CISPA
HELMHOLTZ CENTER FOR INFORMATION SECURITY

Permission Rationales in the Web Ecosystem: An Exploration of Rationale Text and Design Patterns

Yusra Elbitar, Soheil Khodayari, Gianluca De Stefano, Giancarlo Pellegrino, Sven Bugiel, Marian Harbach (Google), Balazs Csaba Engedy (Google)

Feature-Rich Websites

Require permission from the user

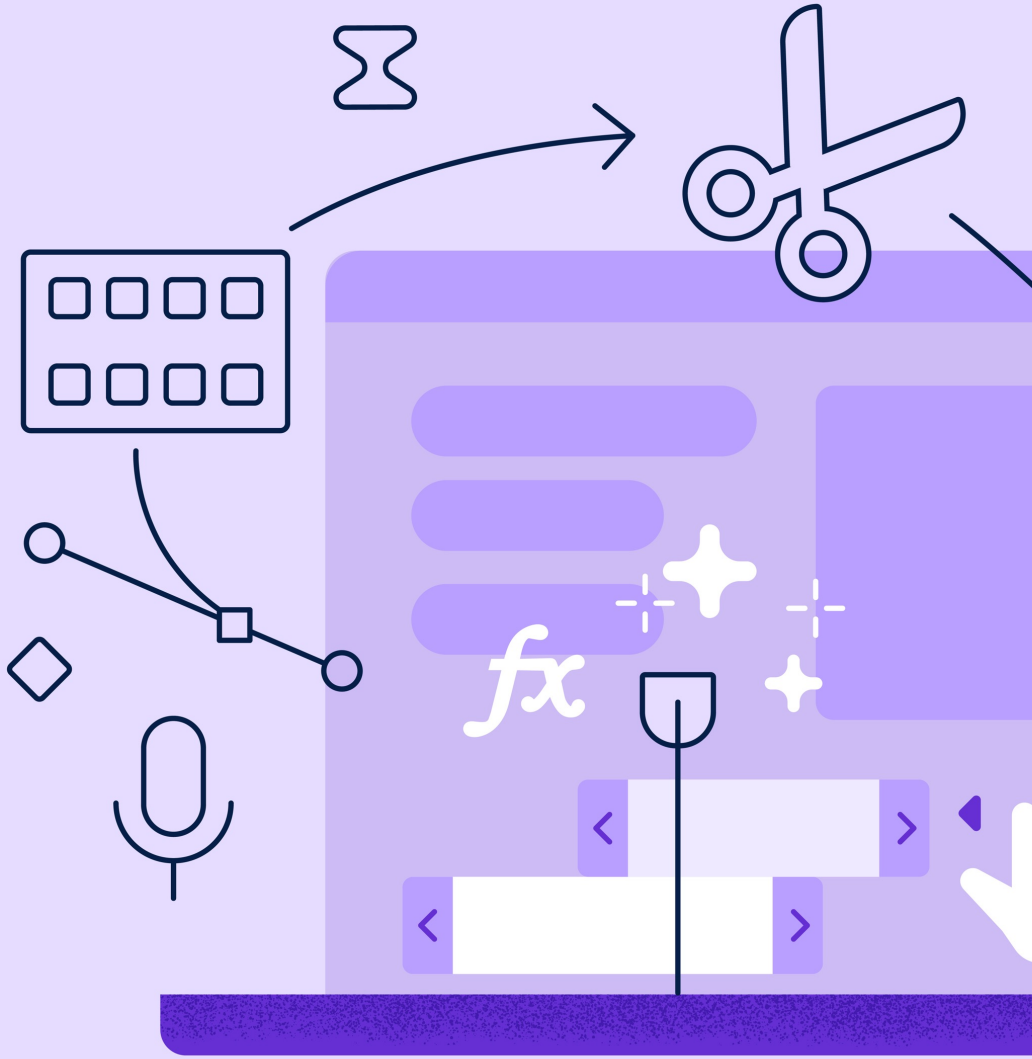
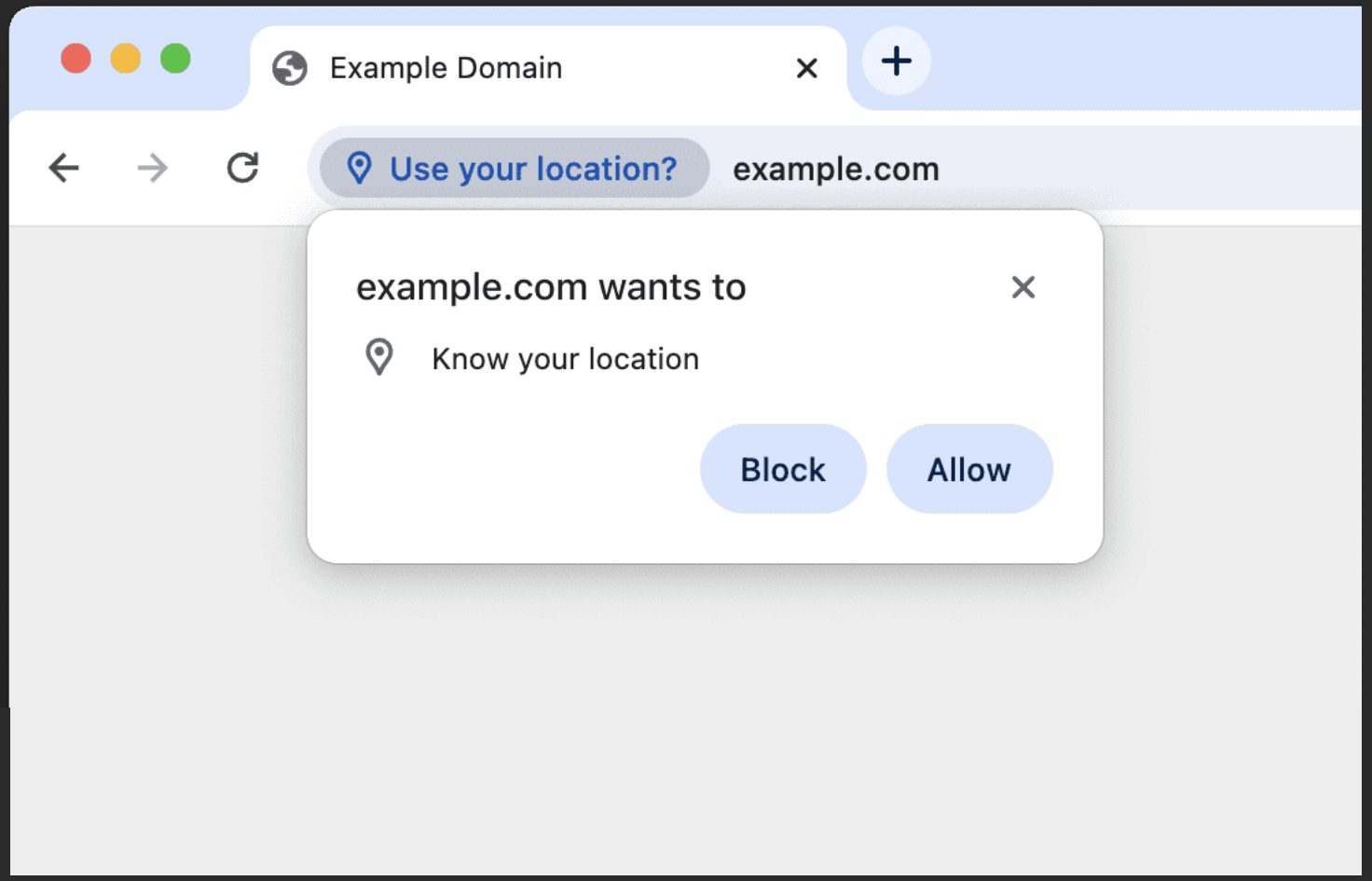


