



SAND2019-5080C

Thunderbird UI

Redesigning the internal web of Sandia National Laboratories



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Introduction

What is Thunderbird UI and why did we do it?

What is Thunderbird UI?

- Thunderbird UI (TUI) is a **Design System**

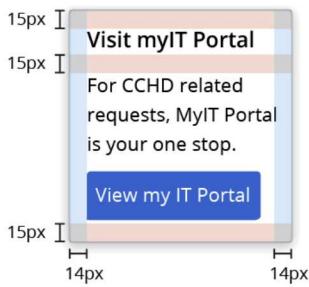
What is a design system?

- Style guide
- Common look and feel
- UI requirements
- Accessibility requirements
- Reusable interface components
- Common set of assets
- Color palette(s)
- Page templates

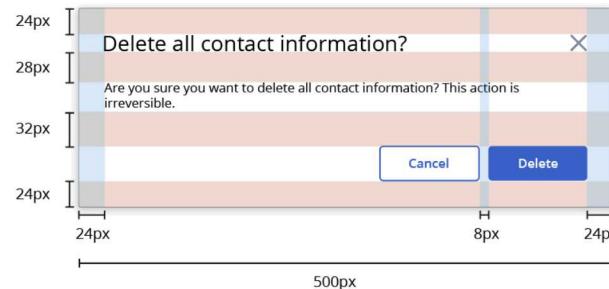
Thunderbird UI examples

Button Toolbar

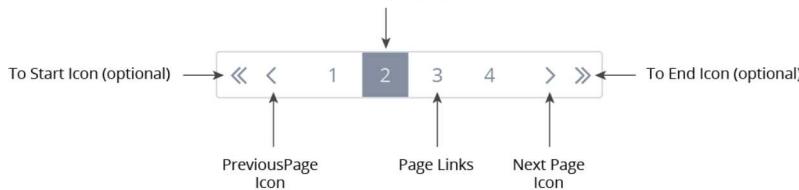
Card



Modal



Current Page Highlight



Button Toolbar

When you have a primary action that you would like to position next to a button group, use a button toolbar to separate the primary button from the secondary button group set. You can also use the `mr-2` class to add a right margin to the primary button.



```
<div class="btn-toolbar">
  <div class="btn-group mr-2" role="group" aria-label="Basic example">
    <button type="button" class="btn btn-primary">Save</button>
  </div>

  <div class="btn-group" role="group" aria-label="Basic example">
    <button type="button" class="btn btn-outline-primary">Day</button>
    <button type="button" class="btn btn-outline-primary">Month</button>
    <button type="button" class="btn btn-outline-primary">Year</button>
  </div>
</div>
```

snl-light-blue

snl-light-blue-900 #004553 rgb(0, 69, 83)	snl-light-blue-800 #005f72 rgb(0, 95, 114)	snl-light-blue-700 #007992 rgb(0, 121, 146)	snl-light-blue-600 #0093b1 rgb(0, 147, 177)	snl-light-blue-500 #00a6d8 rgb(0, 173, 200)
snl-light-blue-400 #033dd9 rgb(0, 109, 217)	snl-light-blue-300 #066cae rgb(0, 96, 206, 227)	snl-light-blue-200 #099dec rgb(153, 222, 236)	snl-light-blue-100 #0ccff6 rgb(284, 239, 246)	snl-light-blue-50 #0f77fa rgb(129, 247, 258)

snl-blue

snl-blue-900 #008052 rgb(0, 104, 82)	snl-blue-800 #009378 rgb(0, 96, 112)	snl-blue-700 #00a7ef rgb(0, 71, 143)	snl-blue-600 #00b7ad rgb(0, 87, 173)	snl-blue-500 #00c6cc rgb(0, 102, 200)
snl-blue-400 #0335a6 rgb(0, 131, 214)	snl-blue-300 #0663a9 rgb(0, 102, 183, 224)	snl-blue-200 #0992eb rgb(153, 224, 245)	snl-blue-100 #0cc0f5 rgb(284, 239, 245)	snl-blue-50 #0f74f4 rgb(129, 248, 258)

snl-teal

snl-teal-900 #008074 rgb(0, 140, 116)	snl-teal-800 #009348 rgb(0, 97, 46)	snl-teal-700 #00a763 rgb(0, 99, 81)	snl-teal-600 #00b7e3 rgb(0, 111, 99)	snl-teal-500 #00c7f1 rgb(0, 142, 116)
snl-teal-400 #033598 rgb(0, 131, 144)	snl-teal-300 #0663a9 rgb(0, 102, 187, 172)	snl-teal-200 #0992eb rgb(153, 224, 199)	snl-teal-100 #0cc0f5 rgb(284, 239, 227)	snl-teal-50 #0f74f4 rgb(129, 244, 241)

snl-purple

snl-purple-900 #0a31cbf rgb(0, 49, 191)	snl-purple-800 #024184c rgb(16, 74, 165)	snl-purple-700 #0322169 rgb(16, 33, 185)	snl-purple-600 #0433a2 rgb(77, 12, 162)	snl-purple-500 #05a3cbf rgb(90, 49, 191)
snl-purple-400 #06b3cc rgb(133, 99, 181)	snl-purple-300 #08c2d9 rgb(136, 106, 227)	snl-purple-200 #0bdcf2 rgb(139, 277, 229)	snl-purple-100 #0d79f2 rgb(132, 216, 242)	snl-purple-50 #0efcf9 rgb(139, 236, 249)

snl-lavender

snl-lavender-900 #0b312b1 rgb(179, 10, 177)	snl-lavender-800 #0280d51 rgb(96, 10, 97)	snl-lavender-700 #07d87c rgb(102, 13, 124)	snl-lavender-600 #0980f6 rgb(152, 15, 108)	snl-lavender-500 #0a312b1 rgb(179, 10, 177)
snl-lavender-400 #0c241c1 rgb(133, 45, 181)	snl-lavender-300 #0d171d0 rgb(136, 113, 200)	snl-lavender-200 #0e1a0d9 rgb(139, 148, 224)	snl-lavender-100 #0f1d0f8 rgb(142, 204, 239)	snl-lavender-50 #0f77f1 rgb(121, 211, 247)

snl-green

snl-green-900 #06c5312 rgb(146, 179, 10)	snl-green-800 #02b6087 rgb(43, 72, 7)	snl-green-700 #0476bd rgb(76, 105, 13)	snl-green-600 #05968f rgb(92, 132, 15)	snl-green-500 #06c5312 rgb(146, 179, 10)
snl-green-400 #09c241 rgb(137, 194, 65)	snl-green-300 #0a7d711 rgb(147, 209, 113)	snl-green-200 #0c4e1a9 rgb(158, 215, 108)	snl-green-100 #0e2f600 rgb(172, 248, 208)	snl-green-50 #0f77f7 rgb(125, 231, 231)

snl-crimson

snl-crimson-900 #02242d3 rgb(138, 36, 51)	snl-crimson-800 #048014 rgb(52, 18, 30)	snl-crimson-700 #05f52b0 rgb(93, 25, 36)	snl-crimson-600 #06f52b0 rgb(111, 31, 43)	snl-crimson-500 #02242d3 rgb(138, 36, 51)
snl-crimson-400 #05f54c5 rgb(155, 88, 92)	snl-crimson-300 #06f74c5 rgb(158, 124, 133)	snl-crimson-200 #07d3d6 rgb(168, 187, 175)	snl-crimson-100 #08f3f2b rgb(176, 211, 214)	snl-crimson-50 #0f77f7 rgb(124, 233, 235)

snl-red

snl-red-900 #0c00000 rgb(0, 0, 0)	snl-red-800 #0780000 rgb(112, 0, 0)	snl-red-700 #07f0000 rgb(140, 0, 0)	snl-red-600 #08e0000 rgb(170, 0, 0)	snl-red-500 #0224311 rgb(138, 36, 51)
snl-red-400 #0d33333 rgb(134, 1, 1)	snl-red-300 #0e66666 rgb(124, 102, 180)	snl-red-200 #0e99999 rgb(136, 153, 153)	snl-red-100 #0f5cccc rgb(145, 204, 204)	snl-red-50 #0f77f7 rgb(126, 231, 231)

snl red-orange

snl-red-orange-900 #f23f000 rgb(197, 45, 0)	snl-red-orange-800 #f552300 rgb(133, 45, 0)	snl-red-orange-700 #f921000 rgb(160, 45, 0)	snl-red-orange-600 #f526000 rgb(160, 45, 0)	snl-red-orange-500 #f21f000 rgb(125, 45, 0)
snl-red-orange-400 #f511000 rgb(157, 45, 0)	snl-red-orange-300 #f913000 rgb(135, 45, 0)	snl-red-orange-200 #f921000 rgb(160, 45, 0)	snl-red-orange-100 #f526000 rgb(160, 45, 0)	snl-red-orange-50 #f21f000 rgb(125, 45, 0)

What does a design system solve?

