

Software Engineering

CS50 for MBAs

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Software Engineering

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 groupings of changes

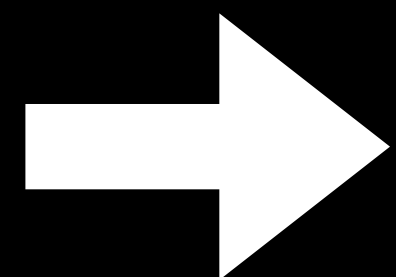
- “Add support for X feature”
- “Update docs to include Y”
- “Fix Z bug in sign-up flow”

Commit Hash

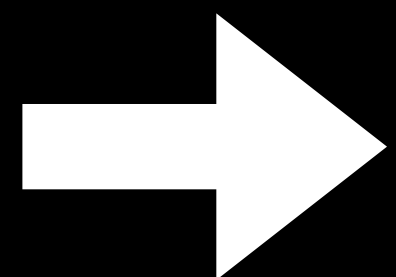


A

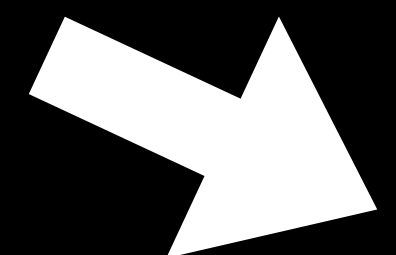
ab2b0



12f88



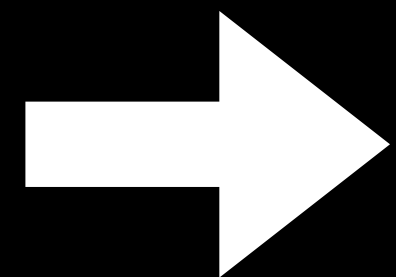
7d659



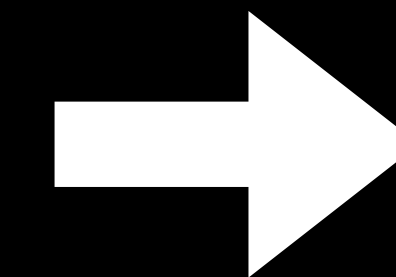
94105

B

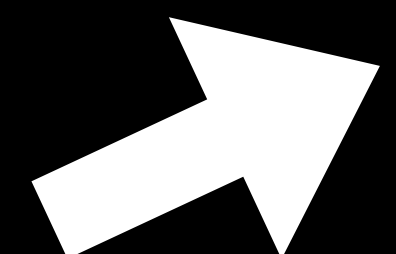
85e74



3e16f



da32c



94105

Merge Conflict

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

```
def page():  
    show_profile()
```

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

```
def page():  
    show_profile()
```

Code Reviews

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?

