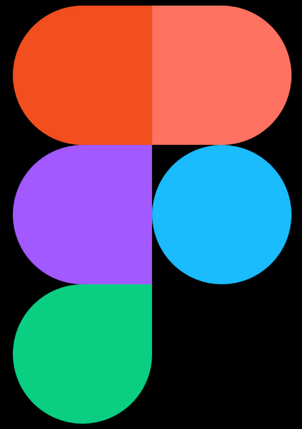
# Engineering at Scale

## A Breadth-First Overview



# Development Velocity

# Development Velocity

Engineering work done per unit time

# Development Velocity

Includes the time to:

- Ship features
- Fix bugs
- Deal with legacy code
- Onboard new engineers
- Coordinate across teams

Build

Test

Launch

**Build**

Test

Launch

# Version Control

# Commits

Logical grouping of changes

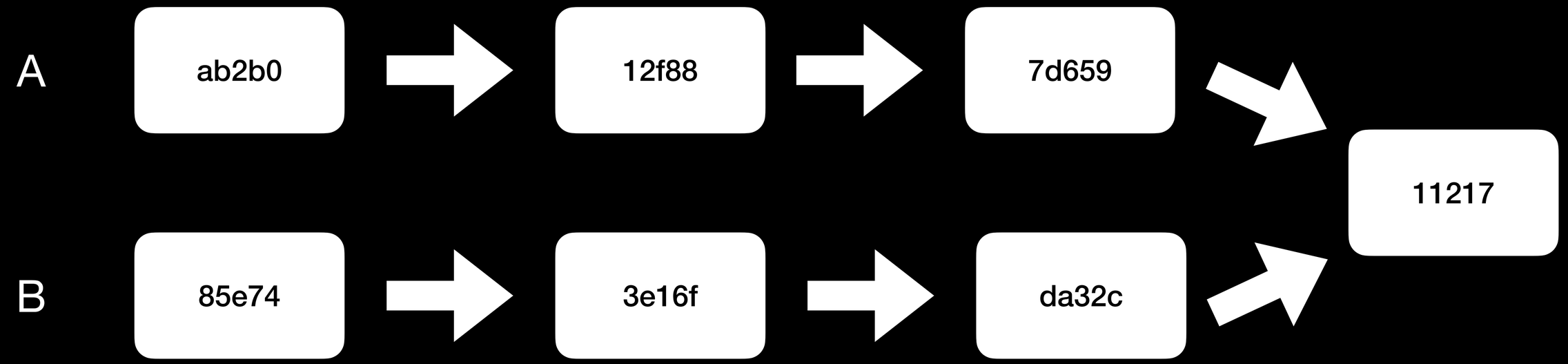
- “Add support for X feature”
- “Update docs to include Y”
- “Fix Z bug in sign-up flow”

# Commit Hash

Add support
for X feature

Update docs
to include Y

Fix Z bug in
sign-up flow


A
ab2b0
12f88
7d659
B
85e74
3e16f
da32c
11217

**Developer 1**

```
def show_profile():
  show_photo()
  show_name()

def page():
  show_profile()
```

**Developer 2**

```
def show_profile():
  show_photo()
  show_friends()

def page():
  show_profile()
```

# Merge Conflict

**Developer 1**

```
def show_profile():
  show_photo()
  show_name()

def page():
  show_profile()
```

**Developer 2**

```
def show_profile():
  show_photo()
  show_friends()

def page():
  show_profile()
```

# Code Reviews

Conversation 2 | Commits 1 | Checks 0 | Files changed 1

**tmacwill** commented on Jun 3, 2020 — Member

when searching for nodes matching some text, make sure only whole words
match rather than substrings. this fixes cases where unexpected results
show up for short query strings.

`use word boundaries for nodesMatching` ··· `1bf55bb`

**tmacwill** commented on Jun 3, 2020 — Member, Author

**@ummcheng** lemme know what you think of this change! was using the extension for a bit, and noticed that I'd get multiple link matches when I didn't expect it (e.g., I said `click hack` and it also matched a link with `hacker`). this might be overly restrictive, though—want to hear your thoughts.

**ummcheng** commented on Jun 4, 2020 — Member

This makes sense to me!

**tmacwill** merged commit **`566f0f3`** into `master` 22 days ago — Revert

53 ui/src/main/active-app.ts

Viewed

```
40      async pollFileLanguage() {
41        // Get a minimum amount of data from plugins to update the client's
42        // mode indicator.
43  -     if (this.hasPlugin()) {
44  -       let editorState = await App.clientManager.sendResponseToActive({
45            execute: {
46              commandsList: [
47                {
48                  type: "COMMAND_TYPE_GET_EDITOR_STATE",
```

```
28      async pollFileLanguage() {
29        // Get a minimum amount of data from plugins to update the client's
30        // mode indicator.
31  +     if (this.pluginConnected()) {
32  +       let editorState = await App.pluginManager.sendResponseToActive({
33            execute: {
34              commandsList: [
35                {
36                  type: "COMMAND_TYPE_GET_EDITOR_STATE",
37  +               limited: true,
```

**ummcheng** 6 days ago

It sounds like we need to update all the editor plugins to recognize this flag?