- No cohesive look and feel to sites and apps on the internal web
 - Example: Pacman loading spinner
- Inconsistent user experience
 - Users have to relearn how to interact with each new site (productivity drain)
- Developers kept reinventing the wheel
 - How many different implementations of a date picker do we need?
- The internal web looks unprofessional
 - Unbefitting a premiere science and engineering laboratory
 - Could effect employee moral and retention

Microsoft's Intranet



The screenshot shows a search results page for 'windows phone 7' on the msW intranet. The results count is 1-10 of 1,338,627. A banner for Windows Phone 7 is displayed. The right sidebar includes 'RELATED SEARCHES' and 'GLOSSARY' sections.

result type
Any Result Type
Microsoft Excel (39,729)
Microsoft Power... (24,937)
Microsoft Word (20,042)
Adobe PDF (11,094)
show more ▾

site
Any Site

1-10 of 1,338,627 results
Your search took 0.37 seconds.

Sort by: Relevance

Windows Phone 7

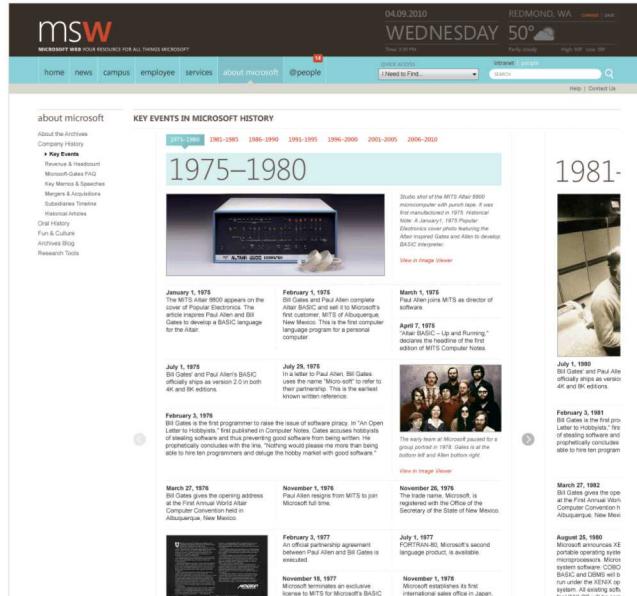
Get in the game!

ITWeb: Windows Phone 7.5
Get started with Windows Phone 7.5 'Mango' release, which offers over 500 new features and enhancements.

RELATED SEARCHES

- Sample Windows Phone 7
- Windows Phone 7 Chart Sam
- Windows Phone 7 Grid Sam
- Windows Phone 7 Scorecar
- Windows Phone 7 Camera A

GLOSSARY



The screenshot shows the msW homepage with a timeline of Microsoft history from 1975 to 1980. Key events include the creation of BASIC, the formation of Microsoft, and the first public appearance of Bill Gates.

KEY EVENTS IN MICROSOFT HISTORY

1975-1980 1981-1985 1986-1990 1991-1995 1996-2000 2001-2005 2006-2010

January 1, 1975 Bill Gates and Paul Allen appear on the cover of Popular Electronics. The article discusses the work of Gates to develop a BASIC language for a personal computer.

February 1, 1975 Bill Gates and Paul Allen complete their first BASIC and it is Microsoft's first product. It is the first computer language program for a personal computer.

February 2, 1975 Bill Gates and Paul Allen officially name version 2.0 as version 1.00. It is the earliest known version.

February 3, 1975 Bill Gates is the first programmer to raise the issue of software piracy. In "An Open Letter to Hobbyists," he writes, "We are asking for help in stopping the practice of stealing software and thus preventing good software from being written. We hope this will stop the hobby market from being ruined."

March 27, 1976 Bill Gates gives the opening address at the First Annual World Altair Computer Convention in Albuquerque, New Mexico.

November 1, 1976 Bill Allen resigns from MITS to join Microsoft full time.

February 3, 1977 An official partnership agreement between Paul Allen and Bill Gates is executed.

November 18, 1977 Microsoft announces an exclusive license to MITS for Microsoft's BASIC language.

1981

March 1, 1981 Bill Gates and Paul Allen introduce MITS as version 2.0. It is the first version of BASIC.

April 7, 1981 Bill Gates and Paul Allen are running "stealing software" on the headline of the first edition of MITS Computer Notes.

April 8, 1980 Bill Gates and Paul Allen officially ship as version 4.0 and 5.0 editions.

February 26, 1980 The trade name, Microsoft, is registered with the Secretary of the State of New Mexico.

July 1, 1981 FORTRAN 77, Microsoft's second language product, is available.

August 25, 1980 Microsoft releases MS-DOS, the first portable operating system.

November 1, 1981 Microsoft establishes its first international sales office in Japan.



The screenshot shows the msW homepage with news headlines and executive updates. A large image of Bill Gates is featured in the top right.

msW

MICROSOFT WEB YOUR RESOURCE FOR ALL THINGS MICROSOFT

home news campus employee services about microsoft

I Need to Find... SEARCH

Help | Contact Us

news & events

Events Calendar

Inside Track

Exec Communications

Industry News

Blogs, Etc

Channel 80 Live

News Alerts

Holidays 2011

campus

Maps & Buildings

Dining

Conference Rooms

Commute

employee matters

HR & Benefits

Career Development

New Employees

Personal Purchasing

Arts

Community

Research & Reference

Legal

TOP STORIES

TODAY | PAST 7 DAYS | Gates Ranked Fifth Most Powerful Person in World

Why MS Embraced Video Gaming a Decade Ago

HTC Reboots Its Windows Phone for the Mainstream

SQL Server 2012 Promises Many Innovative Features

Microsoft Admits SMBs on Disaster Preparedness

Gates Ranked Fifth Most Powerful Person in World

Nov. 04, 2011

Bill Gates is the fifth most powerful person in the world, according to rankings by Forbes magazine. He follows only the leaders of the United States, Russia, China, and Germany.

INSIDE TRACK

EXECUTIVE UPDATE

Get Giving Campaign Results

US employees raised \$35.6 million, beating initial campaign targets. Find out how close that is to the year-end goal.

READ MORE

FIND IT FAST

top sites

Campus Maps

Company Store

Dining

eCompany Store

Give

HRWeb

InfoPedia

ITWeb

MS Classifieds

FIM

MS Library

popular searches

Company Store

Holidays

Windows 8

Travel

Manga

SharePoint

Prime Card

The Commons

Adobe's Intranet



The screenshot shows the 'Inside Adobe' homepage. At the top, there's a navigation bar with links for 'Home', 'News & Events', 'Resources', 'Office', '6-HELP', 'About Adobe', 'BUs & Teams', and a search bar. The main content area features a 'Company News' section with a grid of images and a 'Customer Success Story' section. On the left, there's a sidebar with 'My Status' (Edit), 'Find an employee' (Org. Chart: IE Only / All Browsers), and a 'Popular Resources' section with links to 'Inside Marketing', 'Employee Resource Groups', 'Forms Directory', 'Employee Benefits', 'Employee Health', 'Employee Resource Groups', 'Purchase Requests', 'New Employee Center', 'Travel Reimbursement', and 'Jobs at Adobe'.