 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

Architecture

Monolith vs. Microservices

Monolith vs. Microservices

Monolith

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

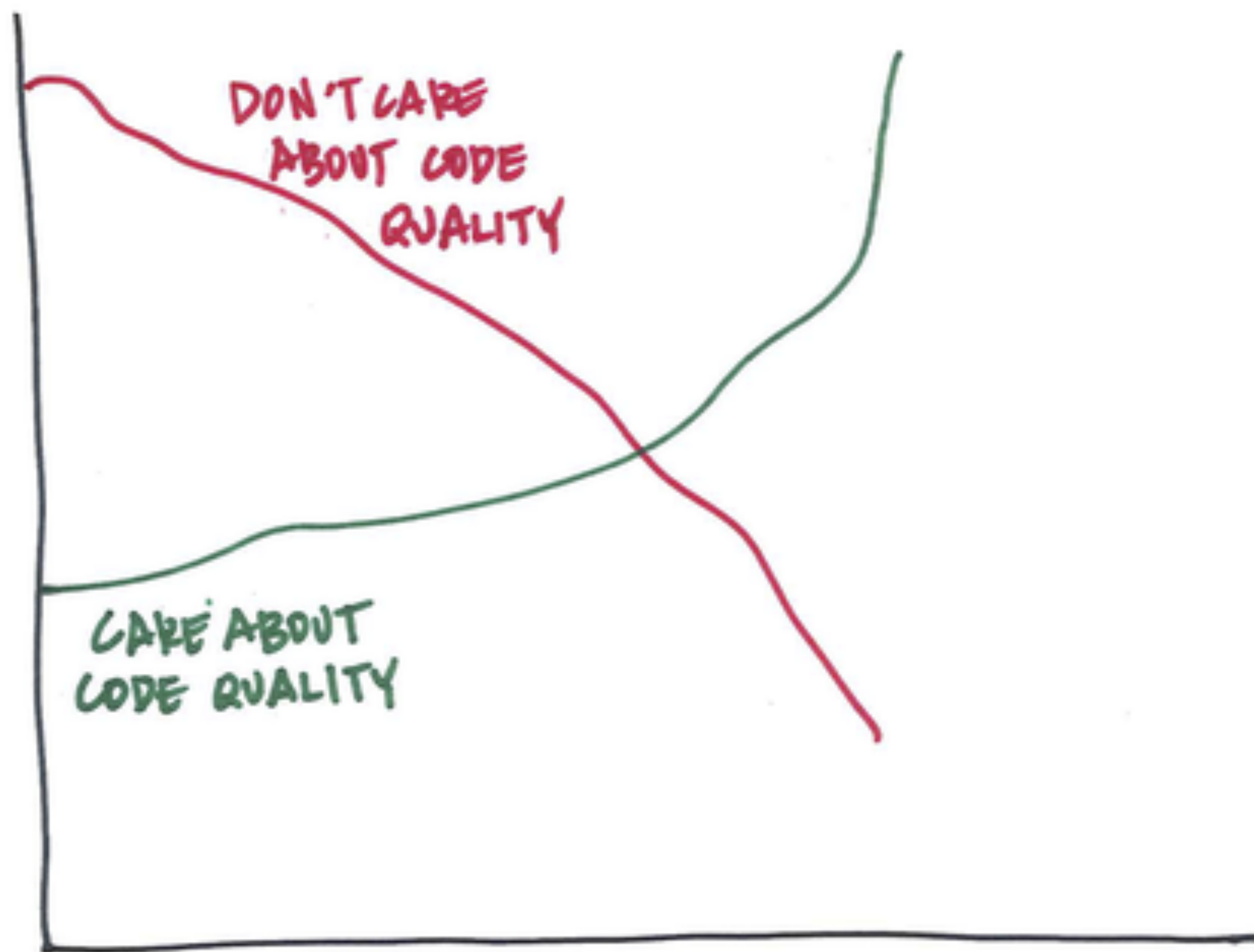
Microservices

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

Tradeoffs

Code Quality

VELOCITY



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”**

Donald Knuth, a better developer than I will ever be

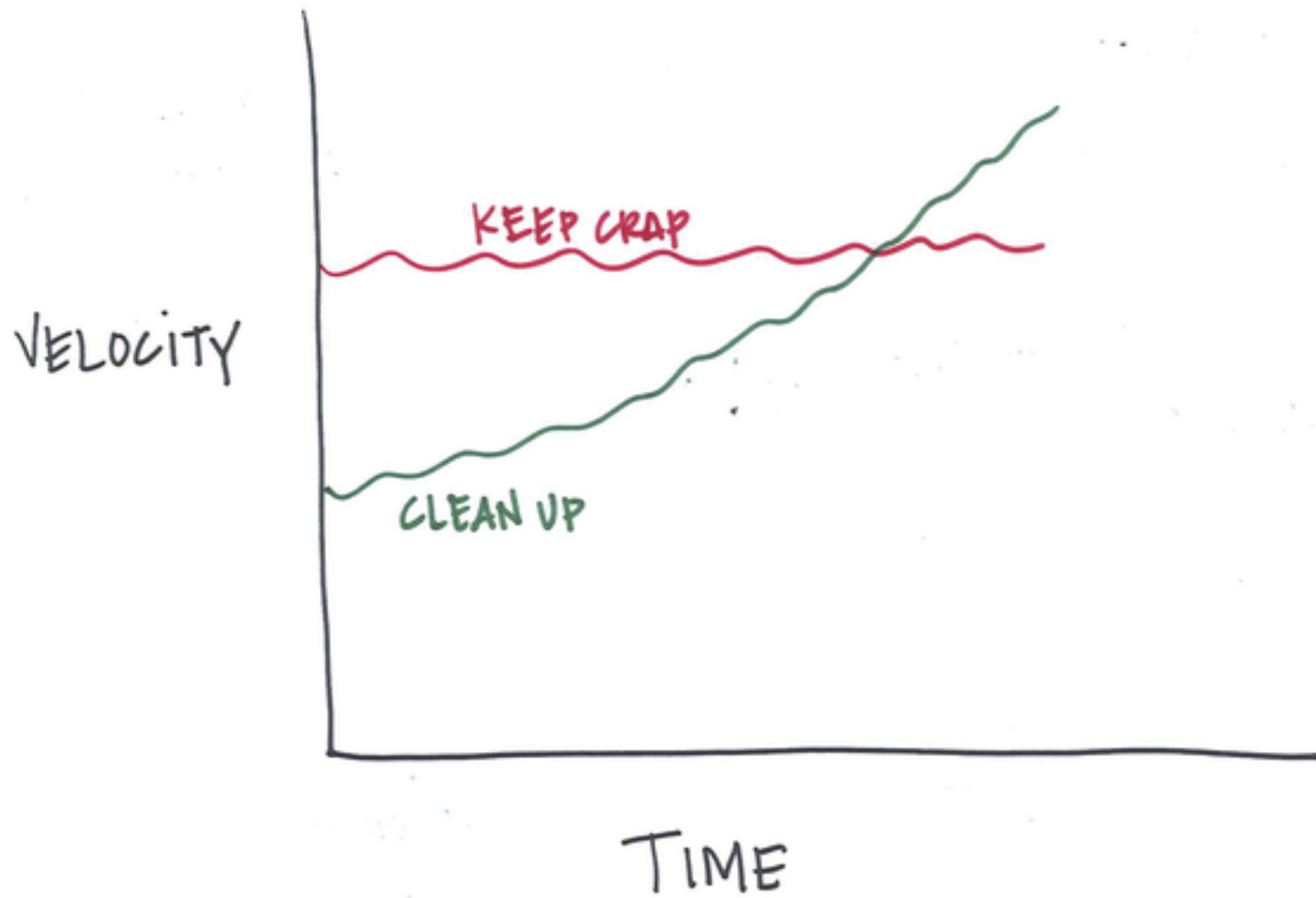
Solutions

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



Tradeoffs

Build

Test

Launch

Software Testing

Unit Testing

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

```
def test_upvote():  
    question = create_question()  
    assert question["upvotes"] == 0  
    upvote_question(question)  
    assert question["upvotes"] == 1
```

Integration Testing

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

```
def test_add_question():  
    load_url("https://quora.com")  
    log_in("tommy", "password")  
    click("Create Question")  
    type("Why is the sky blue?")  
    ...
```