Illustration: polinachekhovich - Freepik.com

The User Makes the Permission Decision



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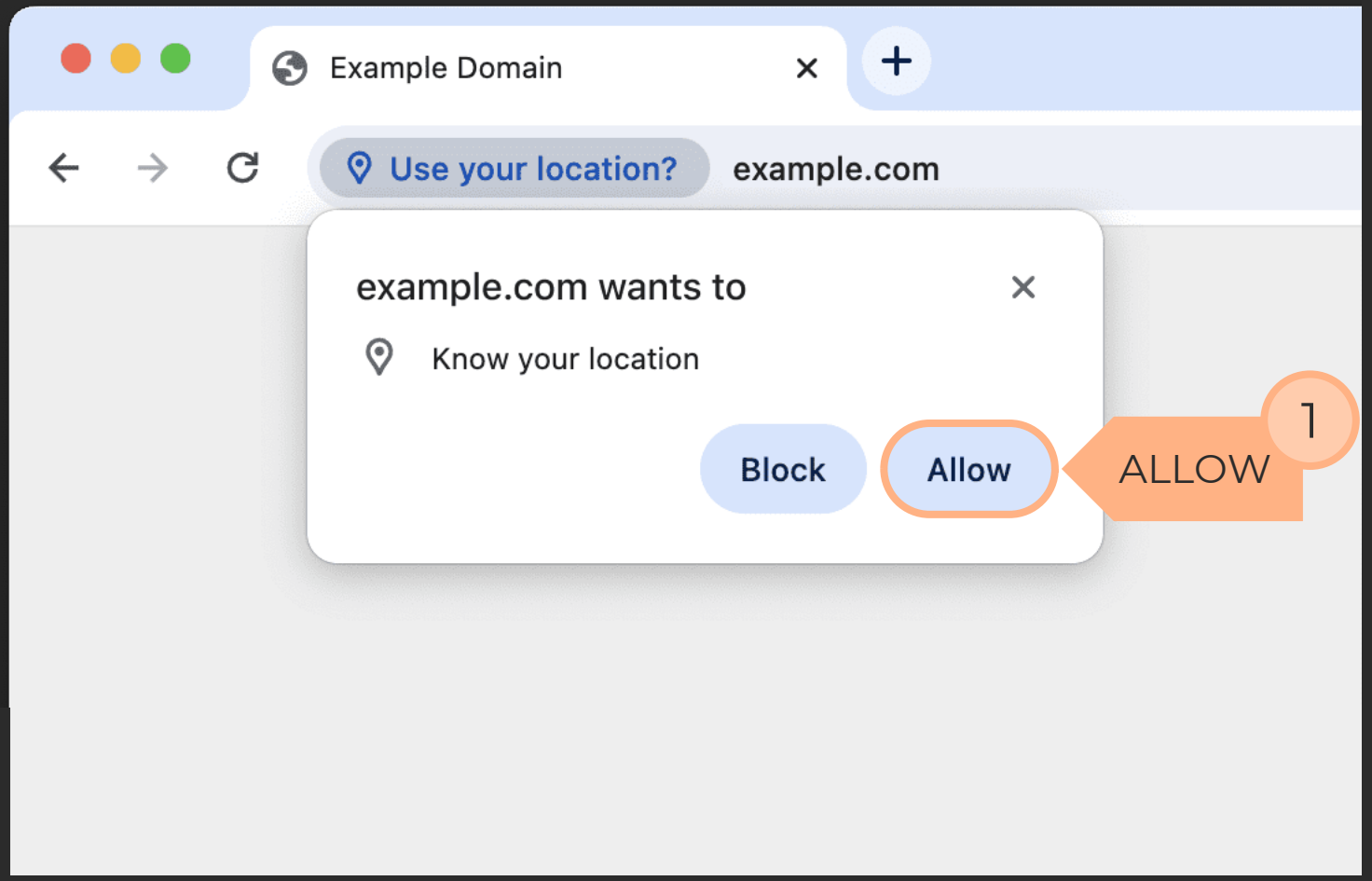

