

Software Engineering for the Web

The State of the Practice

http://bit.ly/sop_icse14

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TESTING WEB APPS

IS A

PAIN IN THE NECK

Can't we fix that?

SPOILER:

WE'RE NOT DOING WELL

**Web
Applications?**

The web was designed for
document sharing
between researchers using

HTML

But then

JavaScript

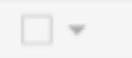
Happened



DontCallMeJuneBug@gmail.com

0

Mail ▾



More ▾

1-50 of 8,026

COMPOSE

Inbox (36)

Starred

Search people...

- Jeff Gordon
- Jimmie Johnson
Mr. Vanilla
- Danica Patrick
Ricky+Danica=Stenica?
- Kelly Earnhardt
- Brenda Lorraine Gee
Call your momma Dale!
- Brad Keselowski
#BackToBackBrad
- Rick Hendrick
Call me Mr. Hendrick
- 💬 Tony Stewart
- Steve Letarte
You're the man, Junior!
- Darrell Waltrip
Boogity-boogity-boogity



For more fake gmail accounts
check out TheWhistle.com

Discovery News - Top Stories - [Blue, Not Red: Did Ancient Mars Look Like This?](#) - 17 hours ago

<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Mike Helton	Your presence is requested- Uh, Junior, we'd like to have a word with you in the NASCAR hauler...From: NASCARBoss@
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Danica Patrick	Need help?- I hear you collect old wrecked cars for your ranch. If you need anymore, I think I can help...From: GoDaddyG
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Toyota Motor Company	Just FYI...- Hey, we know you like Chevys and all, but we can get you a good deal on a new Camry if you're interested...Fr
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Kurt Busch	Most Popular Driver- Can you give someone else a chance this year and sit this one out?...From: ImReallyANiceGuy@gm
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Jeff Gordon	Name change- Hey Ralph - I mean Junior, teammate - whatever your name is. Wait, Ralph IS your first name?...From: IHa
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Juan Pablo Montoya	Keep an eye out!- Watch out for those jet dryers at Daytona. They just pop out of nowhere!...From: TheyCallMeJPM@gma
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Chicago Cubs	Something in common- We're like the Dale Earnhardt of the MLB - still looking for that championship. Maybe this is our year
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Ricky Bobby	Just clarifying- I actually wasn't thinking of you when I came up with, "If you ain't first, you're last." But if the shoe fits...From
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Steve Letarte	Seriously?- You really voted for Chad Kanus for Crew Chief of the Year?...From
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Kasey Kahne	Eat your heart out!- Don't you wish you had piercing blue eyes like me?...From:
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Brad Keselowski	Twitter help- How do you have 175,000 followers without even tweeting once?..
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Kyle Busch	I don't get it- What's the secret to your popularity? Can you give me a few tips?
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Tom Cruise	MI5?- Making a new Mission Impossible movie. It's called Jr's Championship ..
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	The Sprint Cup	Just wondering...- Hey man, when are we finally going to get together?...From:
<input type="checkbox"/>	<input type="star"/>	<input type="star"/>	Teresa Earnhardt	So, about DEI- How much longer does your contract run?...From: CallMeMom@

● Tony Stewart



More ▾

Tony: You still mad at me for causing that wreck at 'Dega last fall?
me: For totaling my car, causing me to miss 2 races and costing me the title? What do you think?
Tony: Yeah, I'm a real bonehead. My bad, man.
me: Who taught you how to drive anyway? Kyle Busch?

Tony is offline. Messages you send will be delivered when Tony comes online.