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

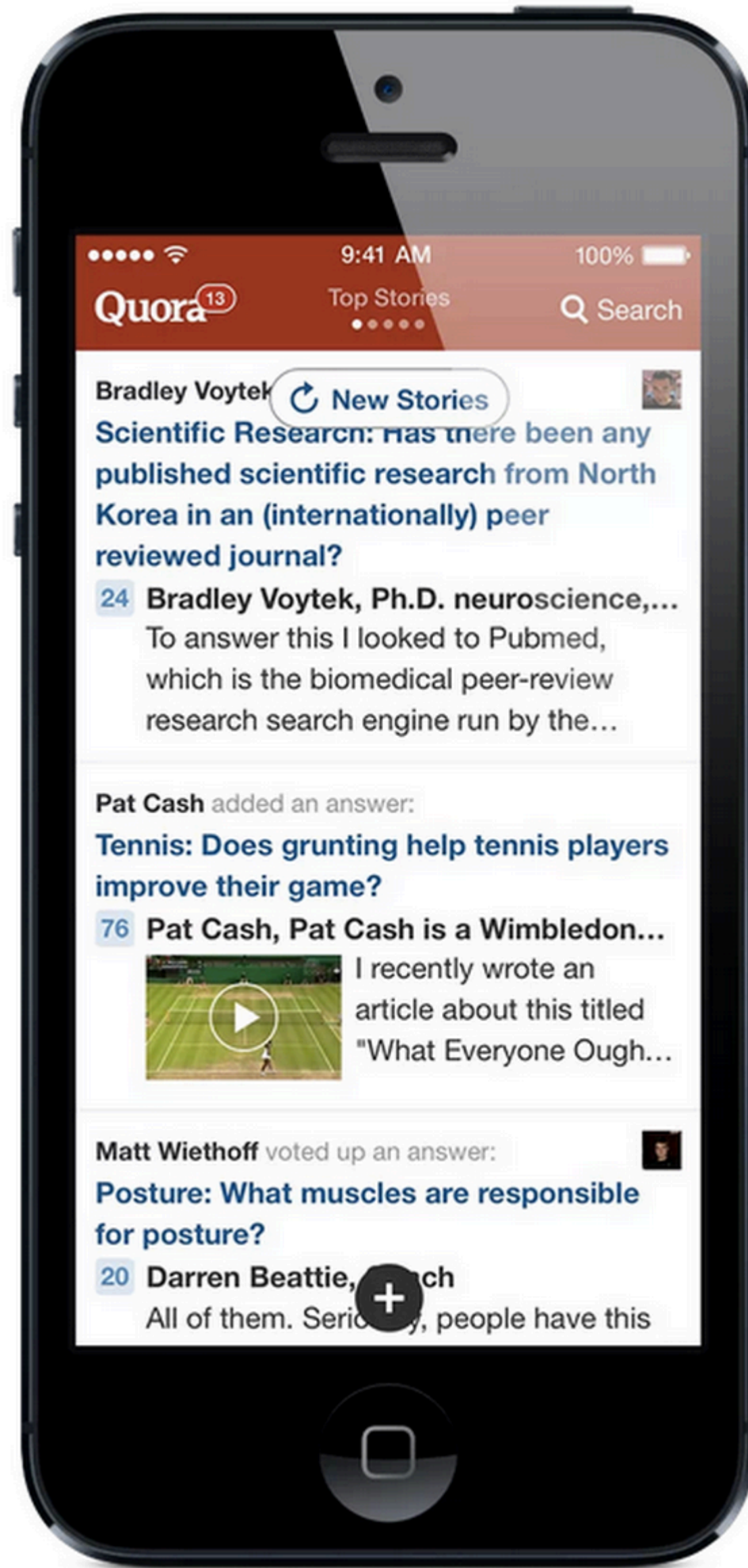
Implement the experiment

Measure impact

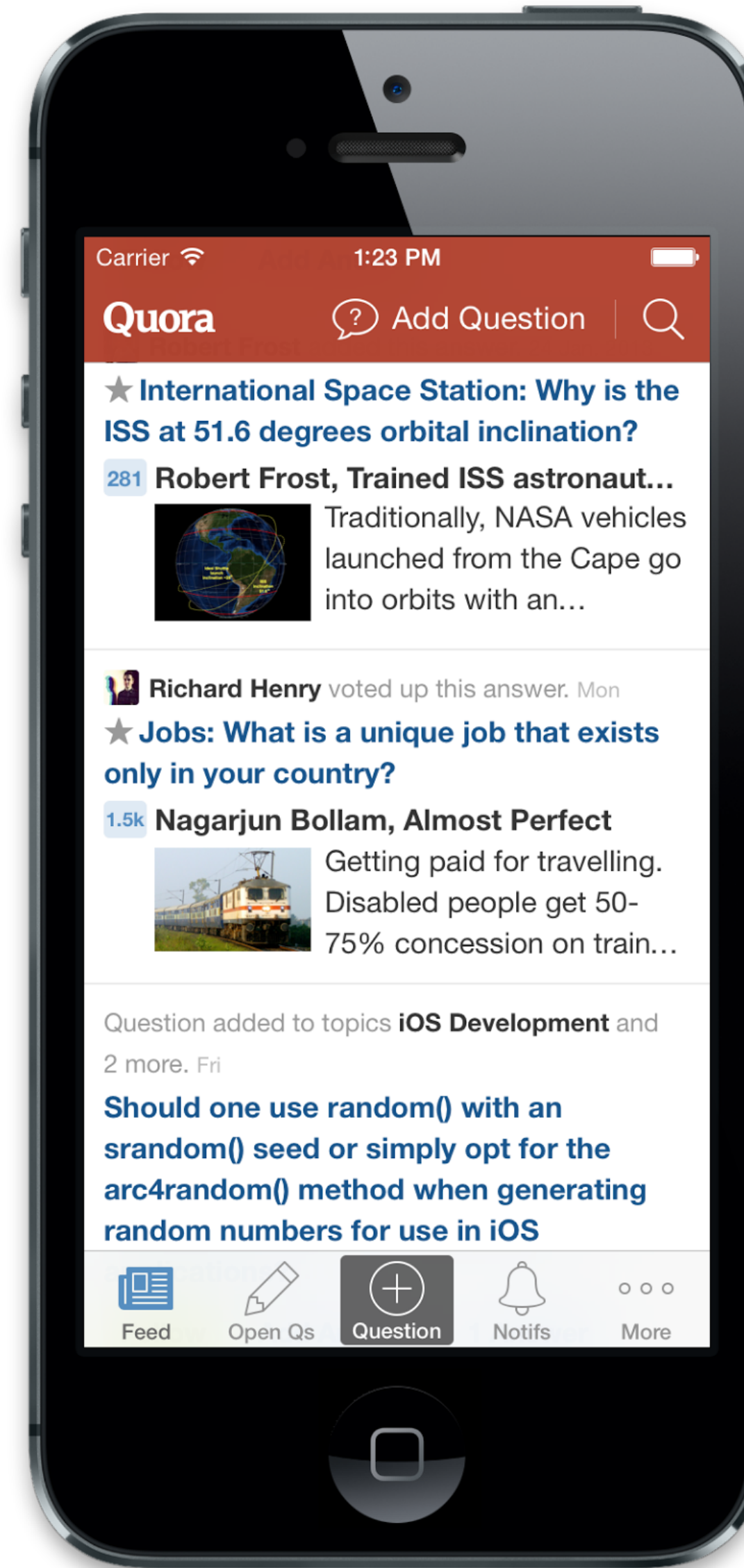
Generate a hypothesis