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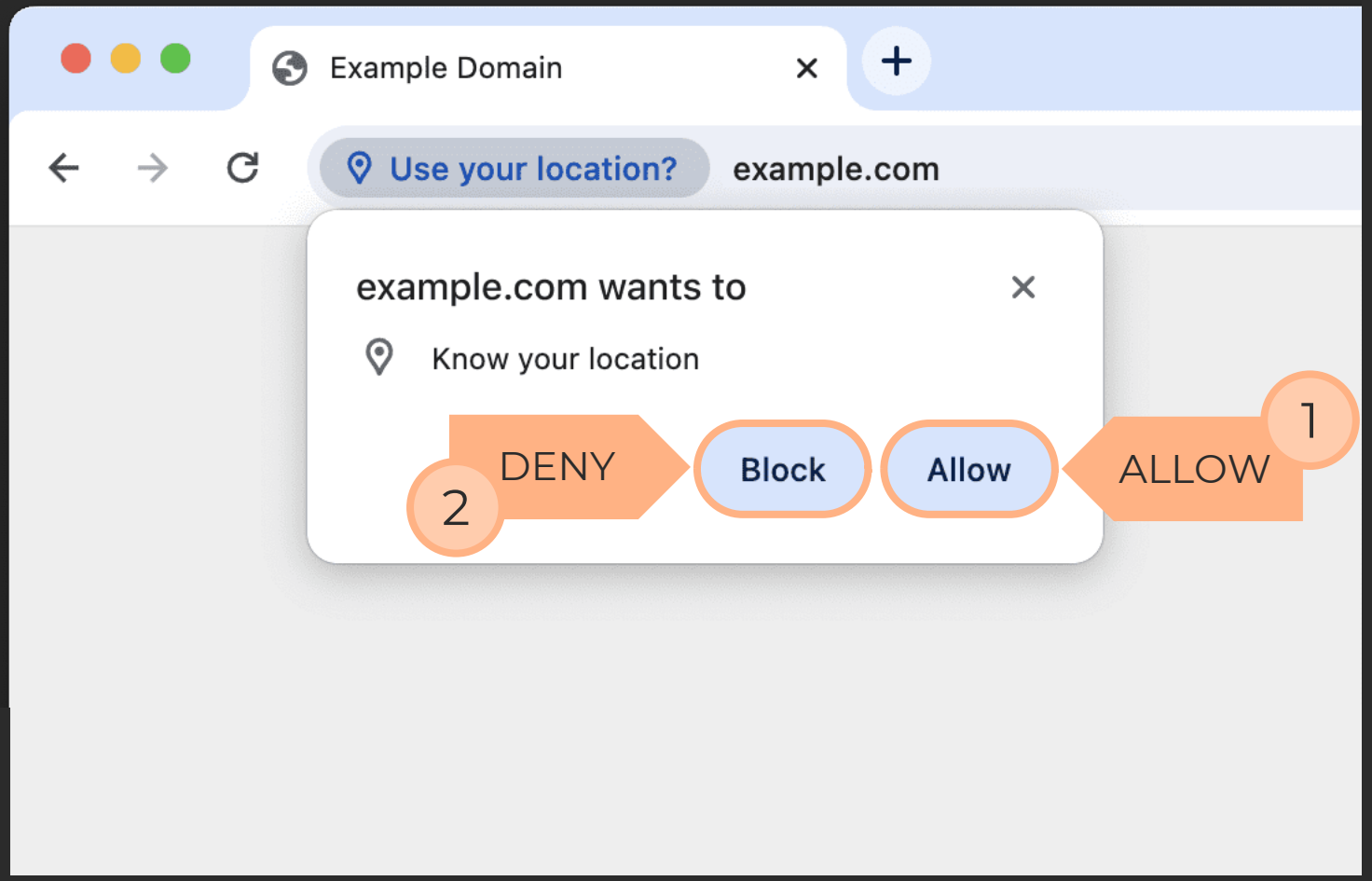

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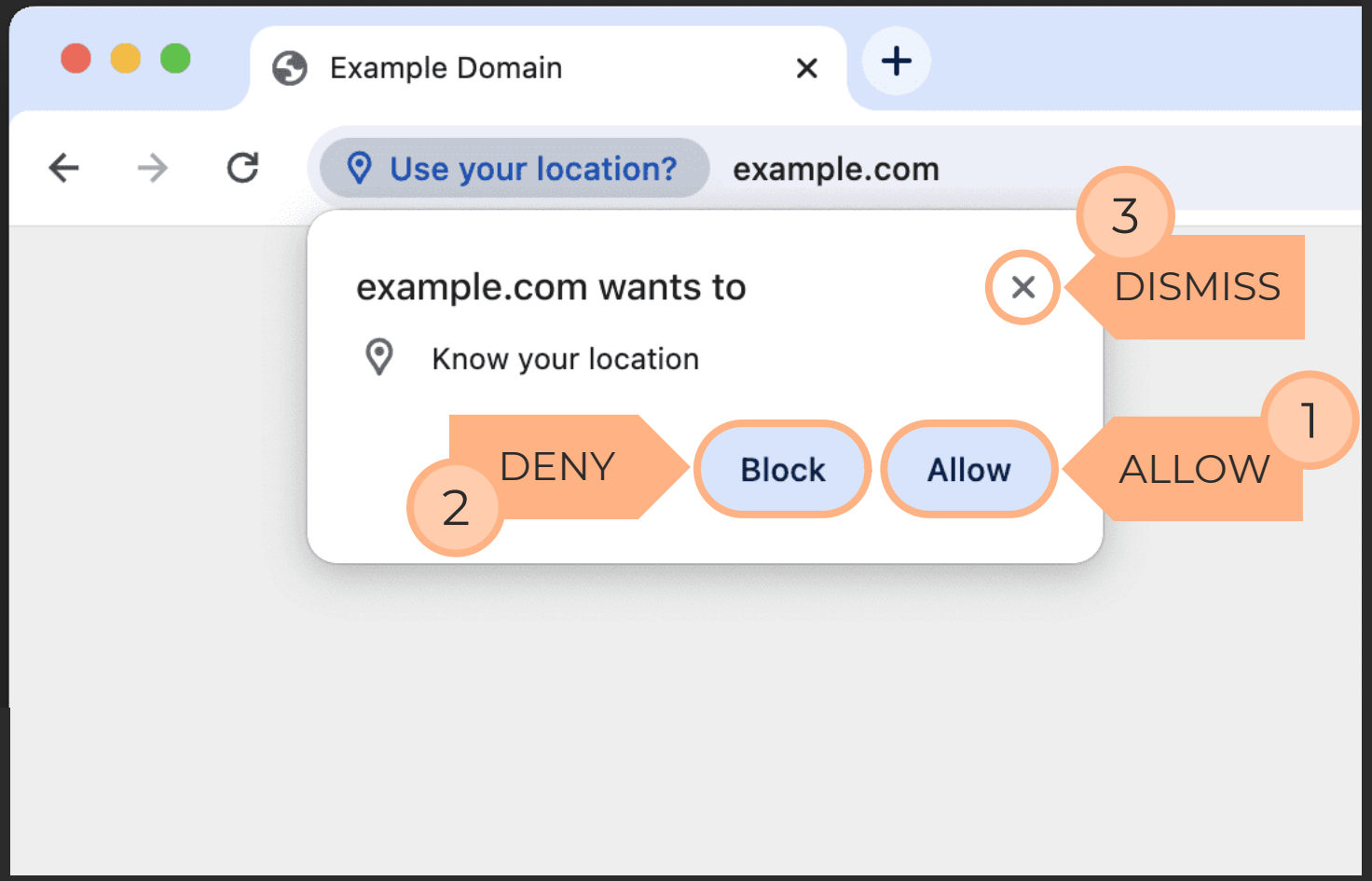

