk as “Very likely”, “Likely”, “Somewhat likely”, “Unlikely”, then convert labels into approximate quantitative values.

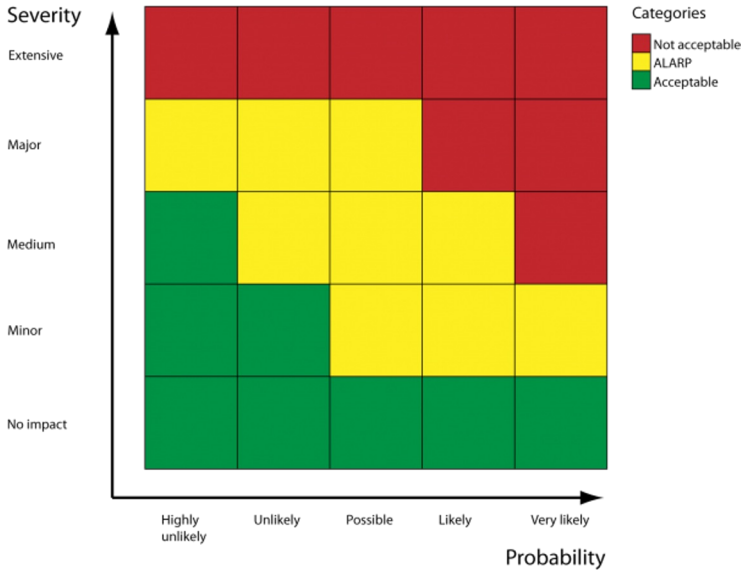
Exercise: Risk Analysis

- What is the risk severity for your scooter app?



Risk Prioritization

Focus on risks with the highest exposure



Risk Control

- What steps can be taken to avoid or mitigate the risk?
- Can you better understand and forecast the risk?
- Who will be responsible for monitoring and addressing the risk?
- Have risks evolved over time?
- Bake risks into your schedule
  - Don’t assume that nothing will go wrong between now and the end of the semester!

DECIDE Model

Detect that the action necessary

Estimate the significance of the action

Choose a desirable outcome

Identify actions needed in order to achieve the chosen option

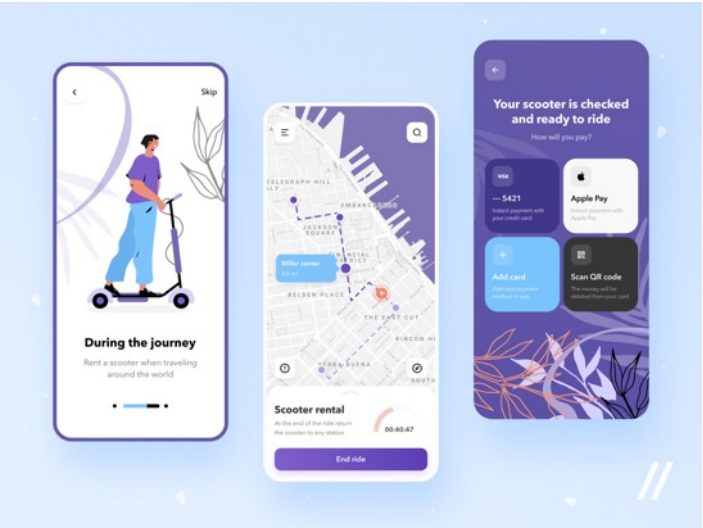
Do the necessary action to achieve change