Implement the experiment

Measure impact



A



B

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

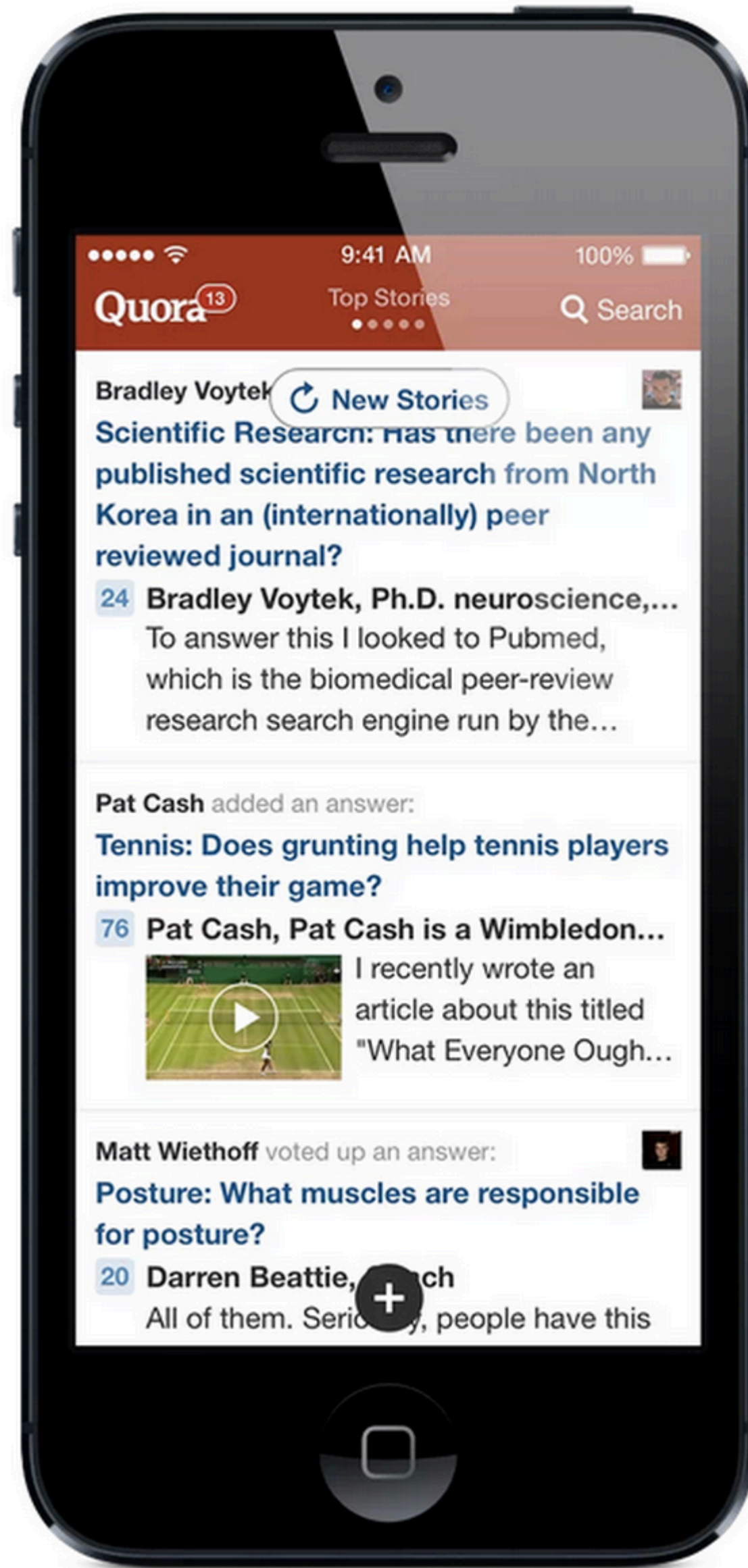
“It’s more obvious how to add a question”