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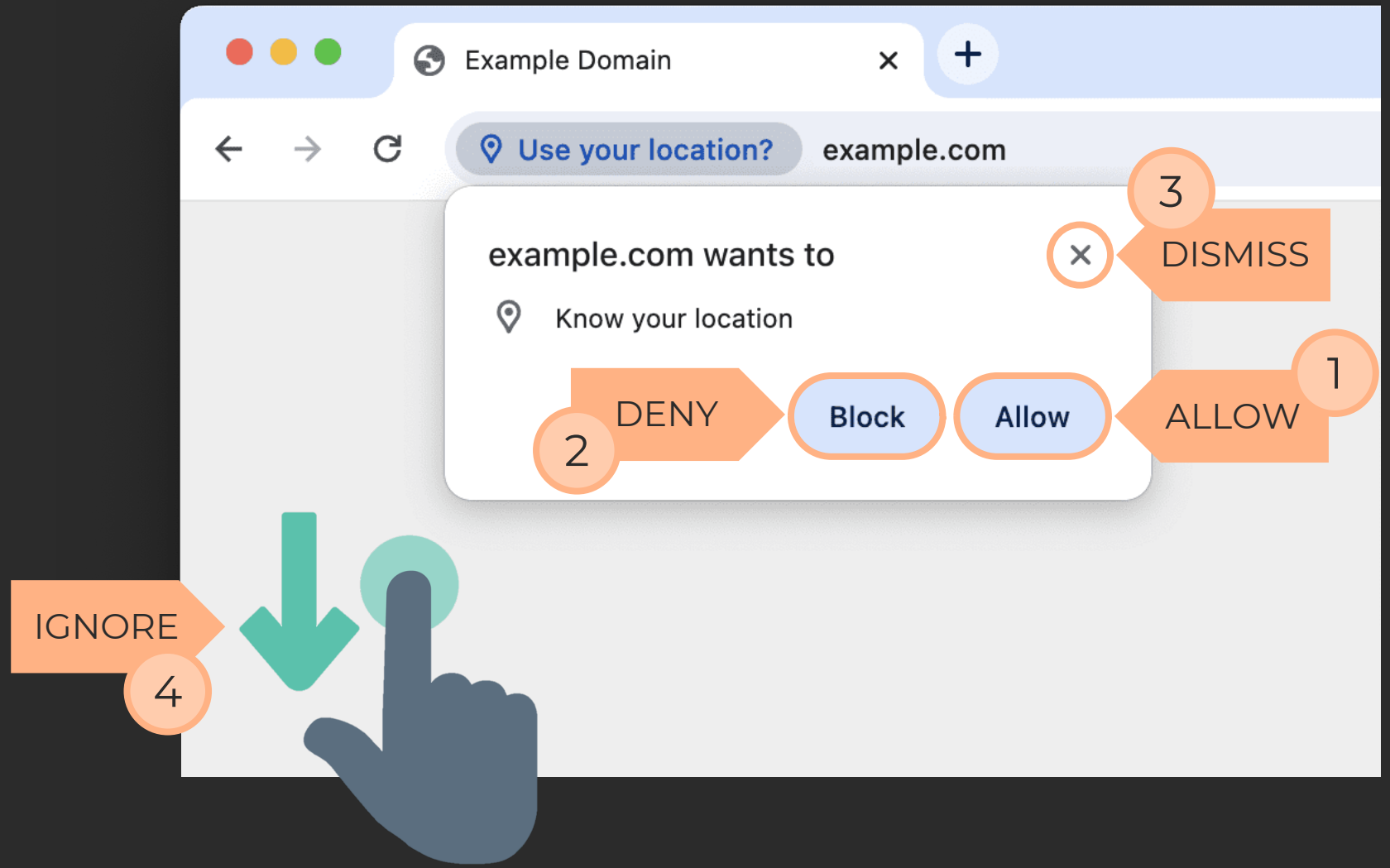

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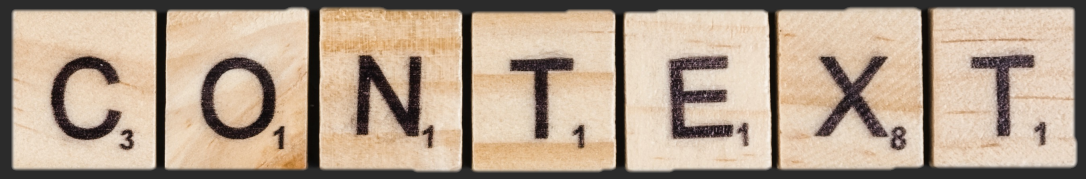
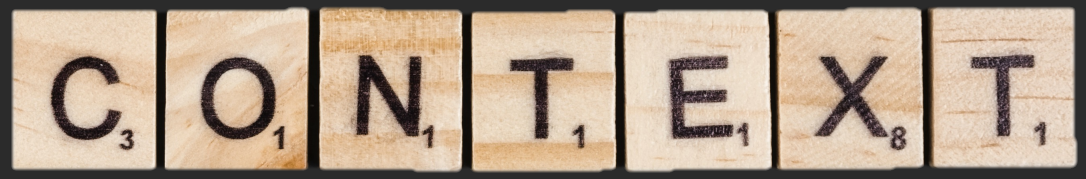


TIMING

Image: Freepik - Freepik.com



TIMING

RATIONALES

Want to see the nearest Whataburger?
Allow the browser to use your location.