# Architecture

# Monolith vs. Microservices

# Monolith vs. Microservices

Monolith

- Single repository
- Tight coupling
- Unified standards
- Shared tooling
- Google, Facebook

Microservices

- Many repositories
- Hard boundaries
- Per-service standards
- Service-specific tooling
- Uber, Netflix

# Tradeoffs

# Code Quality

VELOCITY
DON'T CARE ABOUT CODE QUALITY
CARE ABOUT CODE QUALITY
TIME

# Technical Debt

# Technical Debt

- Cutting corners
- Patching old systems
- Context loss

# DRY

# DRY

Don’t Repeat Yourself

```
def display_items():
  items = get_inventory()
  for item in items:
    print(f"Price: {item['price']}")

def display_cart():
  items = get_cart()
  for item in items:
    print(f"Price: {item['price']}")
```

```
def display(items):
  for item in items:
    print(f"Price: {item['price']}")

def display_items():
  display(get_inventory())

def display_cart():
  display(get_cart())
```

# Abstractions

# Abstractions

- Getting data from a database
- Formatting data for an API
- Communicating with servers
- Handling errors

# WET

# WET

Write Everything Twice

“Premature optimization is the root of all evil”

# Solutions

# The Six-Month Rule

- How long will this take?
- How much time will it save?
- Does the break-even happen within 6 months?

# Cleanup days

# Expiration dates

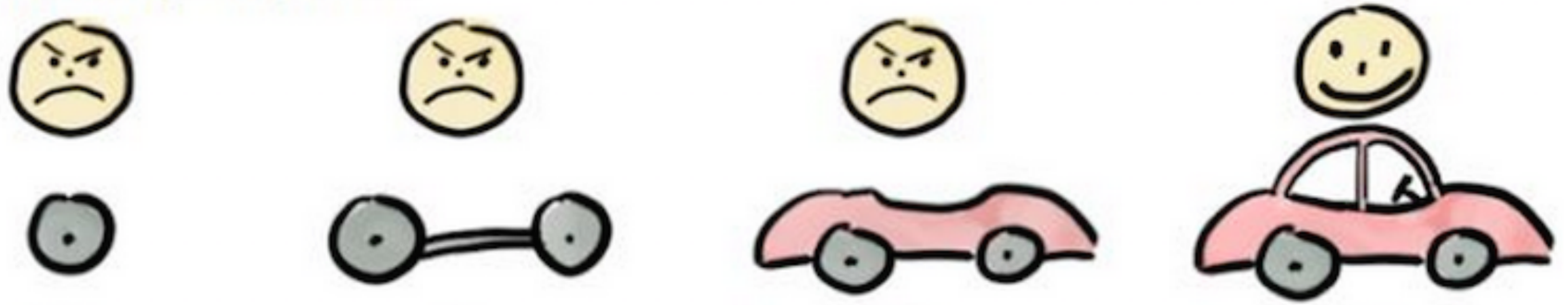
# Migrations

# Migrations

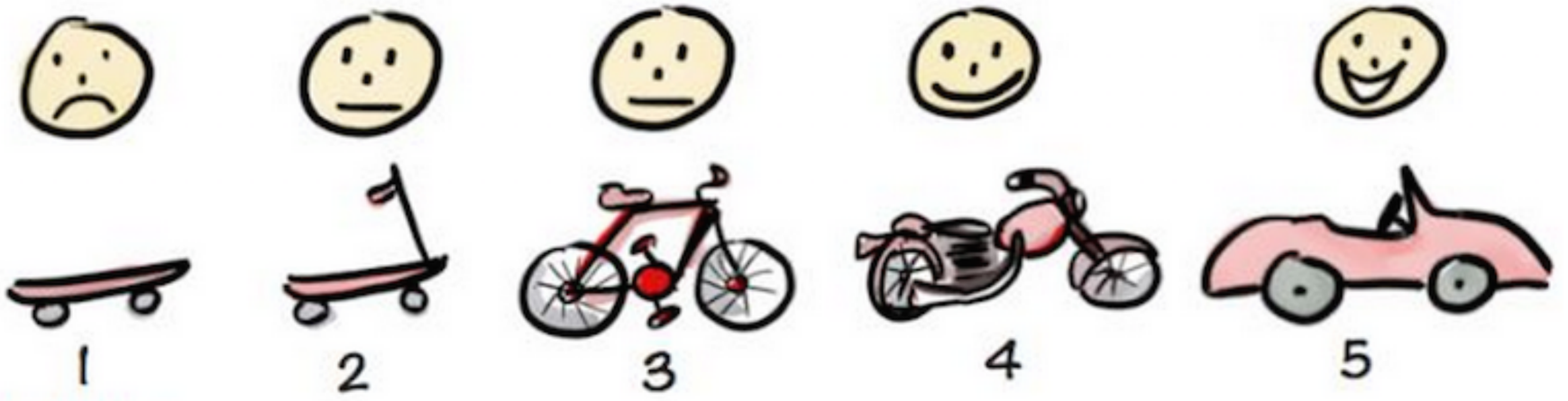
Replacing the screws on a rocket after you've already launched it