“Swipe gestures are trending right now”

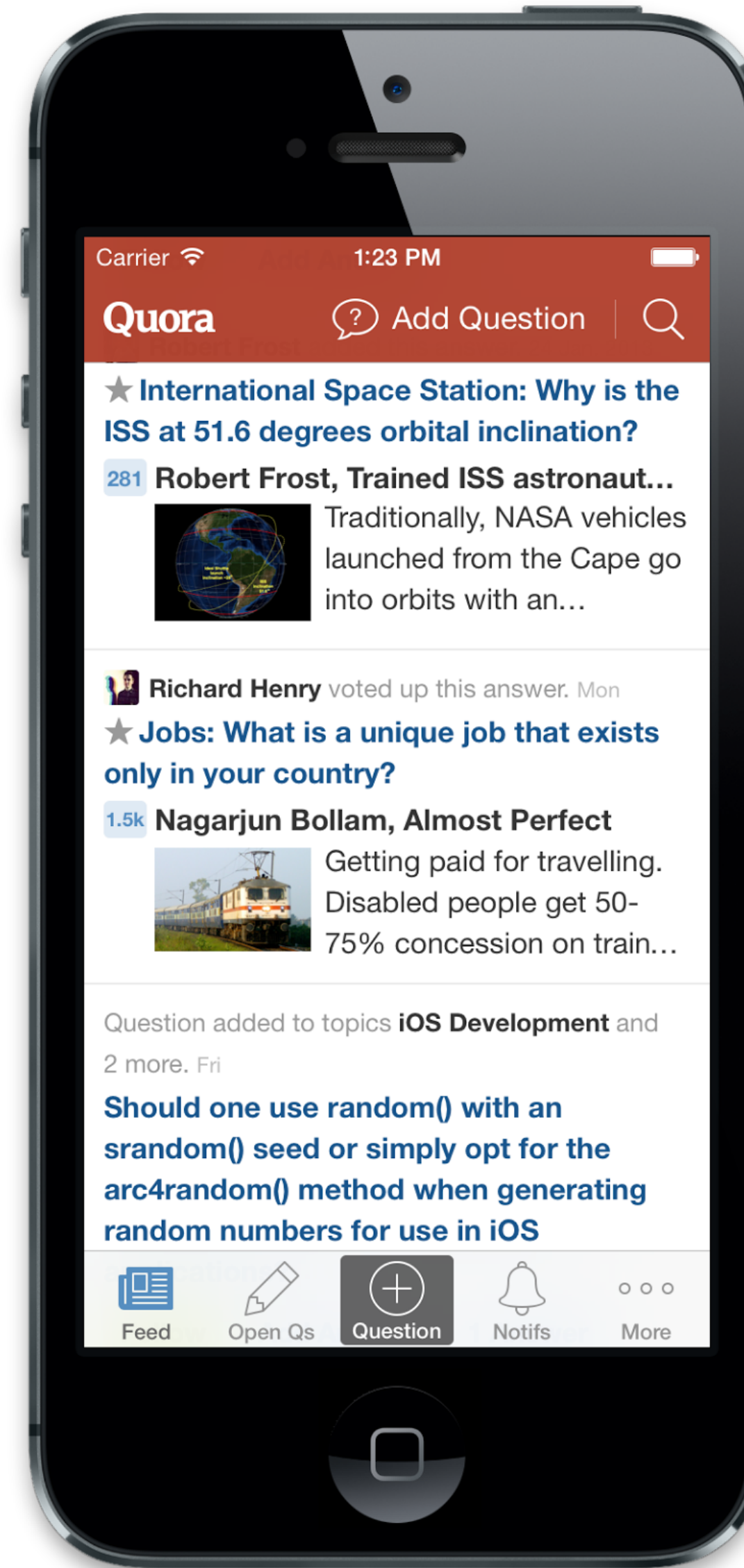
Generate a hypothesis

Implement the experiment