Use current location

Image: Freepik - Freepik.com

Rationales in the Mobile Domain

Android[1]

Explain why your app needs the permission

Check whether your app should show a rationale to the user, explaining why your app needs the user to grant a particular runtime permission. If the system determines that your app shouldn't show a rationale, continue to the next step directly, without showing a UI element.

iOS[2]

Provide a purpose string

Learn how to write clear and succinct purpose strings to help people understand why your app needs access to protected resources like their camera, location, and health data. We'll take you through best practices to help craft concise purpose strings and show you how you can improve wording in permission requests.

1) https://developer.android.com/training/permissions/requesting
2) https://developer.apple.com/documentation/uikit/requesting-access-to-protected-resources

Rationales on the Web?

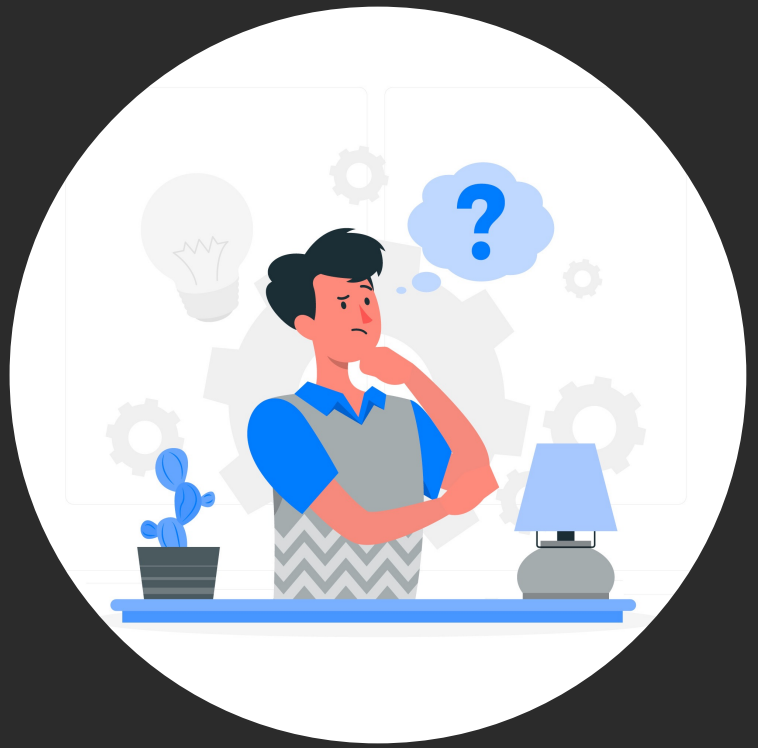


Illustration: storyset - Freepik.com

Rationales on the Web?

Do web developers **provide** rationales?

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Do different rationale **text patterns** affect users' decisions?

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How are rationales on the web **designed**?

How are rationales **phrased** on the web?

When are rationales provided to users?

Do different rationale **text patterns** affect users' decisions?

Do different rationale **UI patterns** affect users' decisions?