This screenshot shows the profile page for Joe Adobe, a Software Engineer in San Jose, CA, West Tower. The page includes a large photo of Joe, his title, location, and a 'Profile Help' button. Below this, there are contact details (Phone: 408-555-1212, Fax: 415-555-1212, Email: joe.adobe@adobe.com, Chat), his hire date (Feb 2000), and his reports (Jane Doe). The 'About' section contains a bio: 'I am fascinated by technology. I'm a software engineer by day and a hobbyist photographer by night. I am fortunate to be able to combine these passions by working on the Creative Cloud. Outside of work, I enjoy spending time with my family and traveling.' There are also sections for 'Employee Details' (LDAP ID: joe.adobe, Worker Type: Regular, Worker Level: Manager) and 'Additional Contact & Links' (Connect Room: joe.adobe).



This screenshot shows the 'Adobe & Women' homepage. It features a large image of two women, a 'Adobe & Women' banner, and a 'Our Mission' section. The mission statement is: 'To establish Adobe as a leader within the industry for creating an environment which supports the growth and development of global women leaders.' Below this, there's a 'Leading Adobe' section with links to 'Leading Adobe' (Leading Adobe (free membership with adobe.com email address)), 'Catalyst' (free membership with adobe.com email address), 'Harvard ManageMentor', and 'Women Executive Shadow Program (WESP)'. There's also a 'Yammer Group' section with a 'Join the Conversation' button.



This screenshot shows the 'Inside Adobe' homepage for 'Adobe MAX'. It features a large image of the Adobe MAX 2008 event in San Francisco. The page includes sections for 'Q1/Q2 2008 Highlights' (Increasing Our Focus on Emerging Markets, Unexpected Photoshop, More Dynamic Careers), 'LATEST NEWS' (Adobe MAX 2008, Adobe MAX 2008, Adobe MAX 2008, Adobe MAX 2008, Adobe MAX 2008), and 'EVENTS, ACTION ITEMS & ACTION CLOMIES' (View events & action items in: San Jose). The right sidebar contains 'TOOLS' (Find Employees & Conference Rooms, Org Chart, World Clock) and 'RESOURCES' (Information Technology, Safety & Security, More, Welcome, Jenny Yip in San Jose, CA, Logout).

IBM's Intranet

W3 Full version BluePages

BluePages home Updated on 23 Feb 2008

My profile My BluePages Edit settings Help

My BluePages Lists View all / Edit Skills Locator AAE Communications P Assets & Expenses P

Simple search | Search contact information | Search entire profile | Search LinkSupport

Edit my profile BluePages wizard

Search type location Search for Name: SOUTHBURY

Parciasepe, Kenneth (Kenny) IBM pronunciation
IBM employee, Regular
IBM Tivoli, Eaton On Demand
BT/IT/CT Govt Enterprise, Enterprise
Program Manager : Delivery Excellence 0

Southbury, CT United States
Building: SBVX | Floor: NA | Office: HOME

Local time: 13:34 | 1:34PM

Report to chain

My preferred contact method is external phone

Phone: 1-203-702-2069 (T/L) 268-1422
ITIN: Email: kparciasepe@ibm.com
Notes mail: Kenny Parciasepe/Southbury/IBMUS
SameTime status: 0 Sign in to view SameTime status

Add to: Notes address book SameTime list My BluePages list

Other viewers

- Full report to chain
- Same manager
- Extended relationships

Jobs & contact info Experience & qualifications Skills Projects & teams Communities & interests Reporting structure Summary

Important contact information

I work from my home office.

Spoken languages: English

Additional spoken languages: No information provided

IBM Workplaces 1-3-9 My Links You & IBM Collaboration Support

Welcome to the w3 home page! 

Search people and w3 

IBM 186.63 (4650) Welcome Jason M. Wittenberg About my site 

News for all

 **Tracking crises across Australia**
Using social media to inform and help citizens during disasters.

 **June is Global LGBT Pride Month**
Diversity fuels relentless reinvention.

 **Celebrating IBM's best**
Ginn Romilly and senior leaders honor 500 outstanding IBMers for their contributions to client experiences.

Last updated on Jun 5, 2014 10:00pm [View all...](#)

Your news

 **Visit the Manager Hub**
Your personalized workplace for growing an essential IBM workforce. [\[Profile for manager\]](#)

 **Performance benefits**
Learn about w3 home page enhancements and [take a tour](#).

 **Tell us what you think**
Let us know we can continue to keep improving your experience.

Last updated on Jun 5, 2014 10:00pm [Edit my profile...](#) [View all...](#)

Get connected

 **Think Friday: Platform-as-a-Service**
Discover how Platform-as-a-Service is enabling developers with speed and efficiency.

 **Story of the Week**
13 9 **THE SPEED of Trust**
posted by [Jesus Fernández](#) [Submit your own story](#)

 **Connect with other IBMers**
Update your profile or status, share files and milestones. Blog or collaborate in [IBM Connections](#) or [IBM Social Business](#), get involved in [Groups](#) and organize team projects with [Activities](#).

 **Find experts and showcase your expertise**
Use [IBM Expertise](#) on w3 or [download the IBM Expertise](#) mobile app.

Last updated on Jun 5, 2014 10:00pm [Edit my profile...](#) [View all...](#)

Popular links

 IBM Portal Home Page	 Blue Harmony Recent records in CATS Blue Harmony workflow (WML)	 Bluemine Market Development and Insights	 Bluepages People search	 BOND Buy on demand	 Business Conduct Guidelines IGG - Conducting yourself as an IBMer
 Career and Life Your Career, Money, Life homepage	 CareerSmart Find career programs, including Training and Development	 Client CollaborationHUB Connect & Engage with team mates	 Concerns and Appeals Open Doc: "Parent Review (US only); Community Review"	 Connections Internal IBM Community	 eAMT e-Asset Management Tool
 GOM Global Opportunity Marketplace	 GTS Resource Analytics Hub	 HRMS Human Resource Management Systems	 IBM Professional Marketplace	 Notes Web based Notes access	 ESI IBM Standard Software Installer
 IT Help Central IBM online support	 Mobile @ IBM Get the latest news about using mobile	 PBC Personal Business Comments	 Practitioner Portal Sales, Delivery and Enablement	 SalesConnect Integrated sales platform	 SmartCloud Meetings Launch meeting