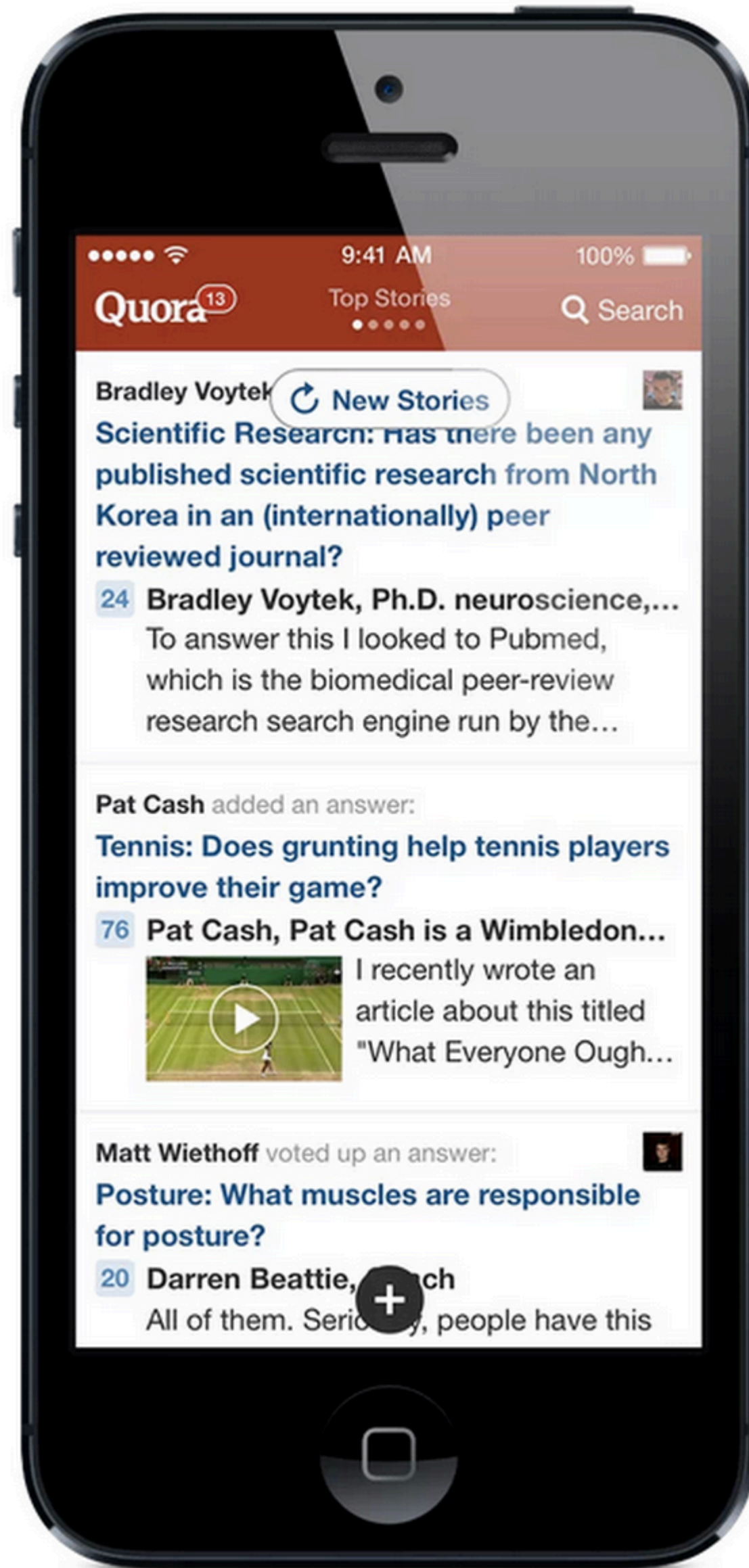
Measure impact



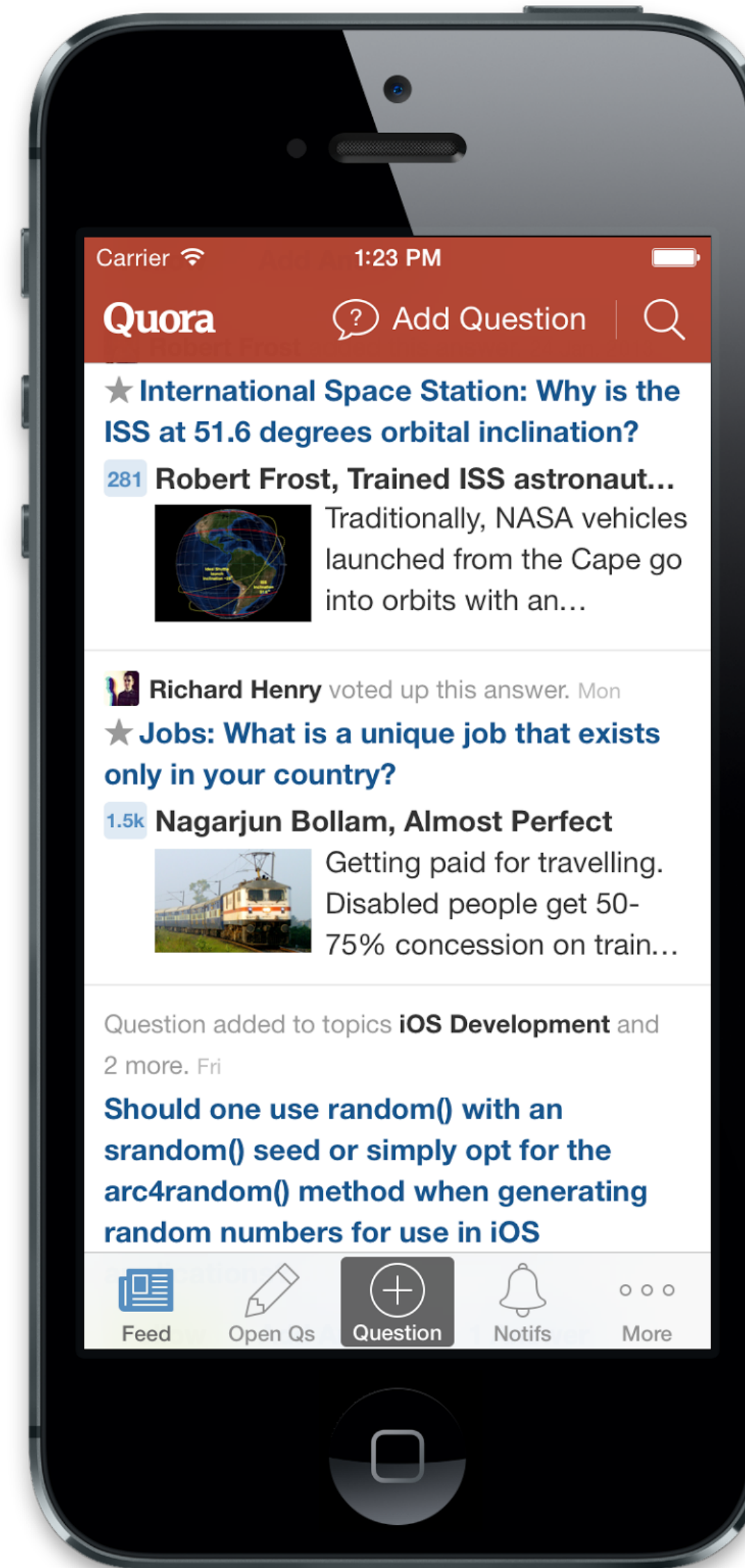
A



B



70%



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