Evaluate the effects of the action

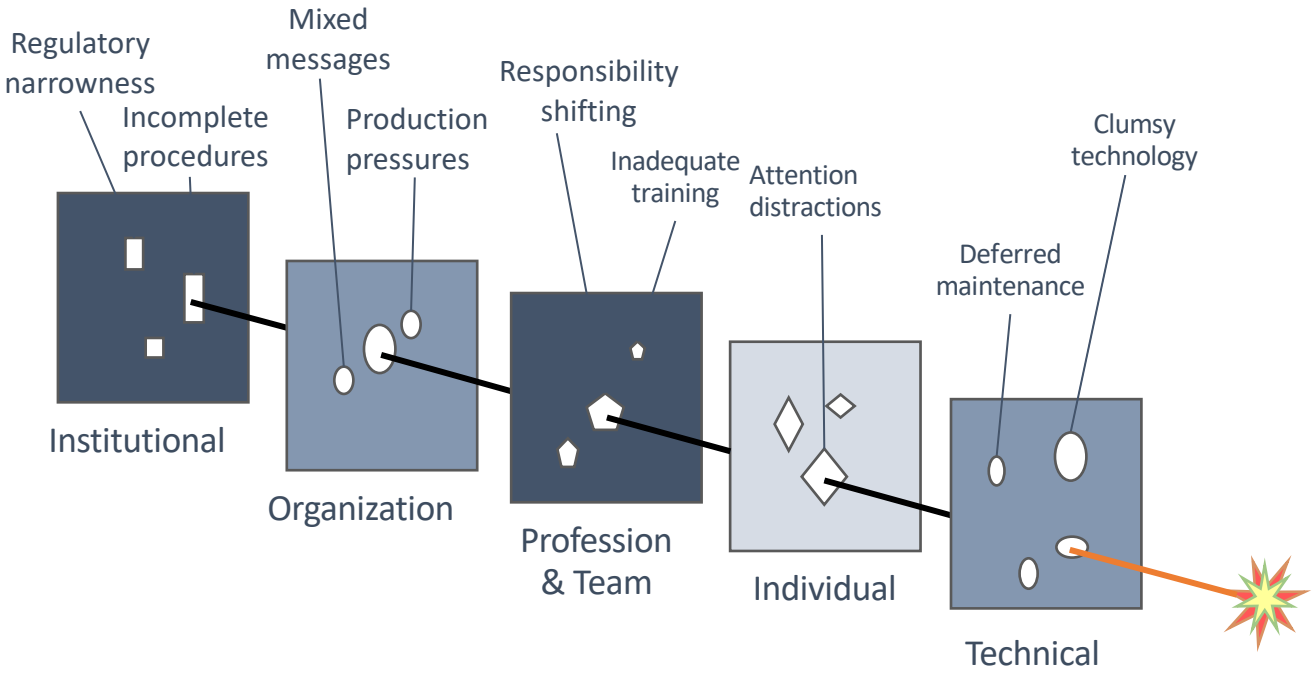
https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/FAA-H-8083-2.pdf

Discussion: Risk Elimination and Mitigation

- How can you eliminate/mitigate risk for your scooter app?