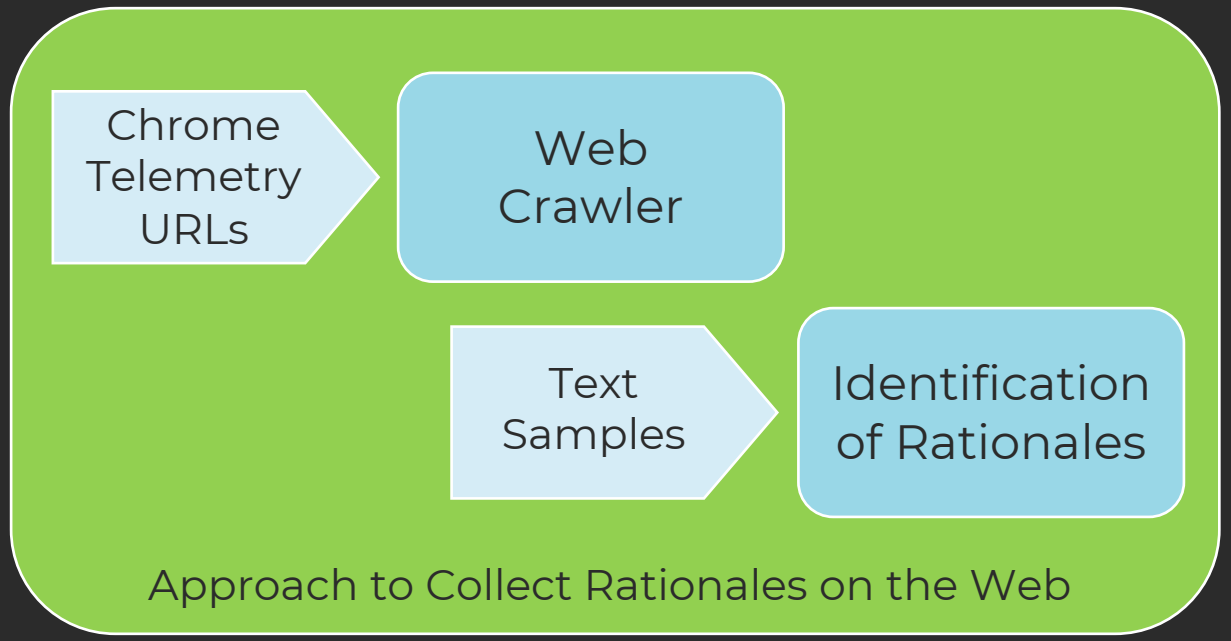
Illustration: storyset - Freepik.com

Rationales in the Expansive Web Content

Image: pixel-shot.com - Freepik.com

Rationales on the Web

RQ1: Identify and collect Rationales on the Web



Approach to Collect Rationales on the Web

RQ2: Identify Rationale Design Patterns and their Effects on Users' Decisions

Rationales on the Web

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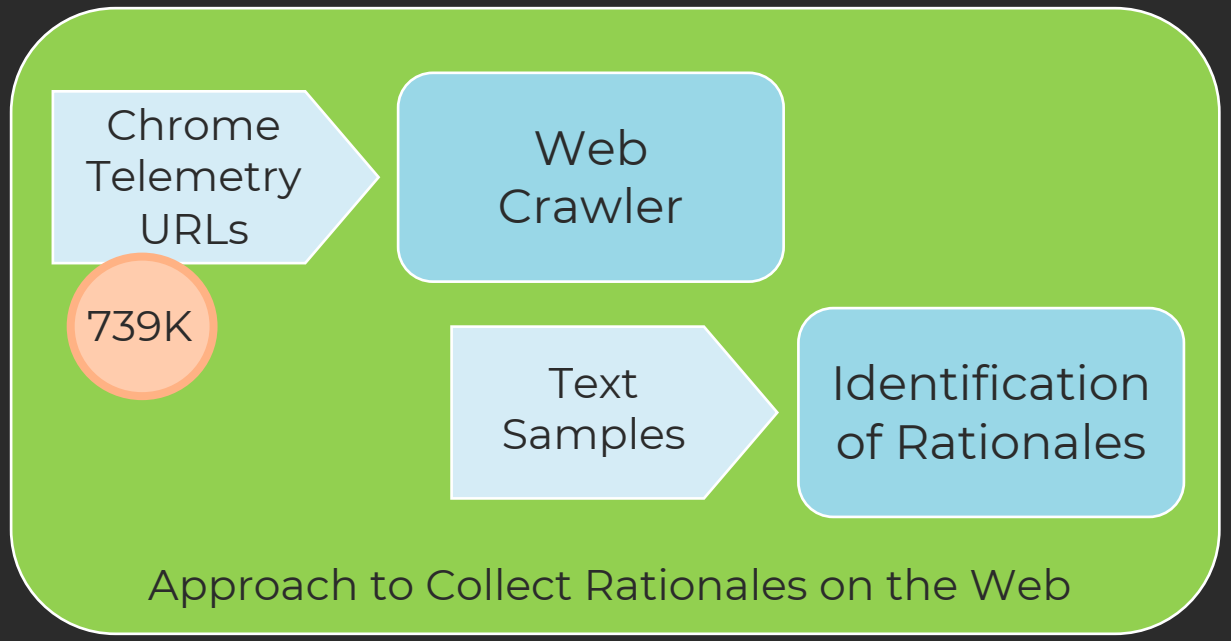

Approach to Collect Rationales on the Web

RQ2: Identify Rationale Design Patterns and their Effects on Users' Decisions

Rationale Texts

Analysis of **Text Patterns & Effects**

Text Patterns & their Effects

Rationale Screenshots

Analysis of **UI Patterns & Effects**

UI Patterns & their Effects

Rationales on the Web

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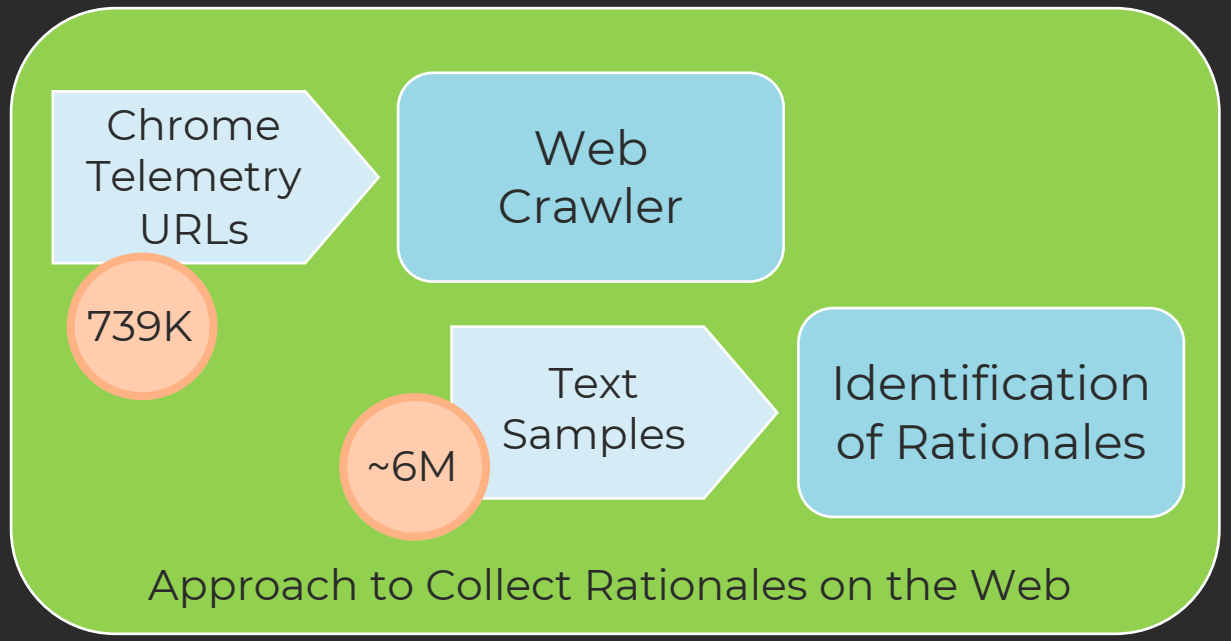