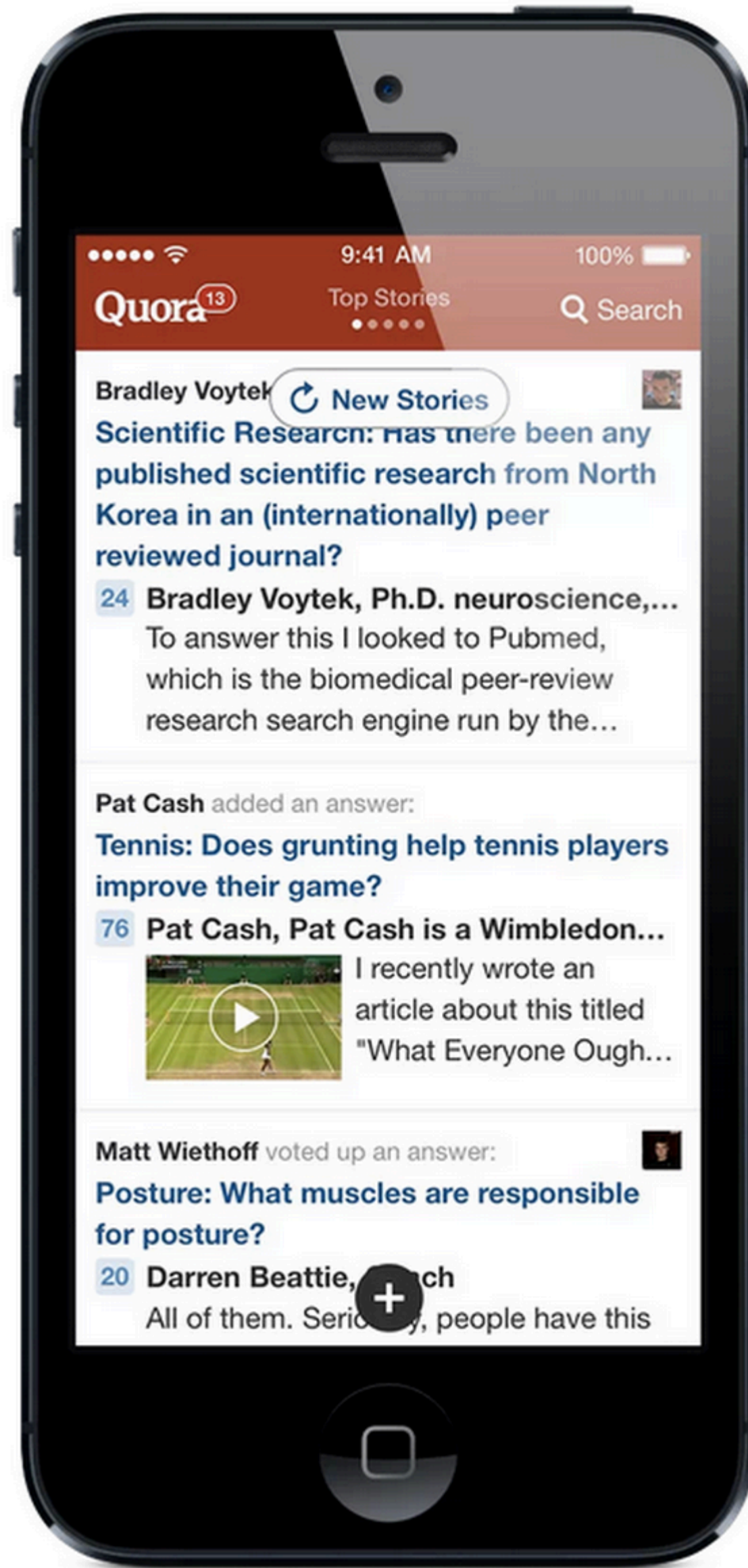
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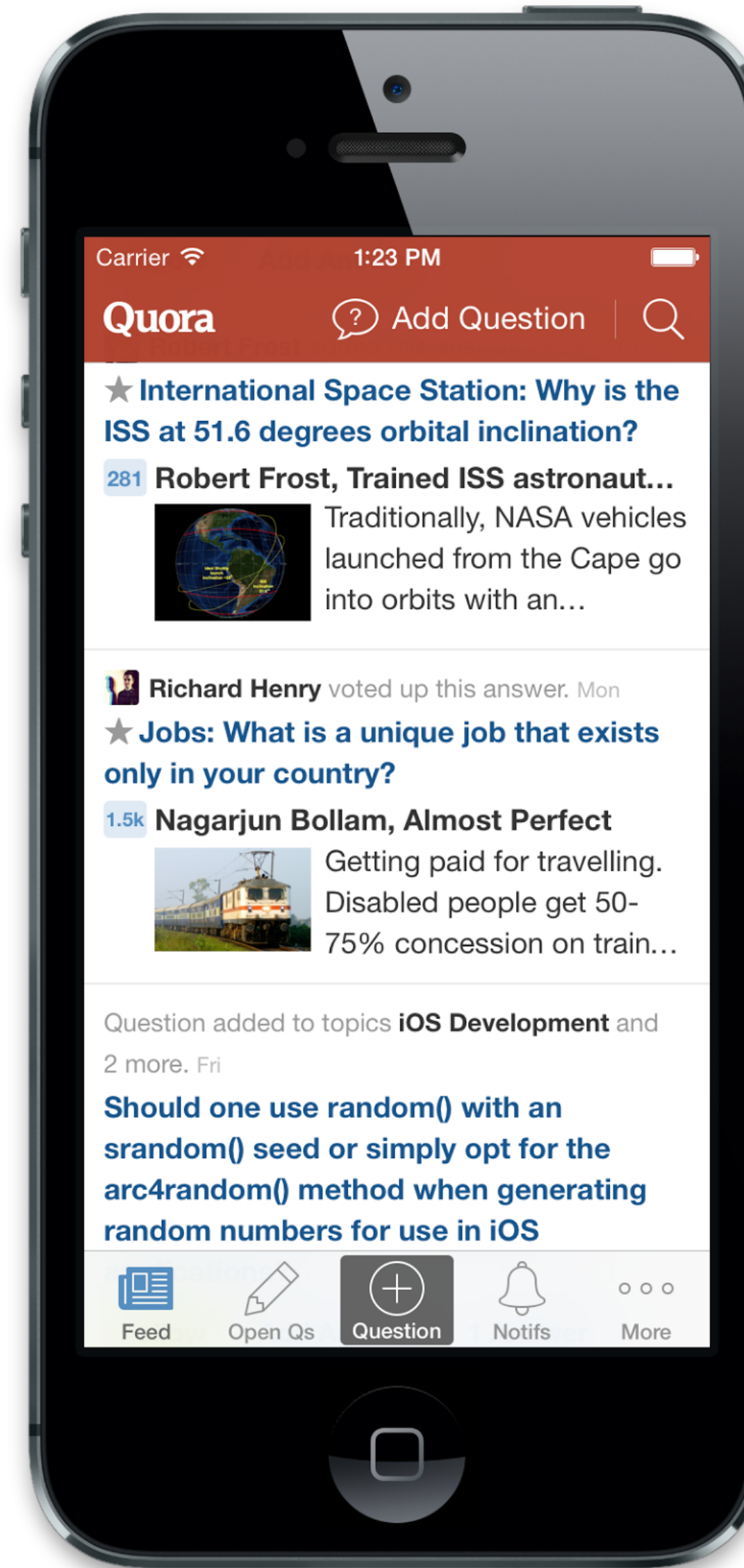
Analytics