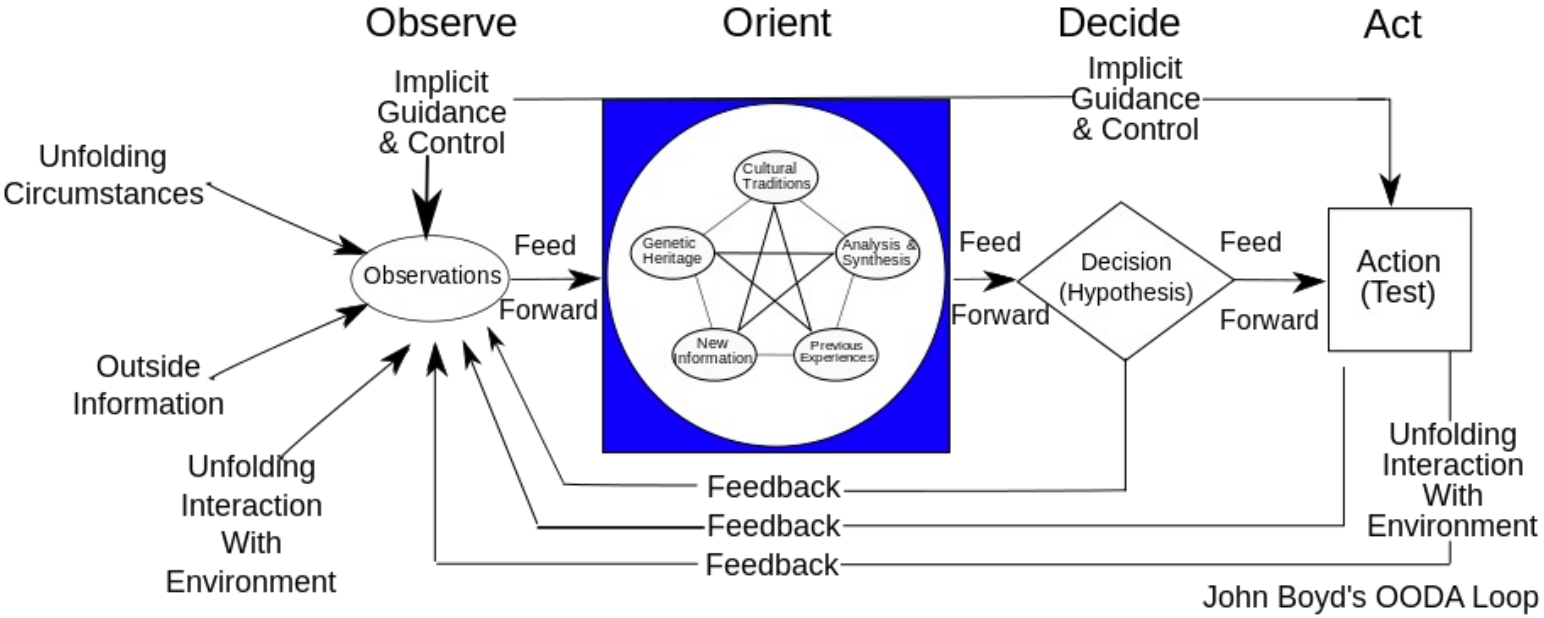


The Swiss cheese model



Modified from Reason, 1999, by R.I. Crook

OODA Loop

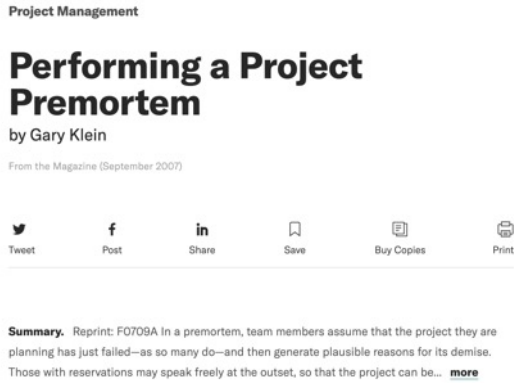


No matter what you do

- Some idiots won't follow your rules ☺

Pre-mortems

- "unlike a typical critiquing session, in which project team members are asked what *might* go wrong, the premortem operates on the assumption that the 'patient' has died, and so asks what *did* go wrong."



Project Management

Performing a Project Premortem

by Gary Klein

From the Magazine (September 2007)

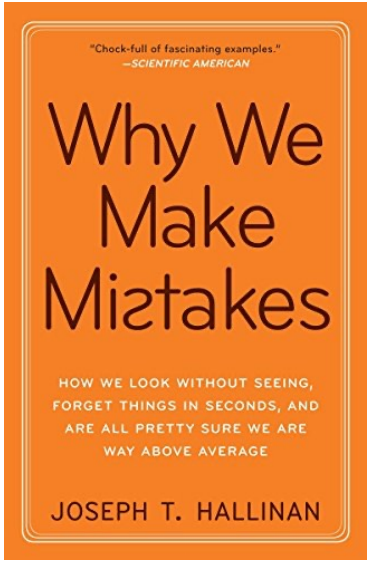
Tweet Post Share Save Buy Copies Print

Summary. Reprint: F0709A In a premortem, team members assume that the project they are planning has just failed—as so many do—and then generate plausible reasons for its demise. Those with reservations may speak freely at the outset, so that the project can be... **more**

What are things that can go wrong?