# Stepping stones, not milestones

## Not like this....

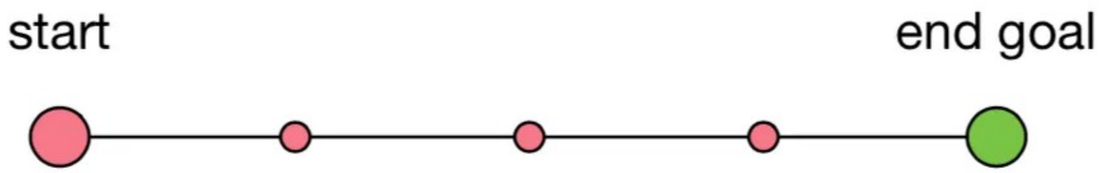



## Like this!

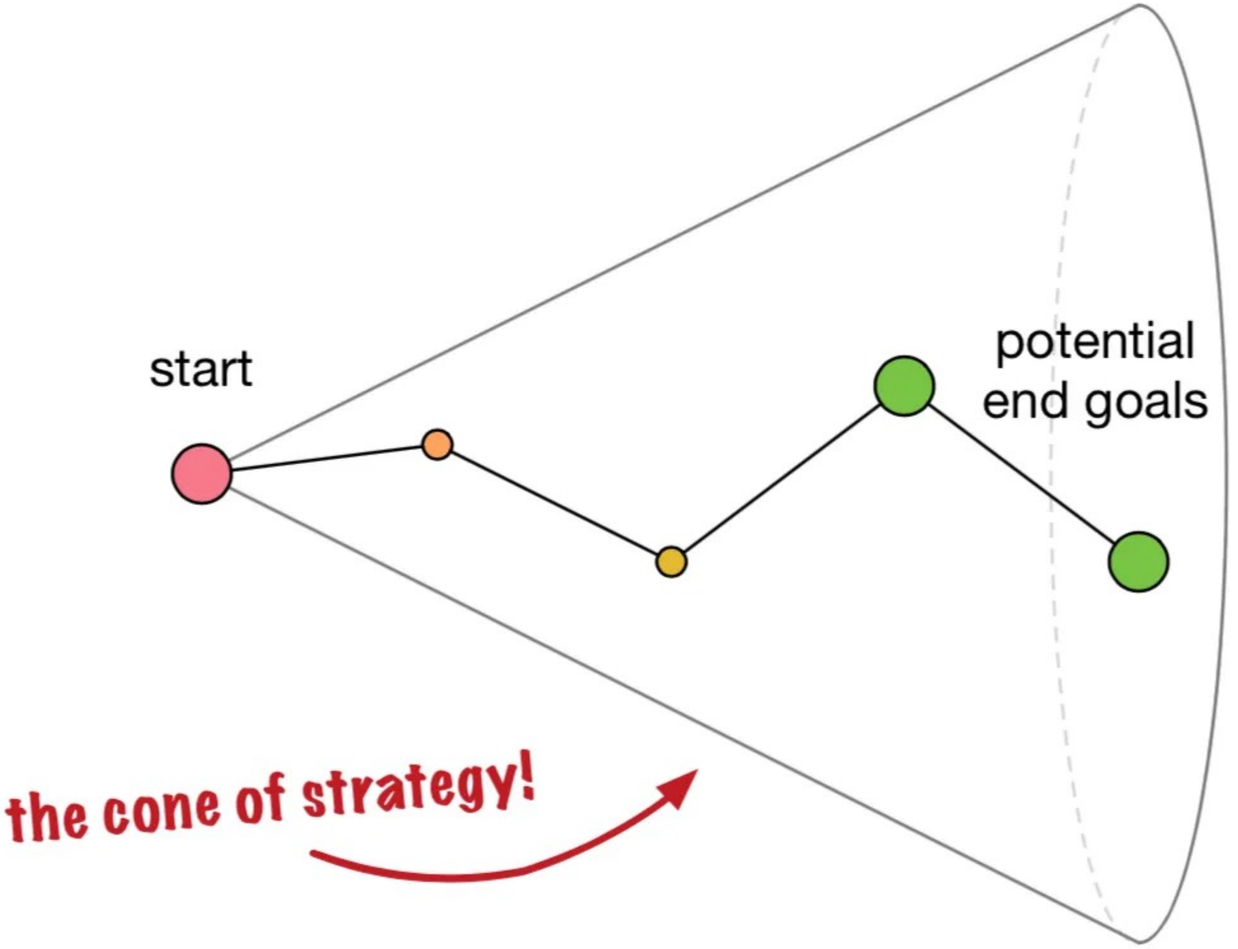


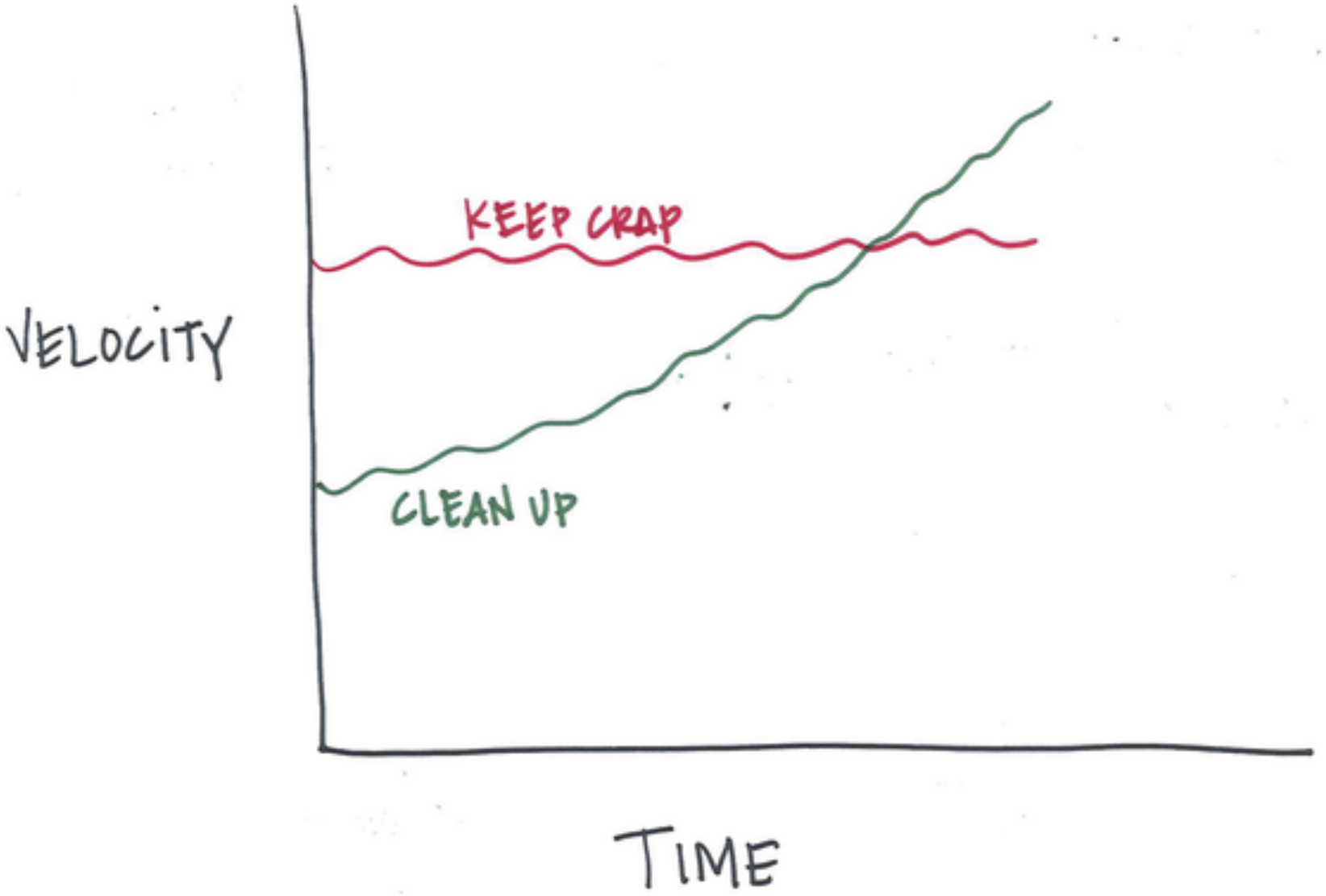

Henrik Kniberg

## Idealized Project Execution




## Real-world Project Execution




KEEP CRAP
CLEAN UP
VELOCITY
TIME

# Tradeoffs

Build

**Test**

Launch

# Software Testing

# Unit Testing

- Test a single piece of functionality
- Fully independent tests
- Runs isolated code

```
def test_share():
    file = create_file()
    assert file["editors"] == 1
    share_file(file, user)
    assert file["editors"] == 2
```

# Integration Testing

- Testing an entire flow
- Lots of dependencies
- Can run on real data

```
def test_new_file():
    load_url("https://figma.com")
    log_in("tommy", "password")
    click("New File")
    type("My Filename")
    ...
```

# Regression Testing

- New changes shouldn’t break existing functionality
- Test other features with your new code