- Google Analytics
- Firebase
- Mixpanel
- Optimizely
- In-house

Key Metrics



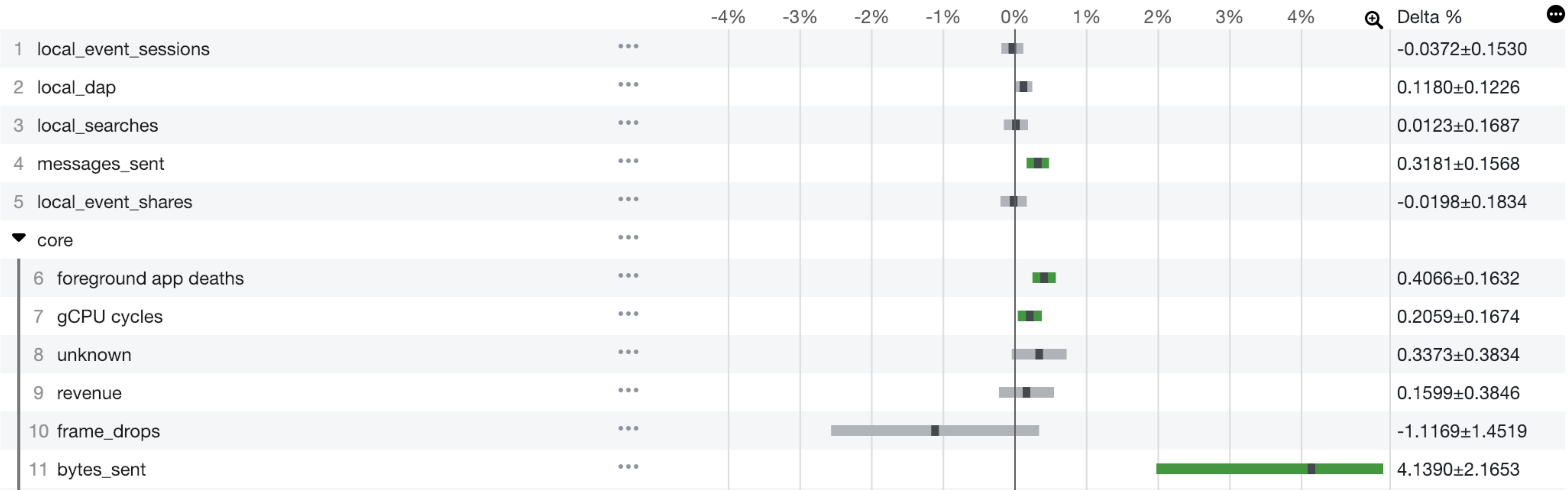
A



B

Key Metrics

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



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

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