[State of Code Review 2017]

Why do we make misakes?



Generalization

- …in the words of psychologist Tom Stafford, we can't find our typos because we're engaging in a high-level task in writing. **Our brains generalize simple, component parts to focus on complex tasks**, so essentially we can't catch the small details because we're focused on a large task.

https://medium.com/swlh/why-we-miss-our-own-typos-96ab2f06afb7

Boredom can give rise to errors, adverse patient events, and decreased productivity—costly and unnecessary outcomes for consumers, employees, and organizations alike. As a function of boredom, individuals may feel over-worked or under-employed, and become distracted, stressed, or disillusioned. Staff who are bored also are less likely to engage with or focus on their work.

Original Articles

Boredom in the Workplace: Reasons, Impact, and Solutions

Michelle Cleary , PhD, RN, Jan Sayers , PhD, RN, Violeta Lopez , PhD, RN & Catherine Hungerford , PhD, RN

Pages 83-89 | Received 24 Jun 2015, Accepted 13 Aug 2015, Published online: 10 Feb 2016

Download citation https://doi.org/10.3109/01612840.2015.1084554 Check for updates

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Abstract

Boredom in the workplace is not uncommon, and has been discussed widely in the academic literature in relation to the associated costs to individuals and organizations. Boredom can give rise to errors, adverse patient events, and decreased productivity—costly and unnecessary outcomes for consumers, employees, and organizations alike. As a function of boredom, individuals may

Related rese

People also read

Boredom at work spillover model work motivation boredom

Cognitive Load

- ...” students who switch back and forth between attending to a classroom lecture and checking e-mail, Facebook, and IMing with friends”

Computers & Education 62 (2013) 24–31

Contents lists available at SciVerse ScienceDirect

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Laptop multitasking hinders classroom learning for both users and nearby peers

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[b] York University, Department of Psychology, 4700 Keele Street, Toronto, ON M3J 1P3, Canada
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ARTICLE INFO

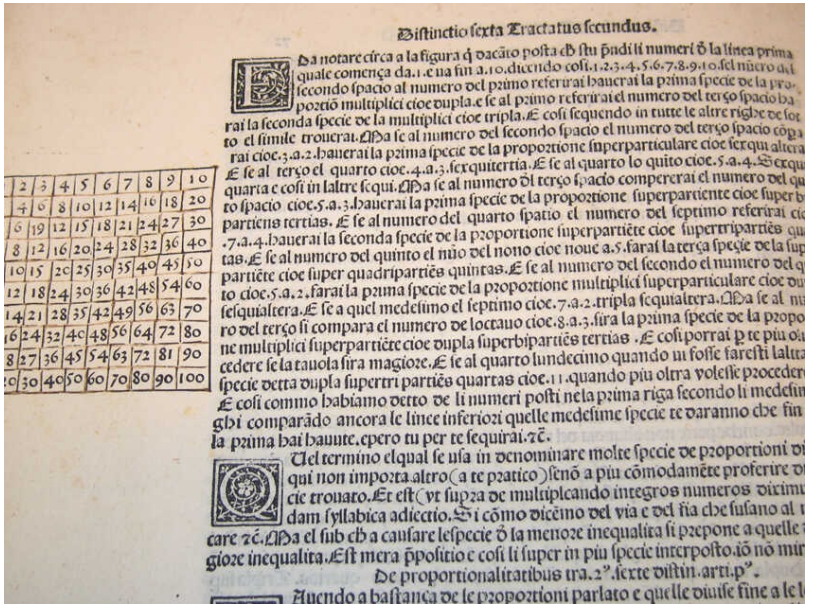
ABSTRACT

Can we remove human error?