# Acceptance Testing

- Does this meet the spec?
- Beta programs, insider releases

# Performance Testing

- Simulate high system load
- Simulate components failing

# A/B Testing

Generate a hypothesis

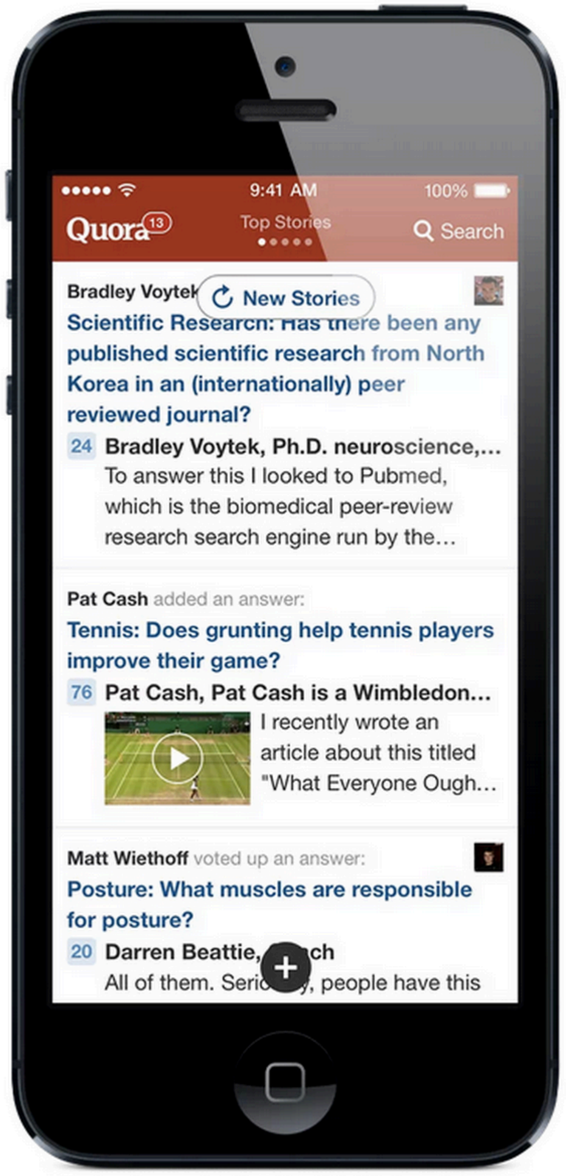
Implement the experiment

Measure impact

**Generate a hypothesis**

Implement the experiment

Measure impact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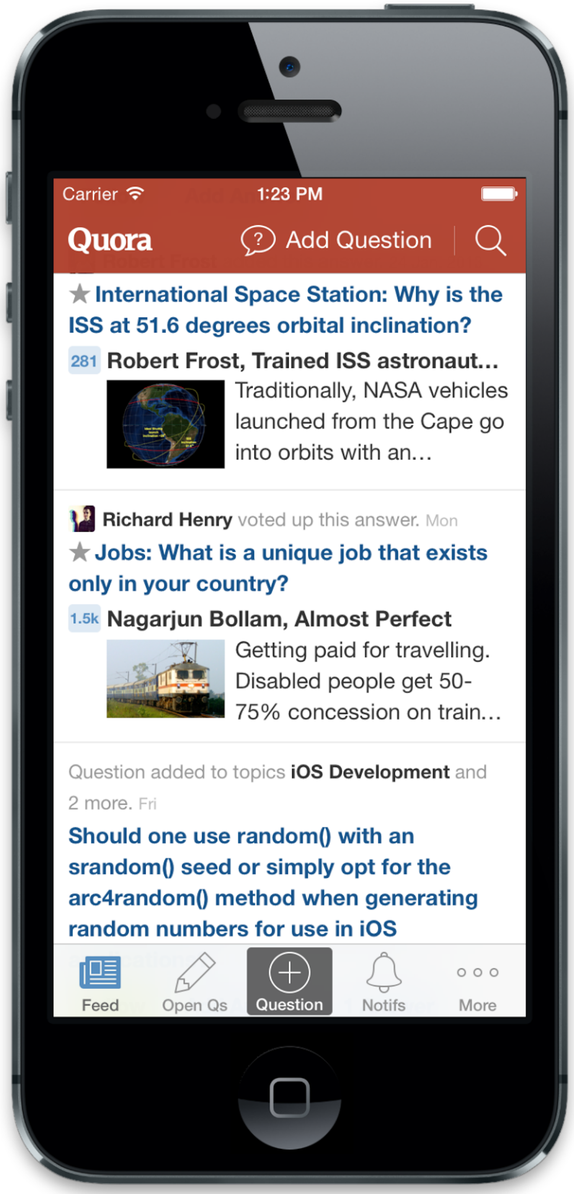
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Question added to topics iOS Development and 2 more. Fri
Should one use random() with an srandom() seed or simply opt for the arc4random() method when generating random numbers for use in iOS
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B

“It’s easier to see what pages are available”

— Your engineer, probably

“It’s more obvious how to add a question, which will lead to more questions”