Sandia's Intranet – Before TUI

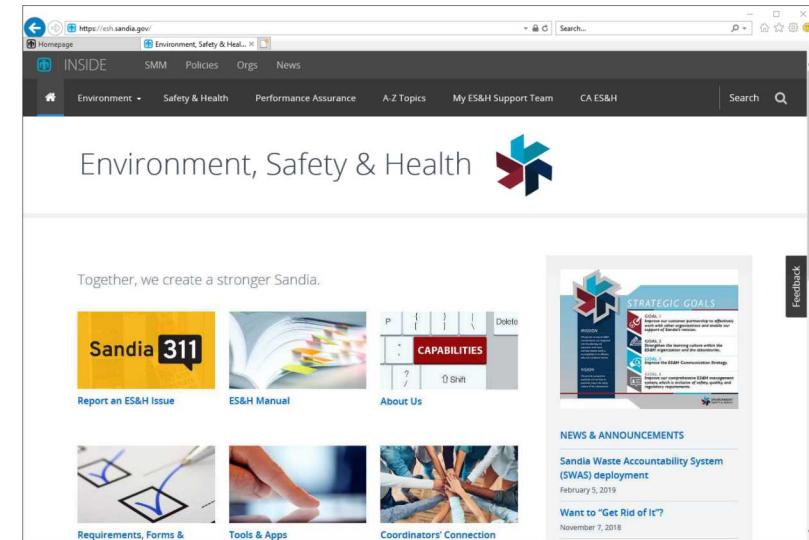
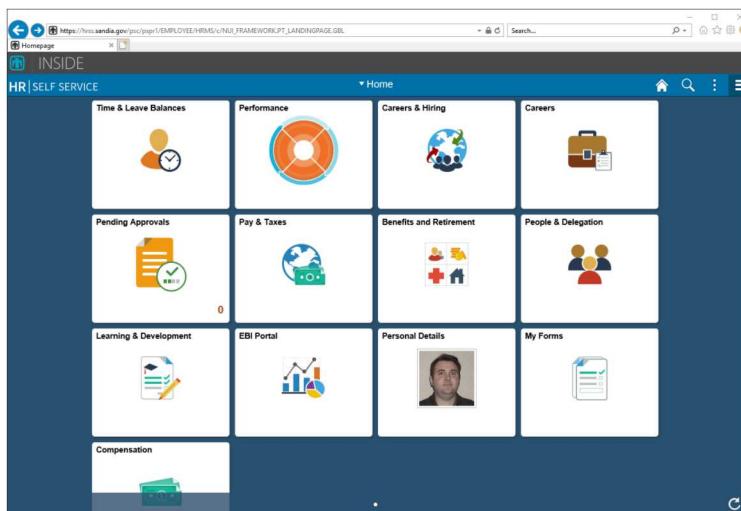
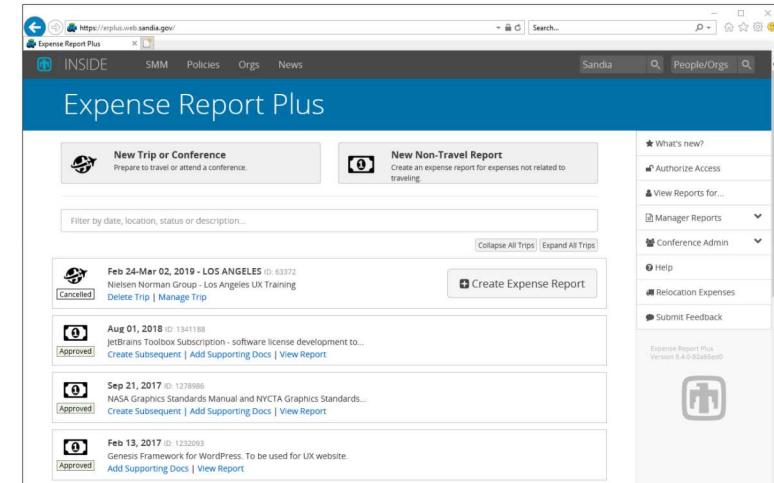
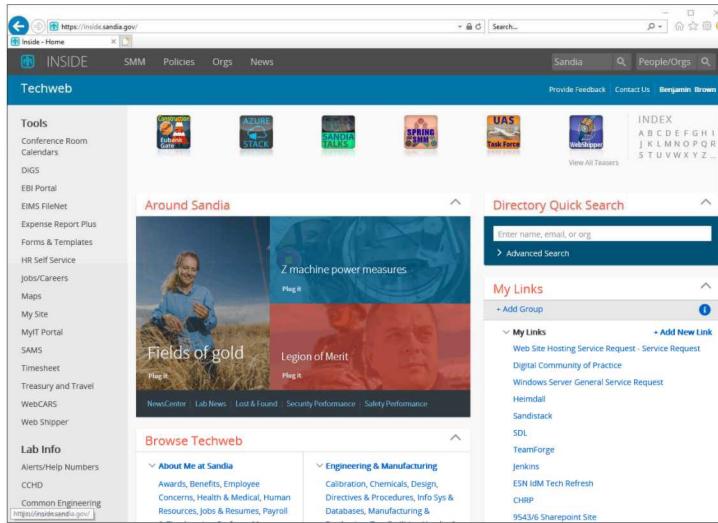
This screenshot shows the Sandia Intranet homepage (Techweb). The layout is cluttered with many links and widgets. On the left, a sidebar lists various tools and resources. The main content area features a grid of links, a 'Quote of the Day' (by Vincent Van Gogh), and a 'Corporate Workbox' section. A 'Search' bar at the top right allows users to search for specific names or orgs.

This screenshot shows the 'Expense Report' section of the Sandia Intranet. It displays a list of travel reports with details like date, location, and status. Each report entry includes a 'View' button, a 'PDF' button, and a 'Subsequent' button. The right sidebar contains links for 'Authorize Access', 'View Reports for...', 'Help', 'Relocation Expenses', 'New Features', and 'Submit Feedback'.

This screenshot shows the 'HR Service' section of the Sandia Intranet. It features a large grid of icons representing various HR functions such as Time, Pay & Taxes, Benefits & Retirement, Careers & Hiring, Personal Information, People, Worklist & Delegation, ePMF, Learning & Development, HR Queries, Compensation, and a 'Compensation' icon at the bottom. The background is a scenic sunset with wind turbines.

This screenshot shows the 'ENVIRONMENT SAFETY & HEALTH' section of the Sandia Intranet. It includes a 'Policy, Processes, Procedures' section with links to Corporate, Center, and ESH programs. The 'Work Planning & Control' section lists Work Planning & Control, WERC Criteria for Safe Design & Operations, Work Planning and Control Repository, and a 'How is Sandia doing?' section. The 'Engineered Safety' section features a table with links to Paul Hommet's introduction, EMOC Engineered Safety, Plutonium at 2, and Advanced Materials Laboratory. The right sidebar contains sections for 'Help Lines', 'Directories', 'Teams/Committees/Support', and 'Communications, Software, Resources'.

Sandia Intranet – After TUI



Notable design systems

- United States Web Design System
- Material Design – Google
- Carbon Design System – IBM
- Global Experience Language (GEL) – BBC
- **Atomic Design – Brad Frost**
 - provides a framework for design system development
 - atoms, molecules, cells, organisms

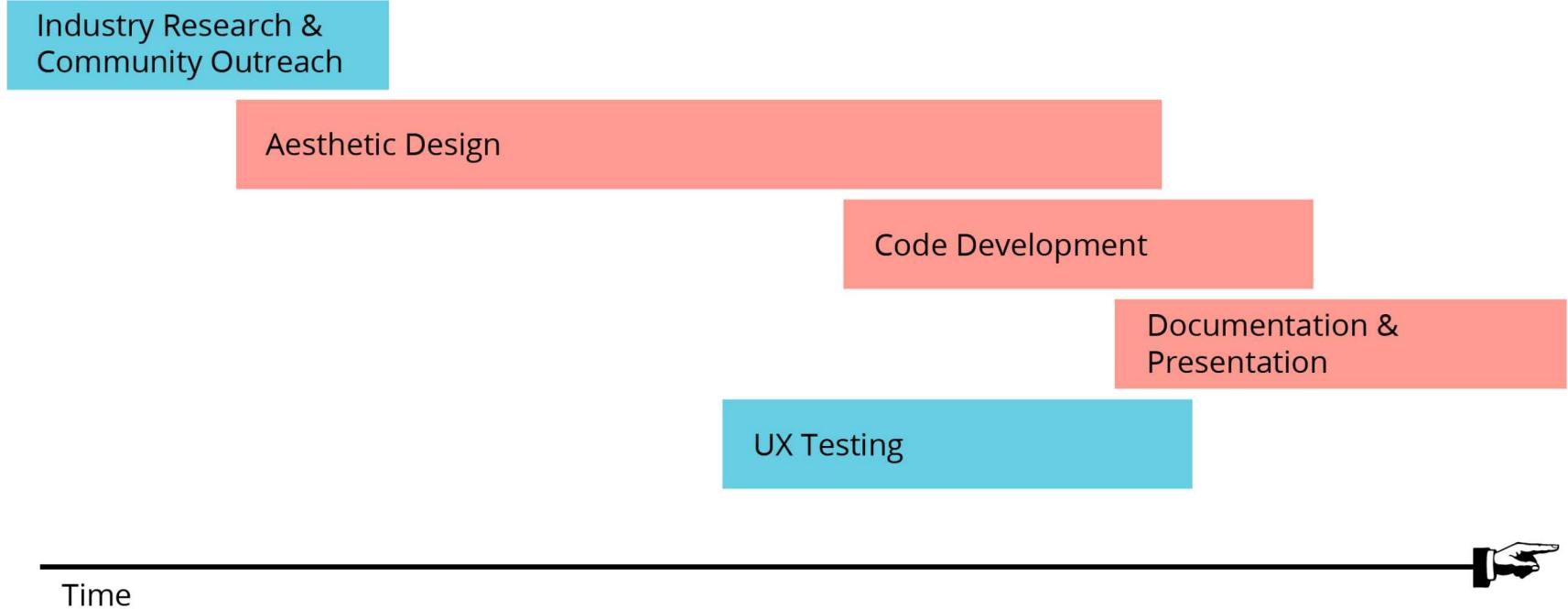
How we went about it

This talk will cover:

- Design and Development
- Distribution and Adoption
- Return on Investment
- Path Forward and Lessons Learned

Design and Development

Phases of development



Code Library Architecture

- Bootstrap used as a foundation for UI code library
 - established starting point
 - accessibility already built in
 - developers already familiar with how to use it
 - can integrate with many other frameworks
- Code library split into two categories
 - Foundations
 - color, typography, icons, grid, etc.
 - Components
 - buttons, tabs, modals, tables, etc.