Can we ~~remove~~ catch human error?

Can we catch human error before we ship our code?

Can we automate tasks to prevent problems?



Distinctio sexta Tractatus secundus.

Da notare circa a la figura ꝯ dacäto posta ch stu ꝑdi li numeri ō la linea prima quale comença da.1.e na fin a.10.ducendo cosi.1.2.3.4.5.6.7.8.9.10.sel nūero del secondo spacio al numero del primo referirai haverai la prima specie de la proportiō multiplici cioe dupla.e se al primo referirai el numero del terço spacio ha rai la seconda specie de la multiplici cioe tripla.Æ cosi seguendo in tutte le altre righe de to el simile troverai.Mda se al numero del secondo spacio el numero del terço spacio cō to.3.a.2.haverai la prima specie de la proportione superparticulare cioe sexqui altera Æ se al terço el quarto cioe.4.a.3.sexquitertia.Æ se al quarto lo quito cioe.5.a.4.Sexqui quarta e cosi in laltre sequi.Mda se al numero del terço spacio compererai el numero del qu to spacio cioe.5.a.3.haverai la prima specie de la proportione superpartiente cioe super partiens tertias.Æ se al numero del quarto spatio el numero del septimo referirai cio .7.a.4.haverai la seconda specie de la proportione superpartiēte cioe supertripartiēs qu tas.Æ se al numero del quinto el nūo del nono cioe noue a.5.farai la terça specie de la sup partiēte cioe super quadripartiēs quintas.Æ se al numero del secondo el numero del q to cioe.5.a.2.farai la prima specie de la proportione multiplici superparticulare cioe du sesquialtera.Æ se a quel medesimo el septimo cioe.7.a.2.tripla sequialtera.Mda se al nu ro del terço si compara el numero de lottauo cioe.8.a.3.sira la prima specie de la propo ne multiplici superpartiēte cioe dupla superbipartiēs tertias .Æ cosi porrai ꝑ te piu oa cedere se la tauola sira magiore.Æ se al quarto lundecimo quando ui fosse taresti laltra specie detta dupla supertri partiēs quartas cioe.11.quando piu oltra volesse procedere Æ cosi commo habiamo detto de li numeri posti nela prima riga secondo li medesim ghi comparādo ancora le linee inferiori quelle medesime specie te daranno che fin la prima hauute.cpero tu per te sequirai.tē.

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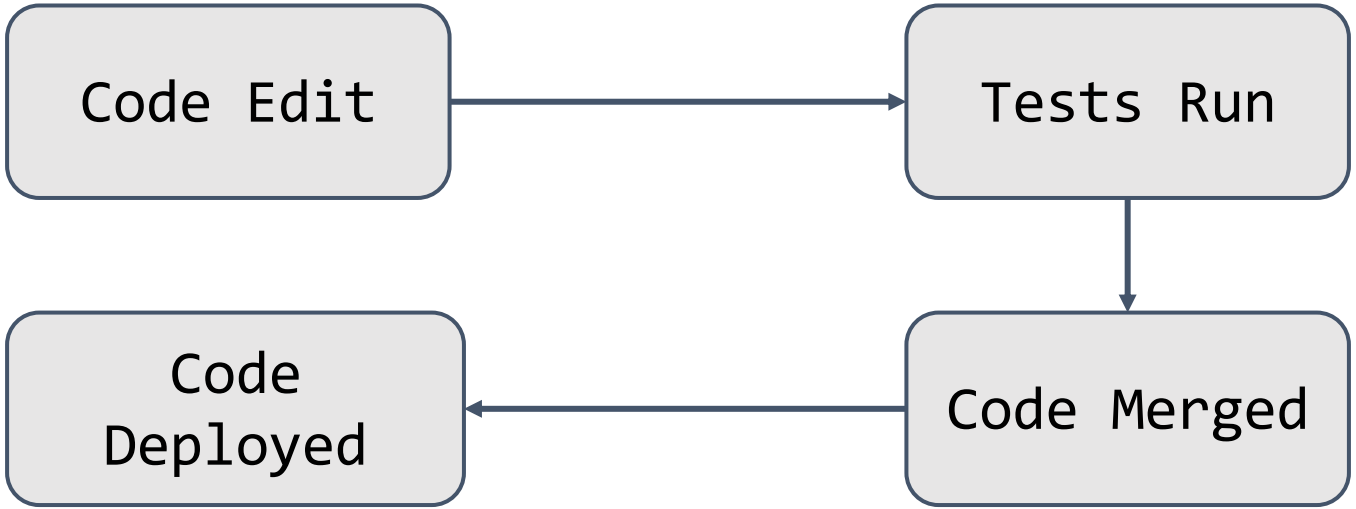
CI/CD Pipeline overview