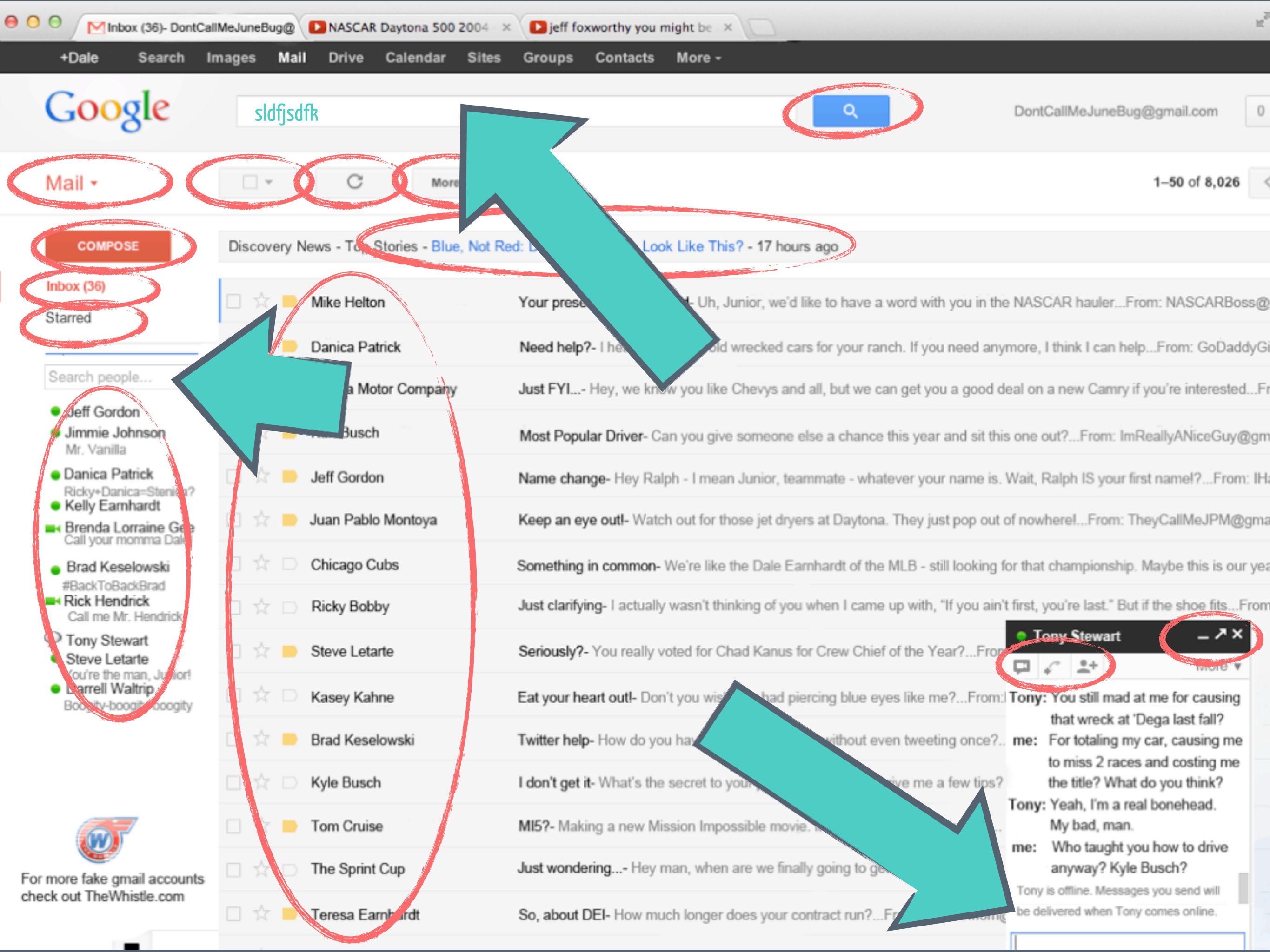
COMPLEXITY x DIVERSITY

- TESTING

= BUGS

CRAWLJAX

JavaScript-Enabled Crawling



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sldfjsdfk



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Danica Patrick
Motor Company

Jeff Gordon
Juan Pablo Montoya
Chicago Cubs
Ricky Bobby
Steve Letarte
Kasey Kahne
Brad Keselowski
Kyle Busch
Tom Cruise
The Sprint Cup
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MI5?- Making a new Mission Impossible movie. I
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more

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```
<!DOCTYPE HTML>
<HTML>
<HEADER>
  <TITLE>Computers Rule</TITLE>
</HEADER>
<BODY>
  <H1>Computer says:</H1>
  <p>NO</p>
</BODY>
</HTML>
```

```
<!DOCTYPE HTML>
<HTML>
<HEADER>
  <TITLE>Ultimate Answer</TITLE>
</HEADER>
<BODY>
  <H1>Computer says:</H1>
  <p>42</p>
</BODY>
</HTML>
```

STATES
ARE THE NEW
PAGES

4,221 APPLICATIONS

2,974,641 STATES

How **dynamic** is the web?

How **bad** is the web?

MEASURING

DYNAMISM

How dynamic is the web?

States / URL

1.9 states

State invisibility

96%

Post-load DOM
manipulations

64% Text
89% DOM

ASSESSING

THE DAMAGE

DEFINING
AMBIGUOUS ID
ATTRIBUTES

<H1 class="title" id="first-title">Hello!</H1>

53% of the sites do
on 35% of the states



DEFINE A

DOCTYPE