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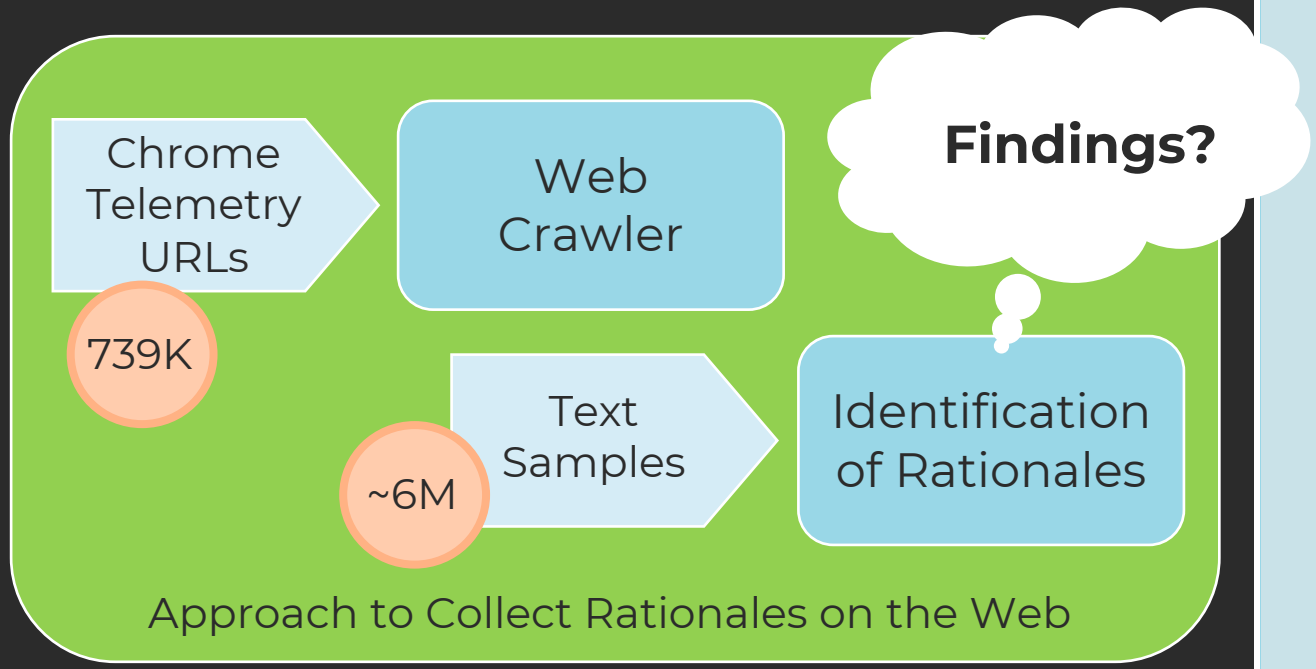

RQ2: Identify Rationale Design Patterns and their Effects on Users' Decisions

Findings: Identification of Rationales

From the 739K crawled webpages...

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3.6K unique rationales across 85K webpages.

Rationales on the Web

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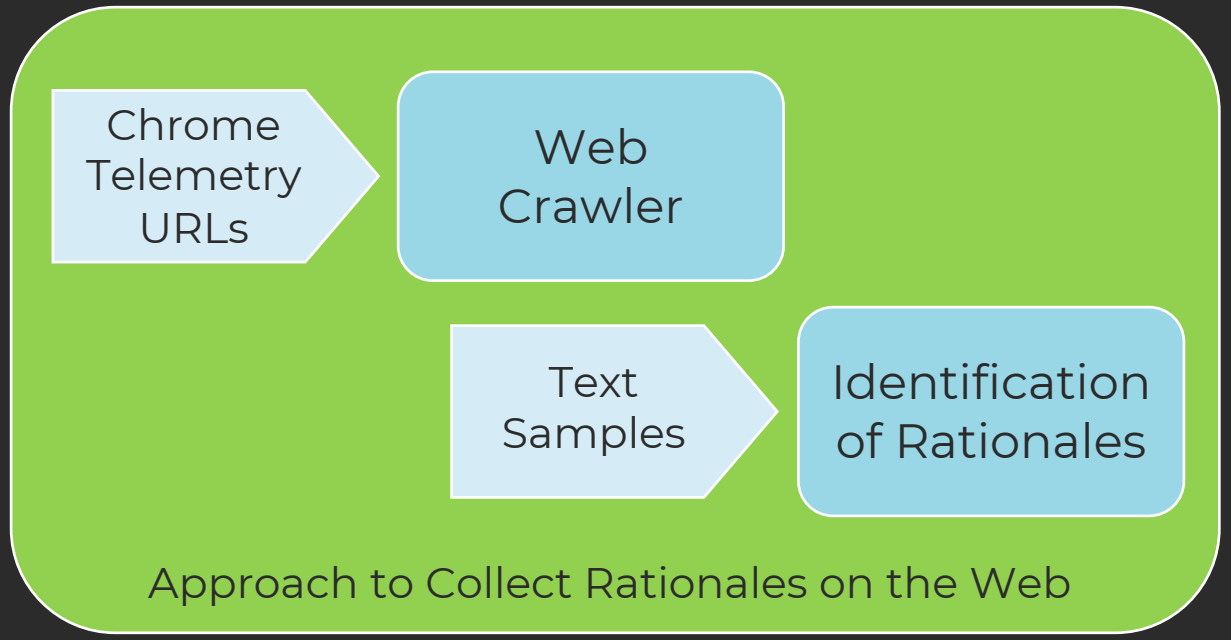

Approach to Collect Rationales on the Web

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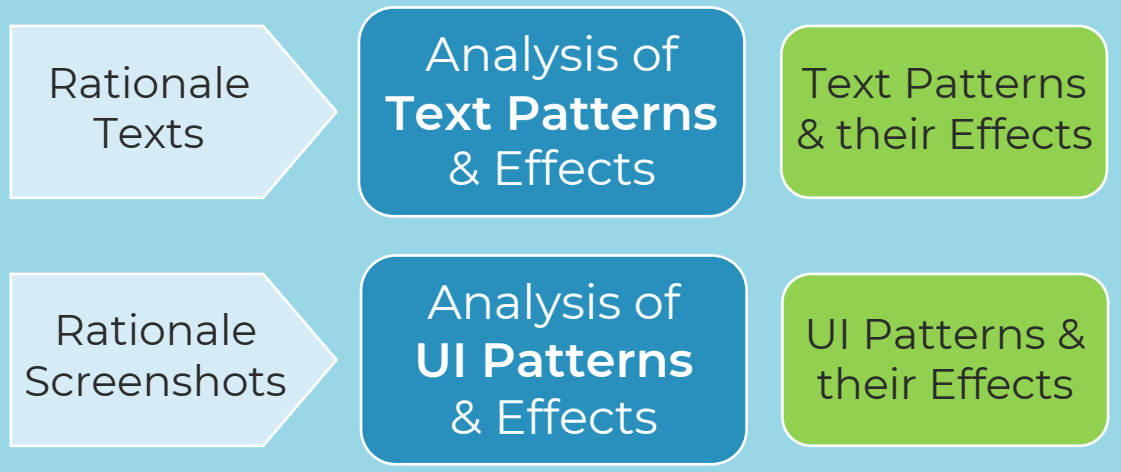