Library Structure

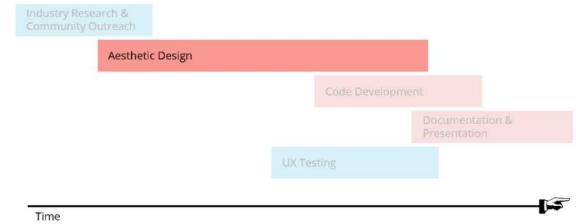
Foundations

- Accessibility
- Animation
- Borders, Shadows, and Light
- Colors
- Grid
- Icons
- Typography

Components

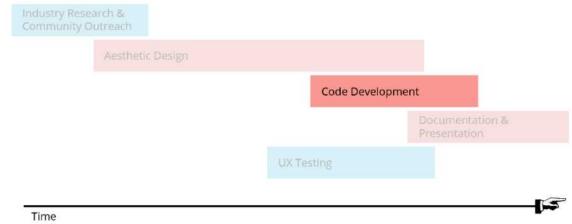
- Accordion
- Alert
- Badge
- Breadcrumb
- Button
- Button Group
- Card
- Carousel
- Checkbox
- Date/Time Picker
- Dropdown
- Form Elements
- Global Header and Footer
- Hero
- In-Page Navigation
- Loading Notification
- Modal
- Pagination
- People Picker
- Popover
- Progress Bar
- Radio Button
- Range
- Search Box
- Secondary Navigation
- Select
- Site Footer
- Site Header
- Switch
- Table
- Tabs and Pills
- Text Area
- Text Input
- Toast
- Tooltip

Aesthetic Design



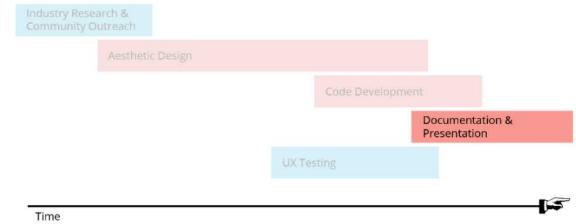
- Team of 4 to 6 designers
- Primarily focused on look and feel
- Components divided amongst designers
- Biweekly design reviews
- Designs based on Bootstrap 4 and industry best practices
- Most time-intensive (expensive) phase
 - About 6 months (not full time project)

Code Development



- Team of 3 to 4 developers
 - Subset of design team
- Components divided amongst developers
- Use Bootstrap 4 component as starting point
- Customize Bootstrap SASS variables
- Add custom SASS, JavaScript
- About 3 months

Documentation & Presentation



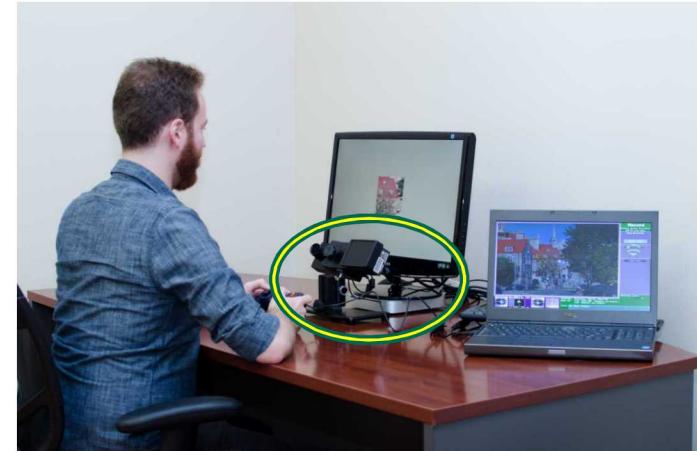
- Team of 2 to 3 writers
- Base documentation on existing UI requirements, industry design systems
- About 2 months

UX Testing and Validation

- First round with clickable prototypes
 - Testing designs, code didn't exist yet
 - Make changes to component design based on results
- Validation Study on Documentation Sections
- Eye-tracking Study on Headings
 - H1, H2, H3, etc.

Heading Study

- Question: How does heading size, weight, and spacing impact readability?
- Measures collected:
 - Comprehension
 - Eye movement data
- Design:
 - 32 passages, 3 heading levels
 - Black text, white background
 - Factors Manipulated (16 conditions)
 - Margin (small, large)
 - Scale (small, large)
 - Weight (regular, bold, light, mixed)



Heading Study Stimulus Examples

Margin 1, Scale 1, Regular Weight

Empire State Building

The Empire State Building is a 102-story Art Deco skyscraper in

Overview

As of 2017 the building is the 5th-tallest completed skyscraper

Structural Specifications

Designed by Shreve, Lamb & Harmon and completed in 1931, its antenna. Its name is derived from "Empire State", the nickname

Construction

The original design of the Empire State Building was for a 50-ft with an airship mast on top, to ensure it would be the world's t

Modern Day

The Empire State Building has long been a popular tourist attra

World Records

The Empire State Building stood as the world's tallest building 1

1970. Following the September 11 attacks in 2001, it was again

Cultural Significance

It was designated a National Historic Landmark in 1986, and we been featured in more than 250 TV shows and movies since the

Margin 1, Scale 2, Mixed Weight

Empire State Building

The Empire State Building is a 102-story Art Deco skyscraper in

Overview

As of 2017 the building is the 5th-tallest completed skyscraper

Structural Specifications

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Margin 2, Scale 1, Bold Weight

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Eiffel Tower

The Eiffel Tower is a wrought iron lattice tower on the Champ de

Overview

The Eiffel Tower is the most-visited paid monument in the wor

Construction

The tower was constructed from 1887-89 as the entrance to the

town. Although construction involved 300 on-site employees, i

Reception

It was initially criticized by some of France's leading artists and

restaurant every day because it was the one place in Paris wher

Details

During its construction, the Eiffel Tower surpassed the Washin

Structural Details

The tower is 324 meters (1,063 feet) tall, about the same height

the top of the tower in 1957, it is now taller than the Chrysler I

Visiting the Tower

The tower has three levels for visitors: the top level's upper pl

European Union. The climb from ground level to the first level

Margin 1, Scale 2, Regular Weight

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Margin 1, Scale 1, bold Weight

Margin 1, Scale 2, Light Weight

White House

The White House is the official residence and workplace of the

History

It is located at 1600 Pennsylvania Avenue NW in Washington, D.

Early History

The Executive Residence was completed in 1800. In 1814, it was

Residence in 1817, other additions over the years include the N

Modern Day

The modern-day White House complex includes the Executive

which now houses offices for the President's staff and the Vice

Details

The White House has an impressive array of amenities, and is a

Layout and Amenities

The White House includes six stories and 55,000 sqft of floor s

elevators, five full-time chefs, a tennis court, a (single-lane) ba

Visitors

The property is a National Heritage Site owned by the National

schedule tours through their Member of Congress at least three

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Grand Canyon National Pa

Grand Canyon National Park, located in northwestern Arizona.

Overview

The park's central feature is the Grand Canyon, a gorge of the

History

The Grand Canyon was officially designated a national park on 1970. UNESCO declared the park a World Heritage Site.