```
<!DOCTYPE HTML>
```

```
<HTML>
```

```
<HEADER>
```

```
<TITLE>Hello World</TITLE>
```

```
</HEADER>
```

```
<BODY>
```

```
<H1>Hello Msc Thesis!</H1>
```

```
<A href="http://ns.nl">Go to NS</A>
```

```
</BODY>
```

```
</HTML>
```

61.6% RENDER IT



90's STYLE

FORMULATE

VALID HTML

9% go wrong here



```
<H1 class="title" id="first-title">Hello!</H1>
```

13% Forget this 

20% misplace elements altogether

53% Contain Double IDs

61% Renders like the 90s

~ 20% Contains invalid HTML

SPEED



Best practices

THOU SHALL

CACHE THY

RESOURCES

43% doesn't

0% Used HTML-5 Caching

THOU SHALL

COMPRESS

THY RESOURCES

80% doesn't



THOU SHALL PUT

STYLE SHEETS

ON TOP

56% *doesn't*



THOU SHALL
ONLY BLOCK JS
WHEN NECESSARY

43% Does not cache

80% Is not compressed

56% Reloads CSS too often

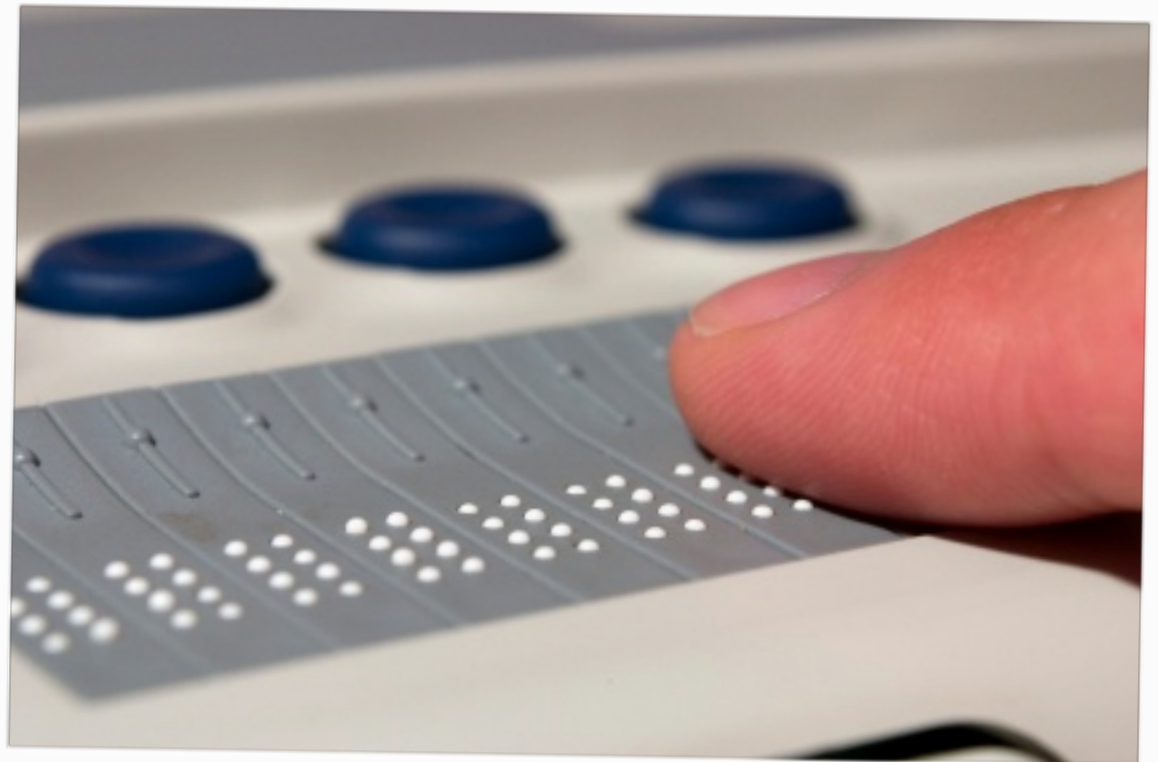
ACCESSIBILITY



LISTEN



FEEL