— Your data scientist, probably

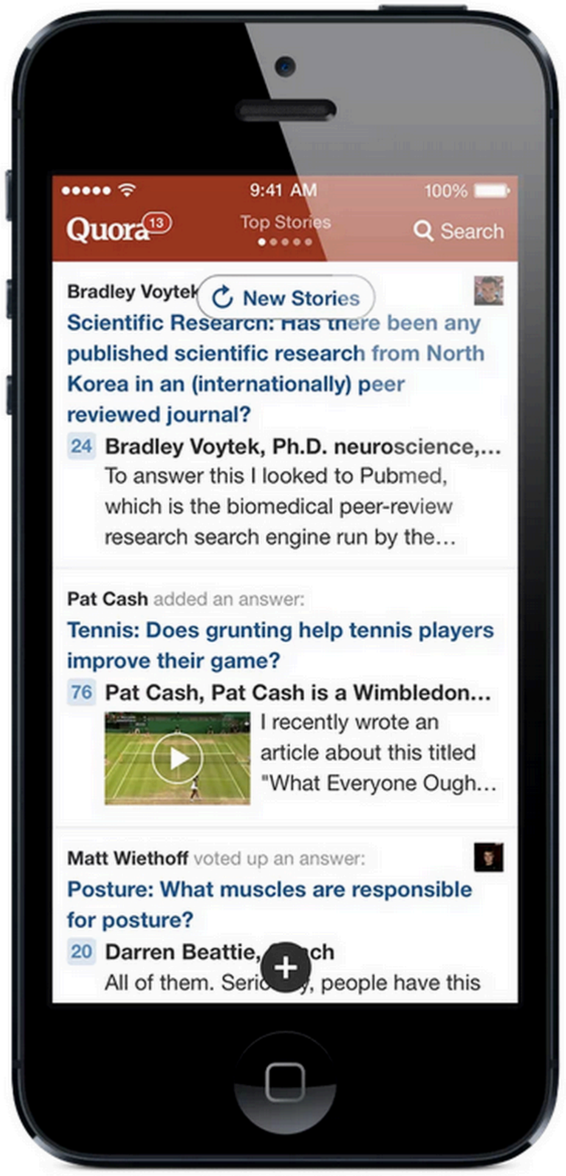
“Swipe gestures are trending right now”