Geography

The Grand Canyon, including its extensive system of tributary

years of Earth's geological history have been exposed as the C

Activities

The primary public areas of the park are the North and South I

South Rim

There is a driving tour of 35 miles along the South Rim. Walkin

road, followed by 7 miles unpaved to Hermit's Rest. Private car

North Rim

On the North Rim there are few roads, however, there are som

available that go to several thousand feet down into the cany

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Heading Study Stimulus Examples

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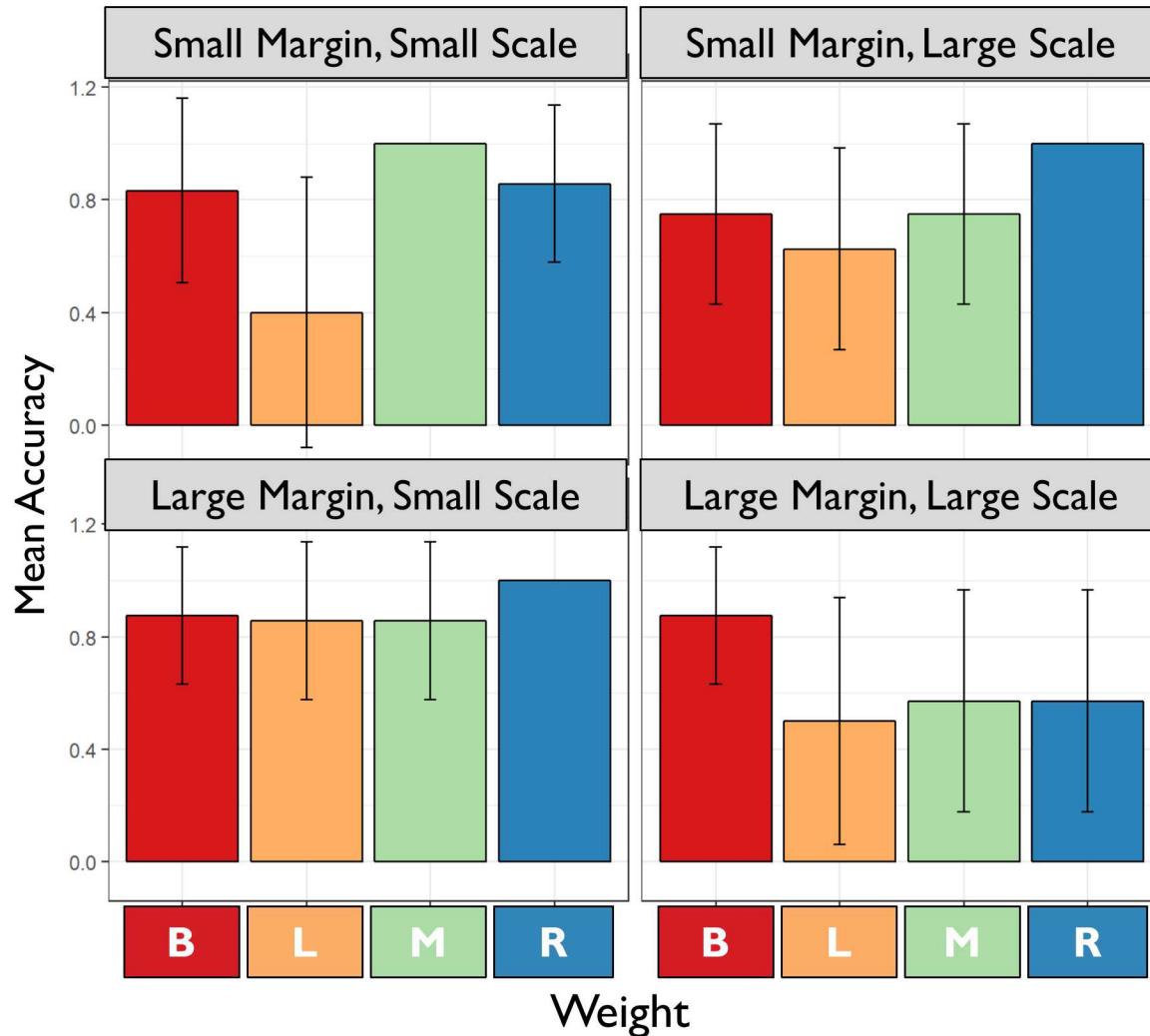
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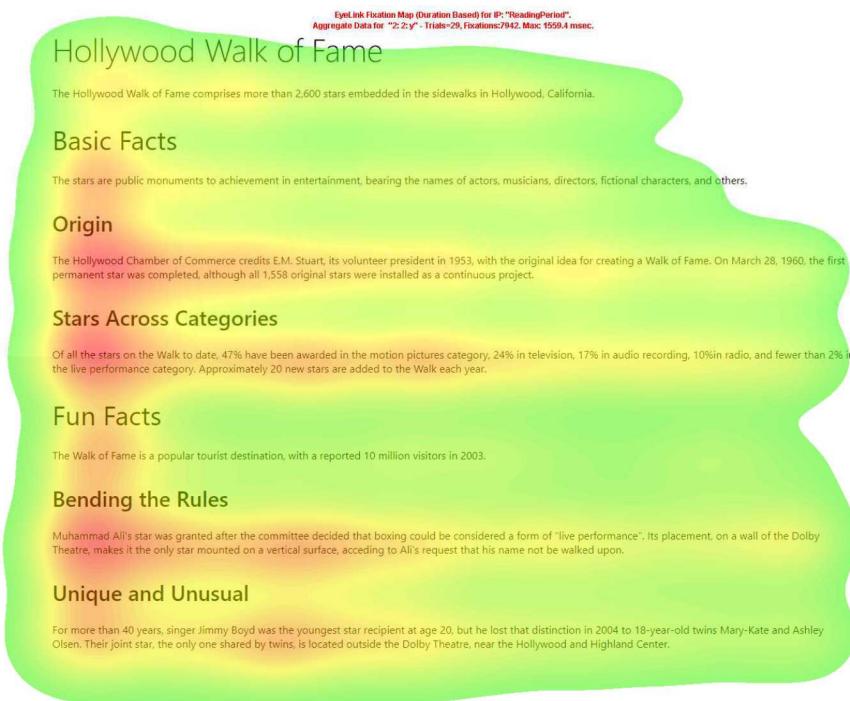
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Heading Study Results: Comprehension Question Accuracy



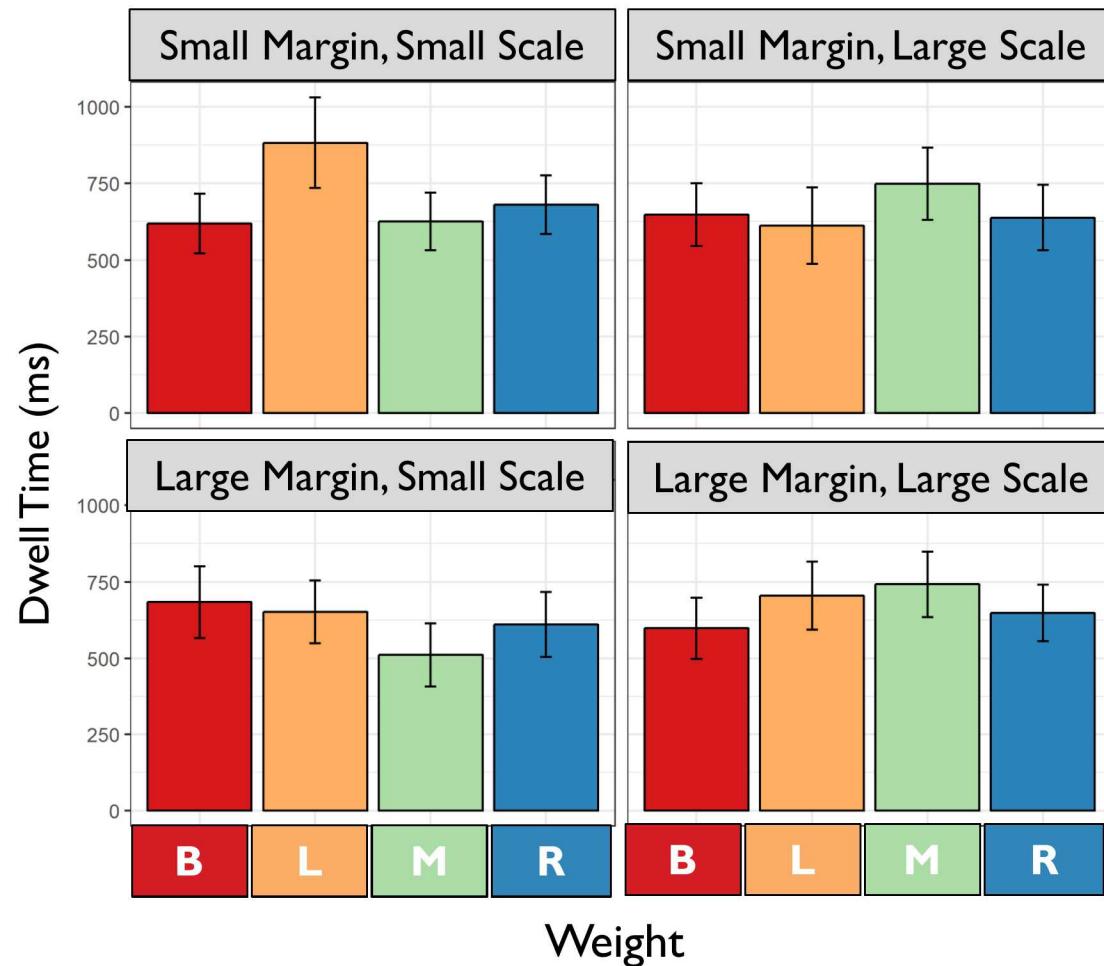
- Passages with light headings had the lowest accuracy, especially with small margin, small scale (*top left*)
- Large margin, large scale combination showed lowest comprehension accuracy (*bottom right*)—except for bold