Continuous Integration:

Catch mistakes before you push your code!

History of CI

(1999) Extreme Programming (XP) rule: “Integrate Often”

(2000) Martin Fowler posts “Continuous Integration” blog

(2001) First CI tool

(2005) Hudson/Jenkins

(2011) Travis CI

(2019) GitHub Actions

Sample CI Workflow

Create Pull Request

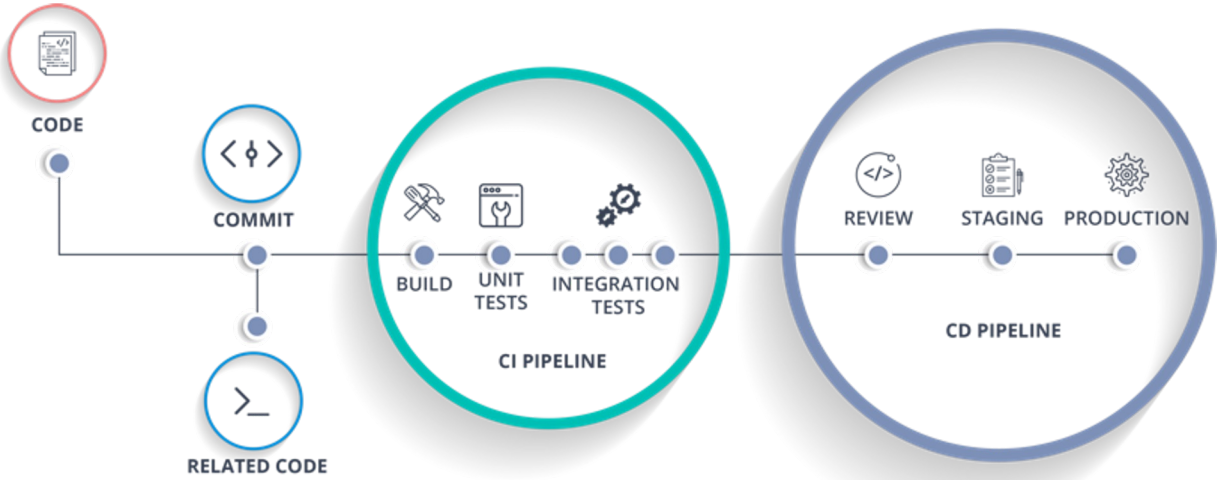
GitHub tells Travis CI build is mergeable