— Your designer, probably

Generate a hypothesis

**Implement the experiment**

Measure impact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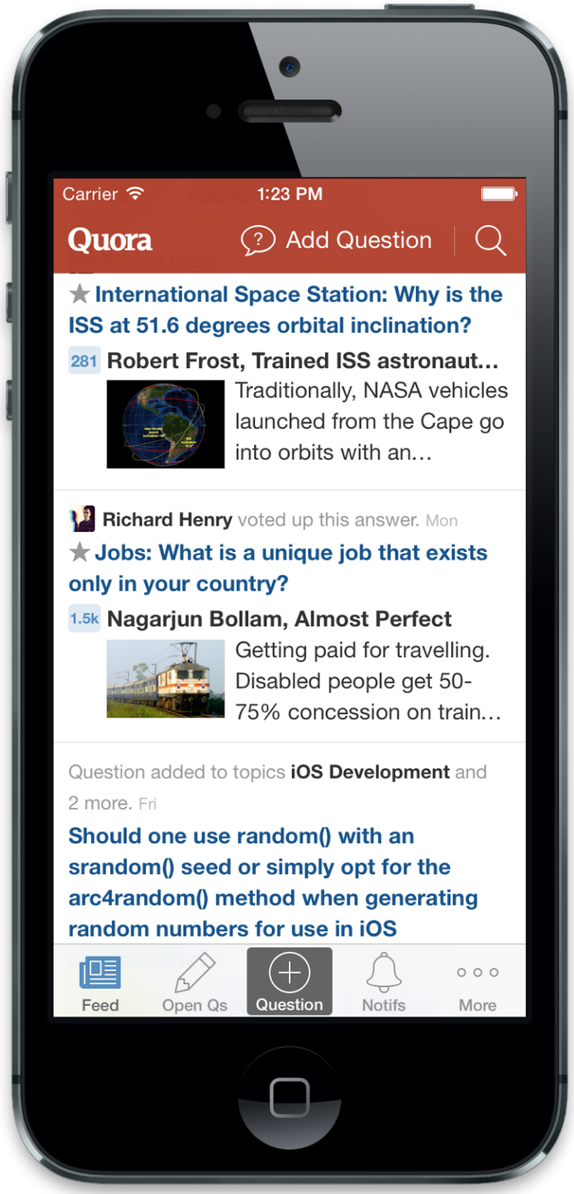
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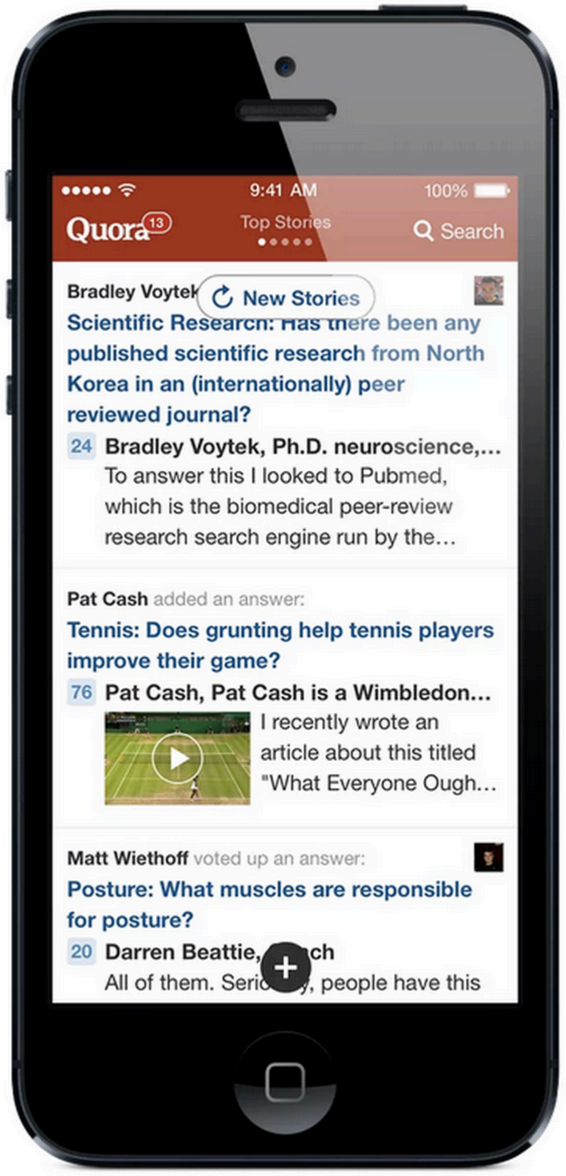
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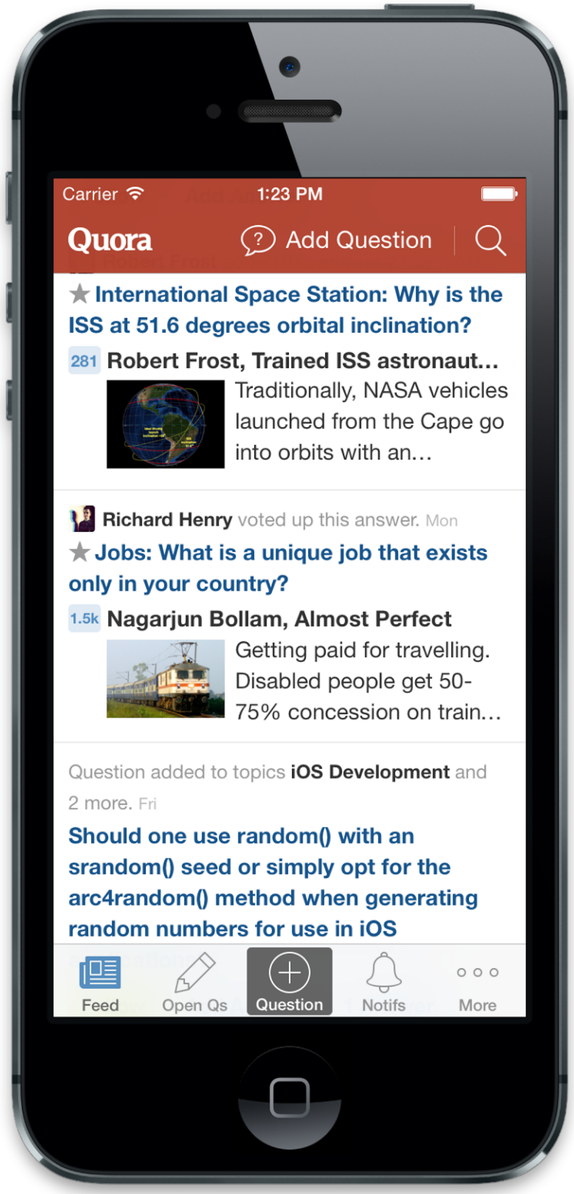
70%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30%

```
define_experiment('tab_bar',
  buckets=[
    (range(0, 30), True),
    (range(30, 100), False)
  ]
)
```

```
def render():
  if experiment.get('tab_bar'):
    return render_with_bar()
  else:
    return render_without_bar()
```