```
<IMG src="lolcat.jpg"  
      alt="Picture of a cat" />
```

```
<LABEL for="username">
```

Enter your username

```
</LABEL>
```



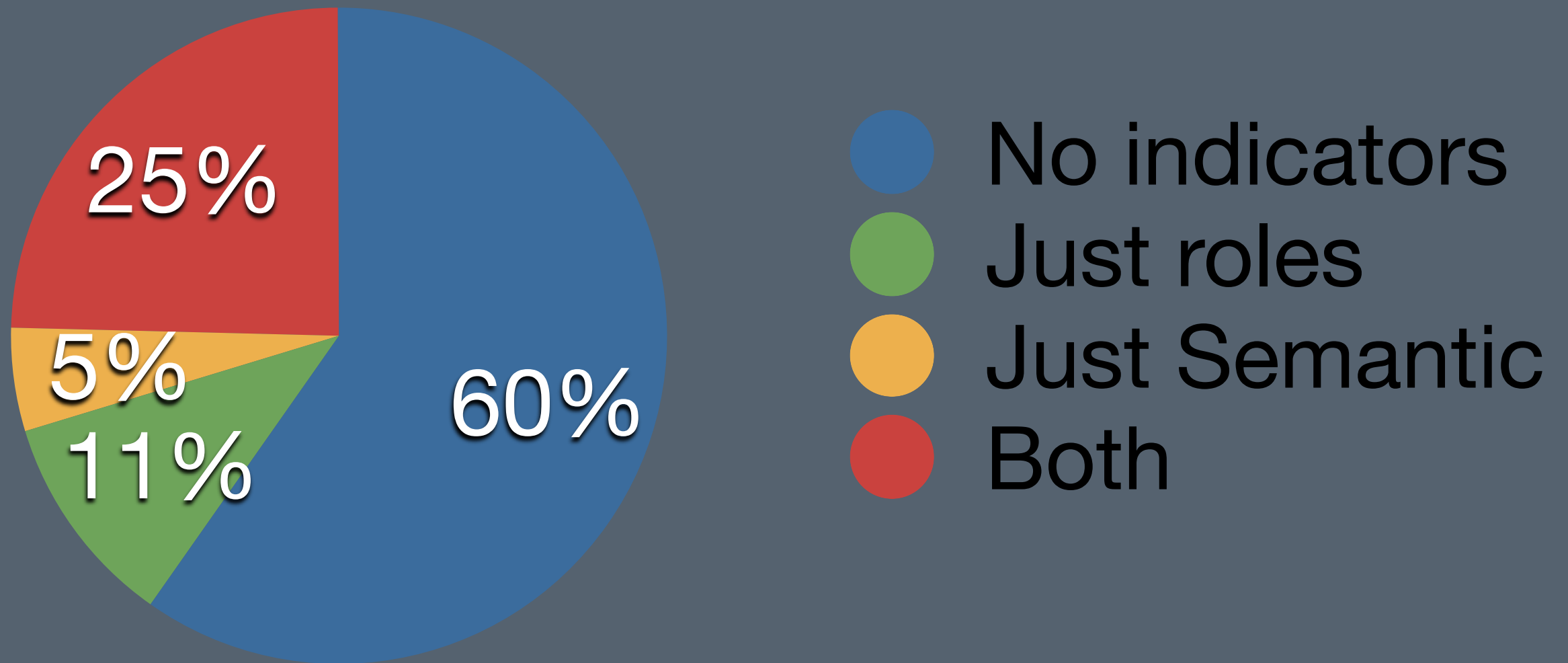

36% Do not label input

NAVIGATION

`<div role="navigation">`

`<NAV>` `<HEADER>` `<ARTICLE>`

NAVIGATION ASSISTANCE



THE WEB IS:

- HIGHLY DYNAMIC
- RIDDLED WITH ERRORS
- NOT AS FAST AS IT COULD BE
- NOT NEARLY ACCESSIBLE ENOUGH

What to do?

Modern Web development

All pages are rendered

New pages are rendered client side

STATIC ANALYSIS

+ CRAWLER

= SUPER POWERS

Generic invariants

Valid HTML, JavaScript, CSS

Accessibility support

Performance best practices

Do all images load?

Semi-Generic invariants

Am I using my framework correctly?

Are all my pages translated?

Are there any JS errors triggered?

App-specific invariants

Is my logo on every page?

Is the feedback button on every page?

Does every page link to the homepage?

CRAWLING **BONUS!**

Code coverage

Random testing

Performance testing

CHALLENGES

State duplication detection is hard

Deployment seems hard

Testing by crawling
works and should
be explored further.

Automated Error detection

Questions?

Find me on Twitter: @alexnaderlof

<http://crawljax.com>