It builds and passes tests

Travis updates PR

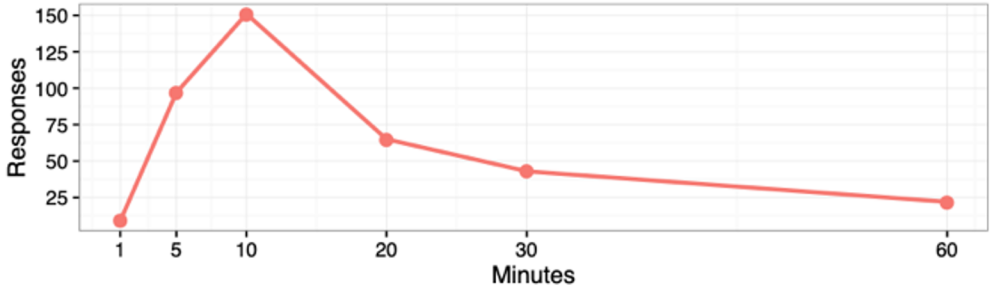
PR is merged

Example CI/CD Pipeline



CI Research

“My favorite way of thinking about build time is basically, you have tea time, lunch time, or bedtime…”



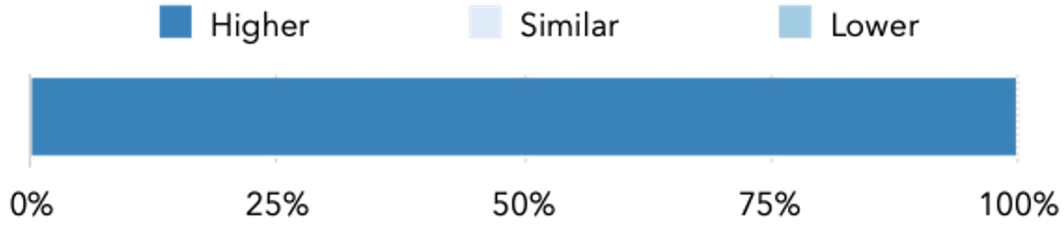
Developers say:

CI helps us catch bugs earlier
CI makes us less worried about breaking our builds
CI lets us spend less time debugging

“[CI] does have a pretty big impact on [catching bugs]. It allows us to find issues even before they get into our main repo, ... rather than letting bugs go unnoticed, for months, and letting users catch them.”

Developers report:

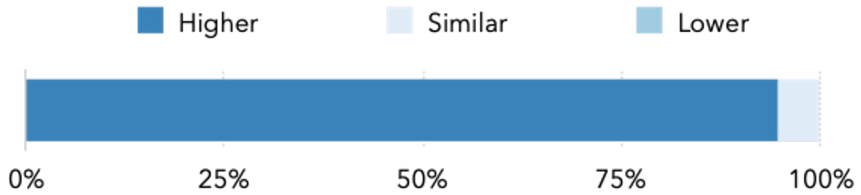
Do developers on projects with CI give (more/similar/less) value to automated tests?



Developers report:

Do developers on projects with CI give (more/similar/less) value to automated tests?

Do projects with CI have (higher/similar/lower) test quality?



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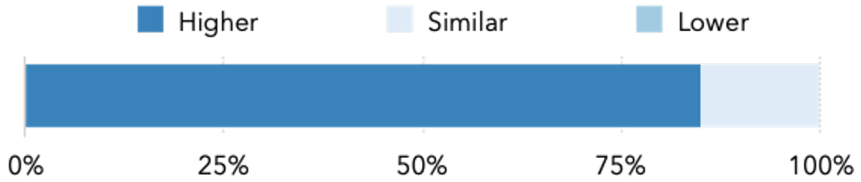