Generate a hypothesis

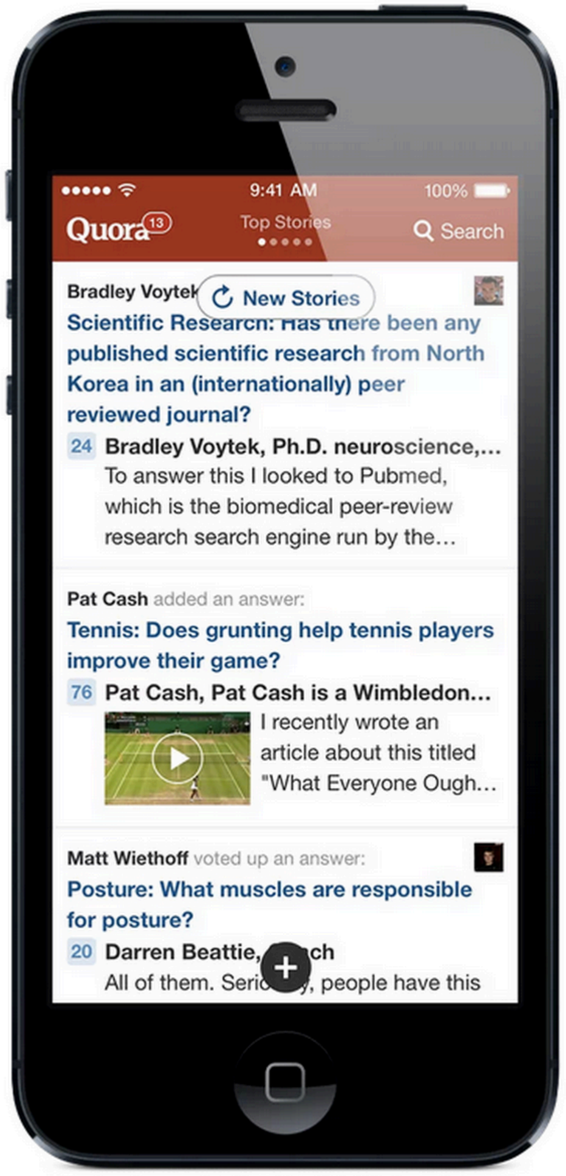
Implement the experiment

**Measure impact**

# Analytics

- Firebase
- Mixpanel
- LaunchDarkly
- Statsig
- In-house

# Key Metrics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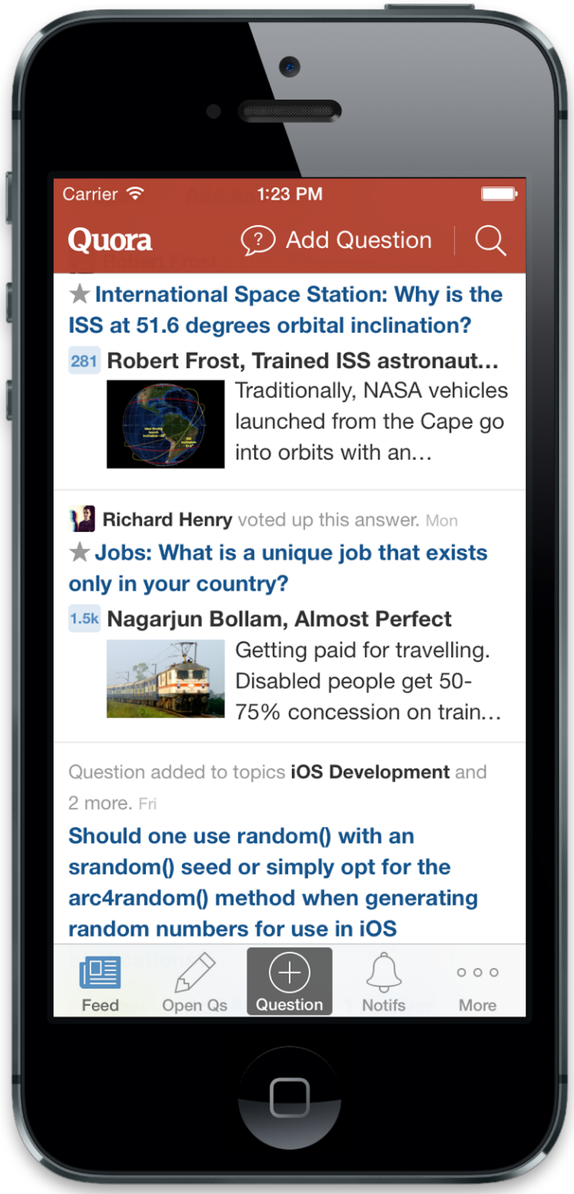
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# Key Metrics

- Engagement?
- Performance?
- Cost?
- Complexity?

-4%
-3%
-2%
-1%
0%
1%
2%
3%
4%
Delta %
1 local_event_sessions
-0.0372±0.1530
2 local_dap
0.1180±0.1226
3 local_searches
0.0123±0.1687
4 messages_sent
0.3181±0.1568
5 local_event_shares
-0.0198±0.1834
core
6 foreground app deaths
0.4066±0.1632
7 gCPU cycles
0.2059±0.1674
8 unknown
0.3373±0.3834
9 revenue
0.1599±0.3846
10 frame_drops
-1.1169±1.4519
11 bytes_sent
4.1390±2.1653

# Tradeoffs

Build

Test

**Launch**

# Deployment Strategies

Manual

Scheduled

Continuous

**Manual**

Scheduled

Continuous

Manual

**Scheduled**

Continuous

Manual

Scheduled

**Continuous**

# Company 1

- B2B company for medical records
- Contracts include reliability SLAs
- 50 employees

# Company 1 Strategy: Scheduled

- Tuesday: Code freeze
- Tuesday night: QA team tests
- Wednesday: Staged rollout to “insider” customers
- Thursday: Wide rollout
- Friday: Release critical patches

# Company 2

- Consumer social network
- Ad-based revenue
- 5000 employees

# Company 2 Strategy: Continuous

- Every few hours:
  - Full suite of tests runs on latest code
  - Employee version switches to latest code for an hour
  - Release if no red flags
- Bugs? Fix in the next release

# Tradeoffs

# Q&A

# Engineering at Scale

## A Breadth-First Overview