Heading Study Results: Viewing Patterns



- People read whole passage
- No clear differentiation between looks to heading versus body text
- Poor "return sweep" targeting
- This could explain why the bolder font helps comprehension in the more compressed passages

Heading Study Results: Heading Dwell Time



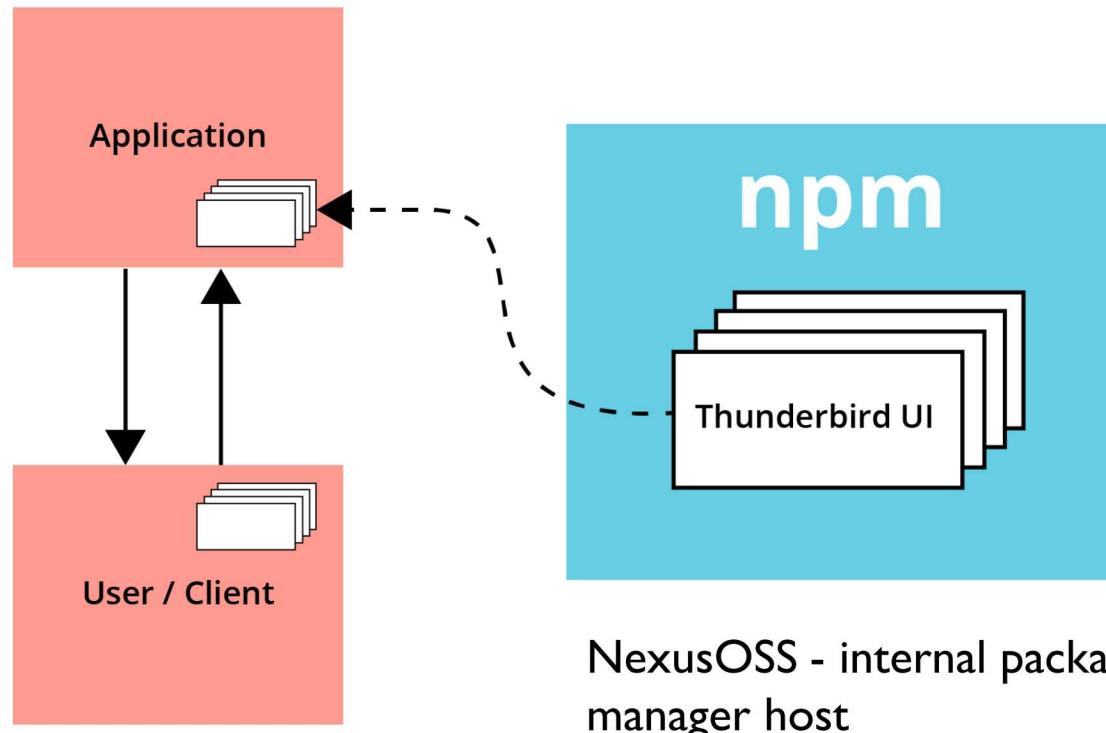
- Dwell times were longest for conditions with worst comprehension
 - Light headings (Small scale, small margin)
 - Light and mixed headings (Large margin, large scale)
- Indicates poor comprehension driven by difficult attentional allocation

Headings Study: Recommendations for TUI

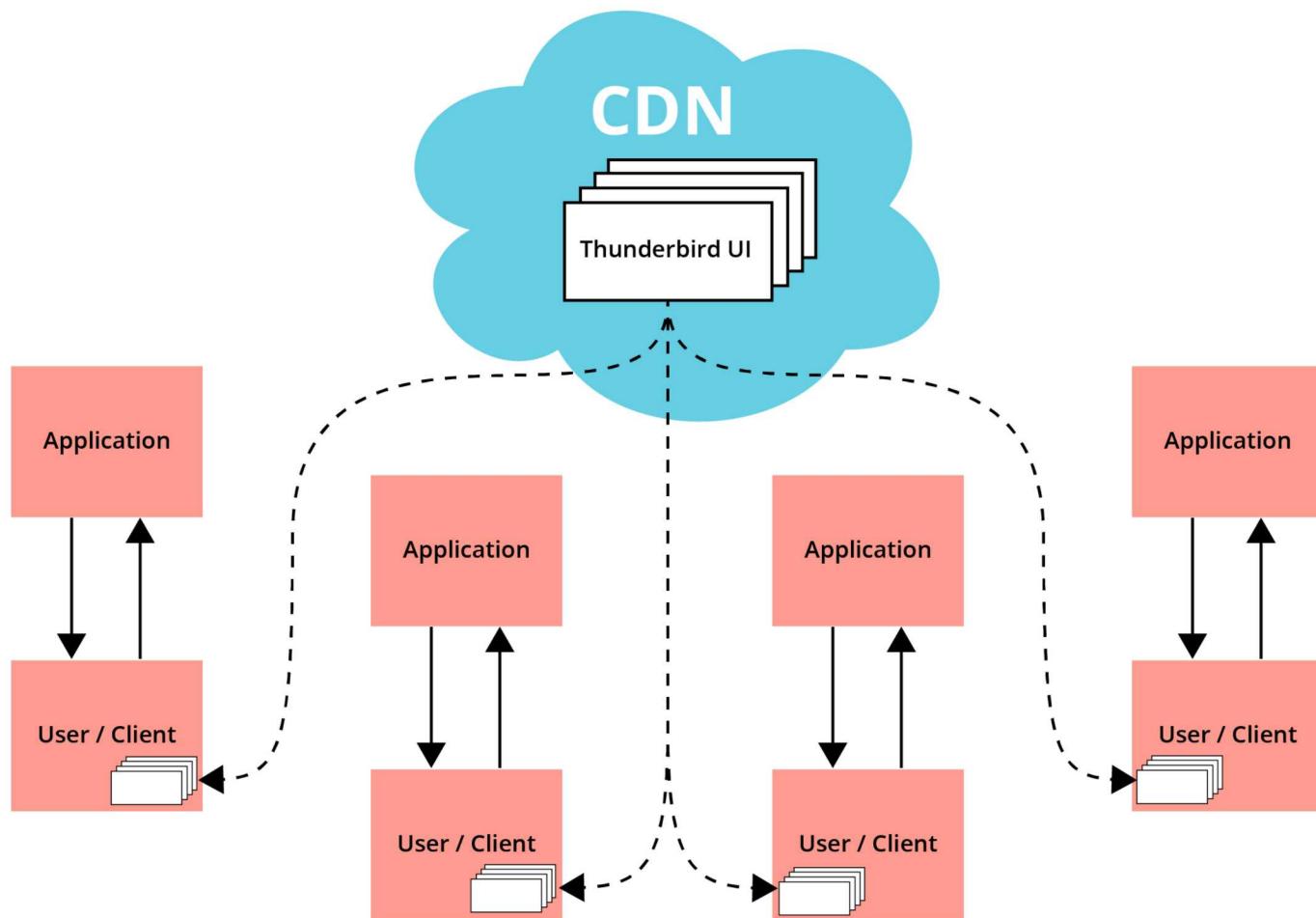
- Avoid extreme Margin / Scale combinations
 - If must use extremely compressed or spaced out text, bold font weight will help readers target fixations
 - Especially avoid light headings, as they produced longest viewing times and lowest comprehension
- “Best” Combinations:
 - Small Scale/Large Margin or Large Margin/Small Scale, with regular weight
 - Produced best comprehension and lowest viewing times
- Caveats
 - Task constraints
 - Differences in visual layout
 - Small sample

Distribution and Adoption

Distribution - Package Manager



Distribution - CDN



Socialization and Outreach

- Grassroots approach
 - Conceive of TUI as “everyone’s design system”
 - Aspire to run project as “open source”
- Community Engagement
 - Developer team interviews
 - 16 interviews with 17 development teams
 - Brown Bag Sessions



Resistance and Barriers

- Perception that it's expensive to implement
- Teams want control over their own design
- Teams want control over their own code
- Lack of trust
 - Trusting other team's code
 - Global Header fiasco!