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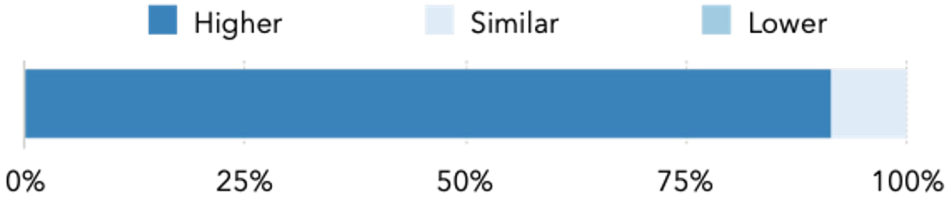
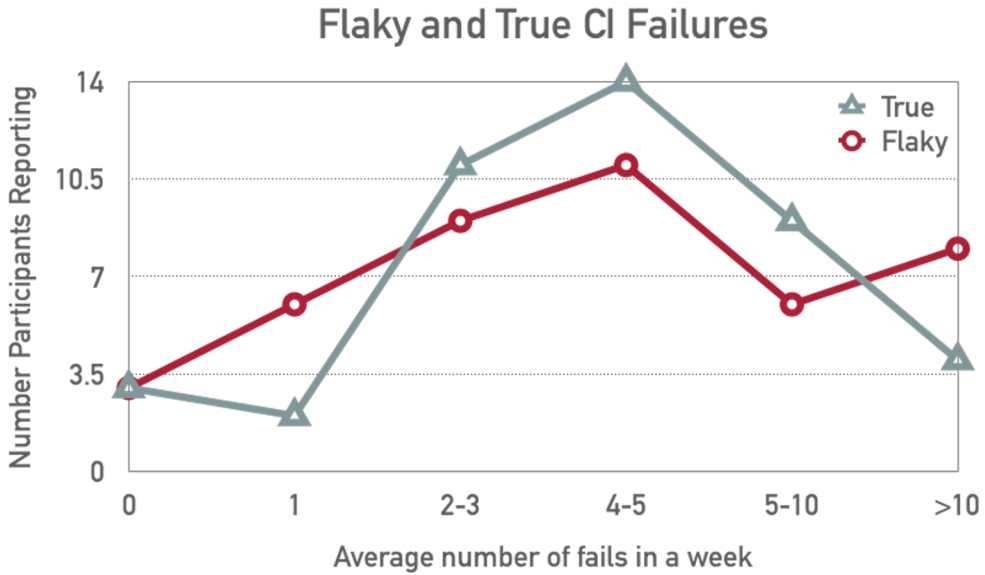
Do projects with CI have (higher/similar/lower) test quality?
Do projects with CI have (higher/similar/lower) code quality?
Are developers on projects with CI (more/similar/less) productive?



Challenge: Flaky Tests

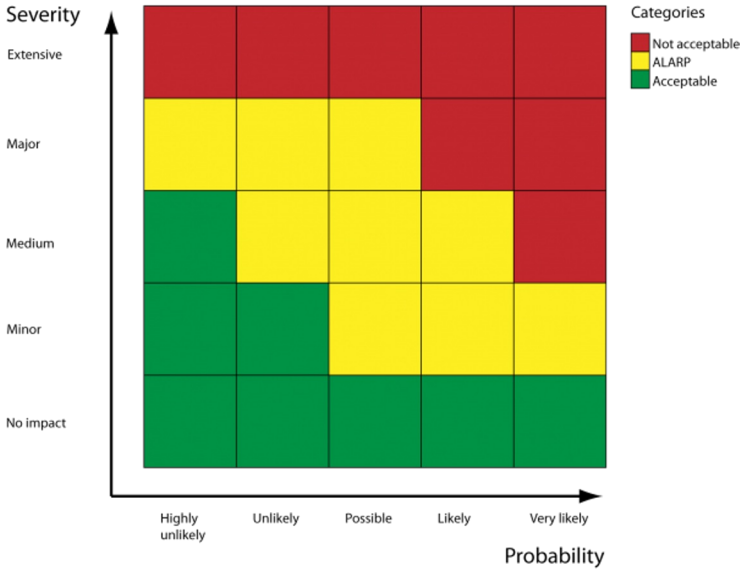


Observation

CI helps us catch errors before others see them

Risk Analysis:

- Probability a human makes a mistake: Very Likely
- Severity: ranges, but could be extensive



Solution:
Use CI to catch your mistakes, make you look better, and mitigate your risks!