Return on Investment

How to Assess Return on Investment (ROI) for TUI?

- Given the significant time and money investment made to develop TUI, does it increase efficiency?
- We assessed this in two ways:
 - Development team efficiency
 - Semi-structured interviews
 - Compared responses between teams currently using TUI or not to assess whether it saved them time or money
 - User efficiency on websites using TUI
 - Web analytics metrics of sites using TUI to assess whether it streamlined user interactions relative to sites not using TUI

Measuring ROI: Development Team Efficiency

- Interviewed 5 development teams over 7 interview sessions
 - 3 sites were using TUI, 2 were not
- Questions included:
 - Did you use TUI in your development process? Why or why not?
 - How was TUI implemented?
 - How did it affect your development process? (If you didn't use it, how do you *think* it would have impacted your team?)

Measuring ROI: Development Team Efficiency (I)

- Development teams were highly positive
 - Generally think it saves time
 - More professional-looking and consistent sites
 - Saves M&O costs (bug fixes automatically rolled out)
- Difficult to provide *measurable* ways TUI helped
 - Estimates range from 20% time savings on a regular site to 80-90% time savings for a very simple site
 - One site said a high school intern created a site from scratch in ~53 hours

Measuring ROI: Development Team Efficiency (2)

- All teams reported that TUI saved them time when:
 - Setting up a new site
 - Implementing basic features (which is “tedious”)
- Time-savings on basic tasks allowed developed to:
 - Develop more custom features
 - Address customer-specific requests
 - Work on more creative, challenging work

Measuring ROI: Development Team Efficiency

- Not all teams used TUI in intended way
 - Some sites were being developed in parallel, and so they custom-coded elements to *look like* TUI
 - Some sites store locally-hosted versions of TUI, which causes challenges:
 - Changing referenced paths
 - Re-downloading when new versions are released
- Noted drawbacks include:
 - Addition of features not in TUI
 - Customization of TUI assets to meet customer needs
 - Limits developer freedom and creativity
 - Lack of features present in more mature libraries

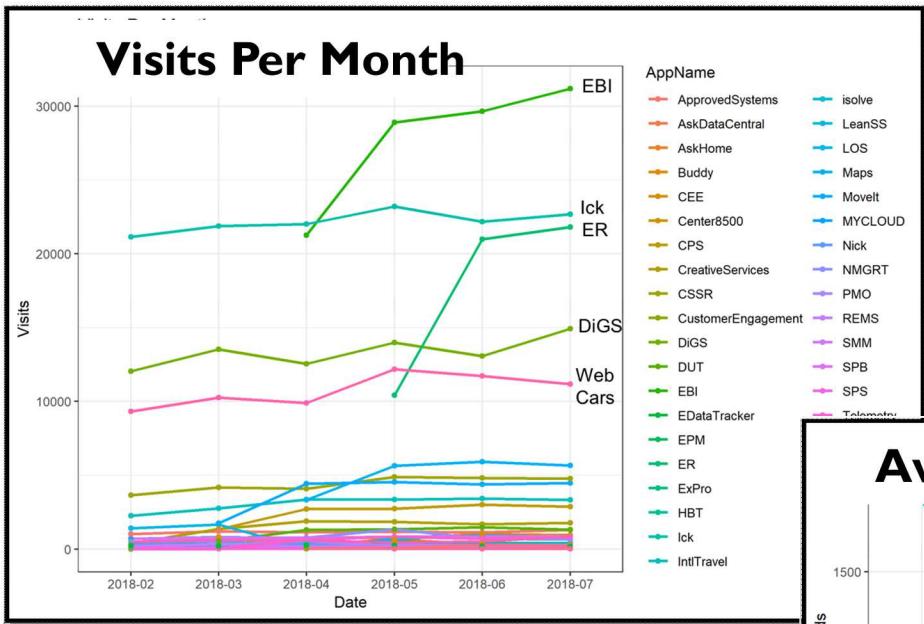
Measuring ROI: Development Team Efficiency

- Caveats of findings:
 - Small sample size
 - Lack of baseline of development team efficiency (and general difficulty with measuring development team efficiency/productivity)
 - Lack of quantitative measurement of TUI efficiency gains
 - TUI Maturity at time of use

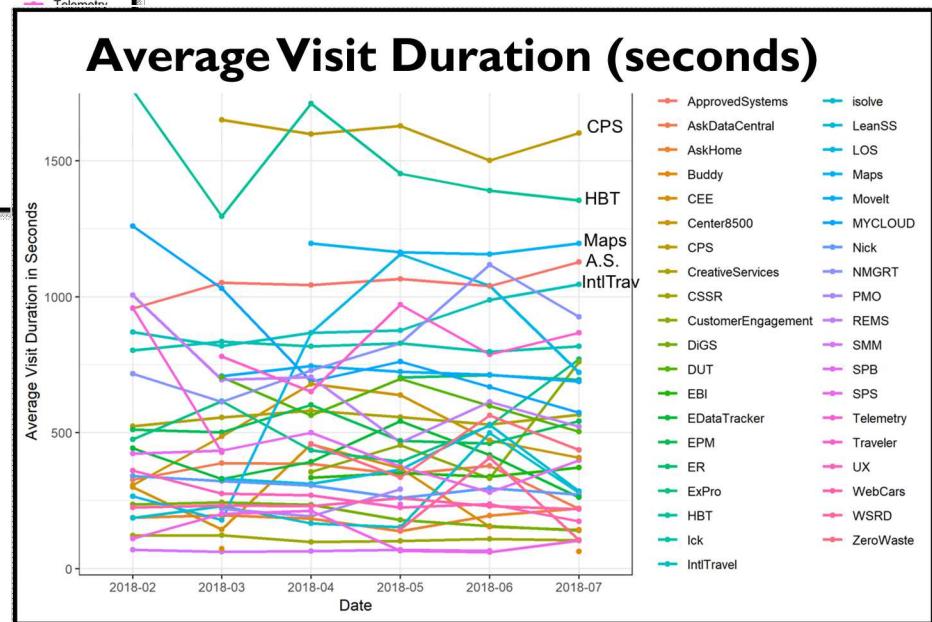
Measuring ROI: Web Analytics Metrics

- Web analytics metrics capture data regarding how users naturally interact with websites
- Basic metrics include:
 - Number of visitors (unique or total)
 - Time on site
 - Number of pageviews per visit
- Recommendation for usage:
 - Establish baseline levels of time MOWs spend on internal websites
 - Measure changes to these levels after TUI implementation
 - Direct measurement of corporate time savings across large population (12,000+ employees)

Measuring ROI: Web Analytics Metrics (Example)



Identify sites with highest number of visitors to target improvements



Identify sites with the longest visit durations to target improvements

“Is this better?”

- Than what?
 - Need to establish baselines on key metrics *before* making changes in order to measure improvements
- For whom?
 - Improving development team efficiency is a very thorny issue. May depend on:
 - Site/application characteristics: complexity, purpose, budget
 - Team characteristics: size, experience level, etc.
 - Improving user efficiency might be easier to measure using web analytics
 - Goal in enterprise applications (i.e., reduce time on sites) likely different from commercial applications (i.e., increase time on site, profits, etc.)

Path Forward and Lessons Learned

Path forward for Thunderbird UI

- Implement governance
- Additional front-end technologies
 - Angular
 - React

Lessons Learned

- Buy-in can be a challenge
 - Do lots of outreach
 - Cultivate grassroots, open source approach
 - Need executive leadership support
- Make the design system easy to use
 - Easily accessible. Don't make devs jump through hoops.
 - Keep code clean! Improves trust.
- Measuring ROI
 - Establish a baseline before you start making changes



Thank you!

Questions?