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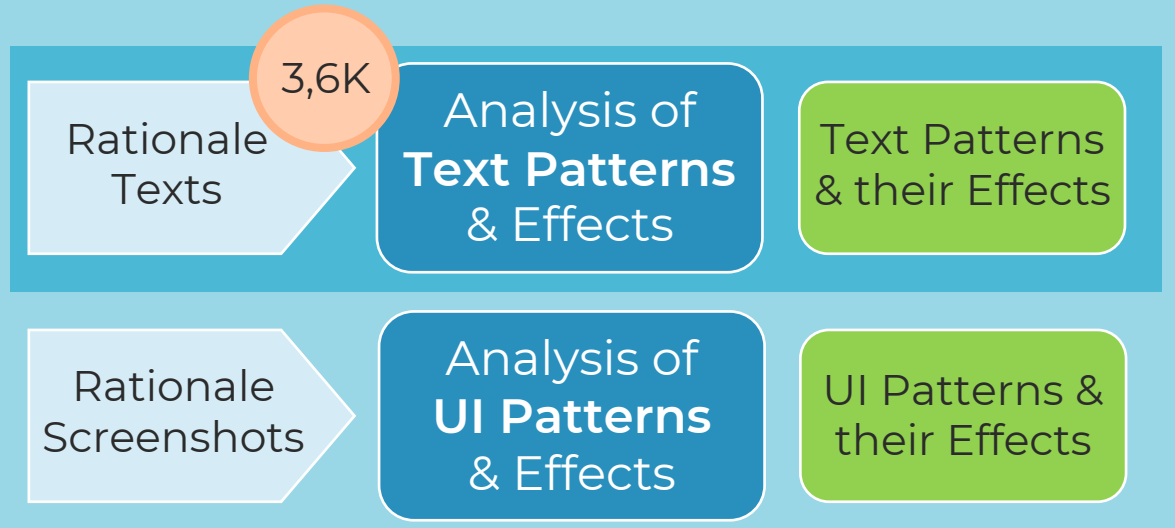

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Findings?

Rationale Texts

3,6K

Analysis of **Text Patterns** & Effects

Text Patterns & their Effects

Rationale Screenshots

Analysis of **UI Patterns** & Effects

UI Patterns & their Effects

Common Text Patterns

and their effects

- Message Tone
- Encouragement
- Message Content
- Permission Necessity

Text Patterns & their Effects: Message Tone

76% use a **NEUTRAL** message tone.

“This website…

NEUTRAL *requests access to your location.”*

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+18% increase in grant rate

Text Patterns & their Effects: Encouragement

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CONSEQU.

*"Blocking camera access may **limit features** of this website".*

Text Patterns & their Effects: Encouragement

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BENEFITS

*"Granting camera access will **improve your experience**."*

CONSEQU.

*"Blocking camera access may **limit features** of this website".*

-20% decrease in grant rate

Text Patterns & their Effects: Message Content

Rationale
Message
Content

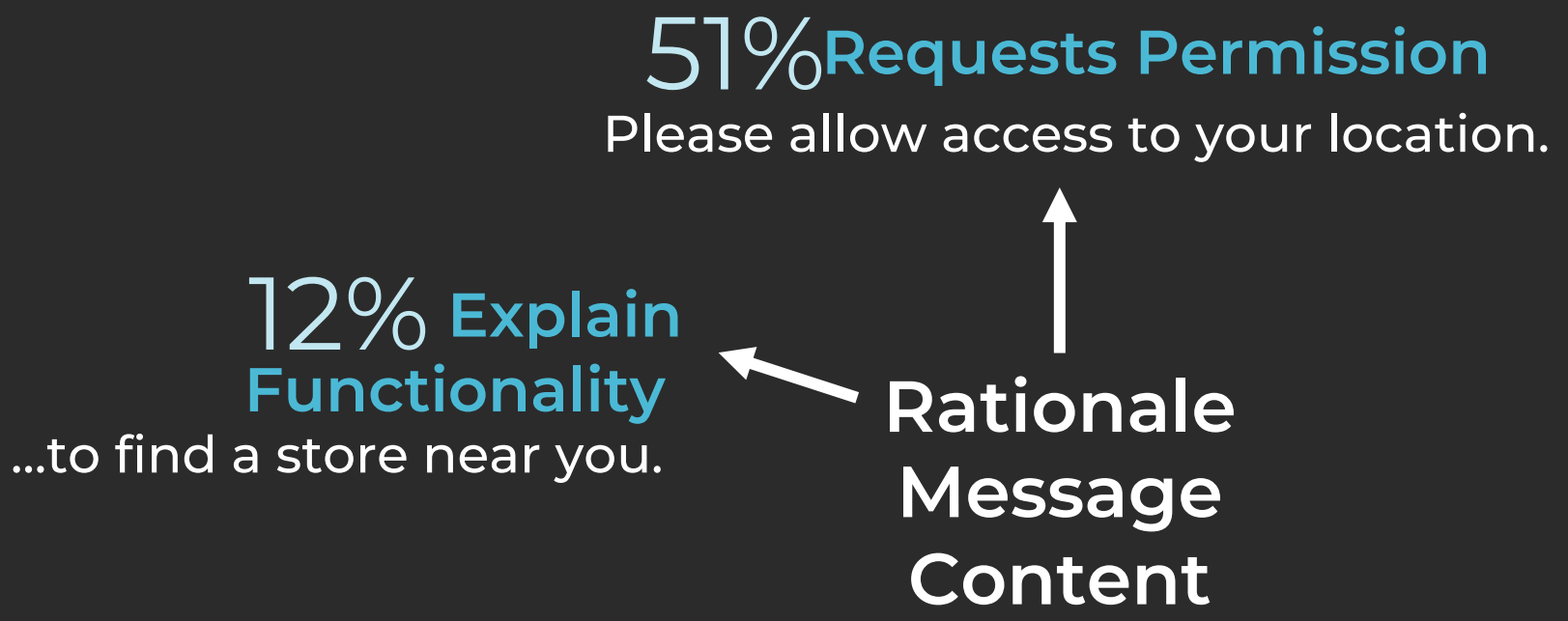
Text Patterns & their Effects: Message Content

51% **Requests Permission**

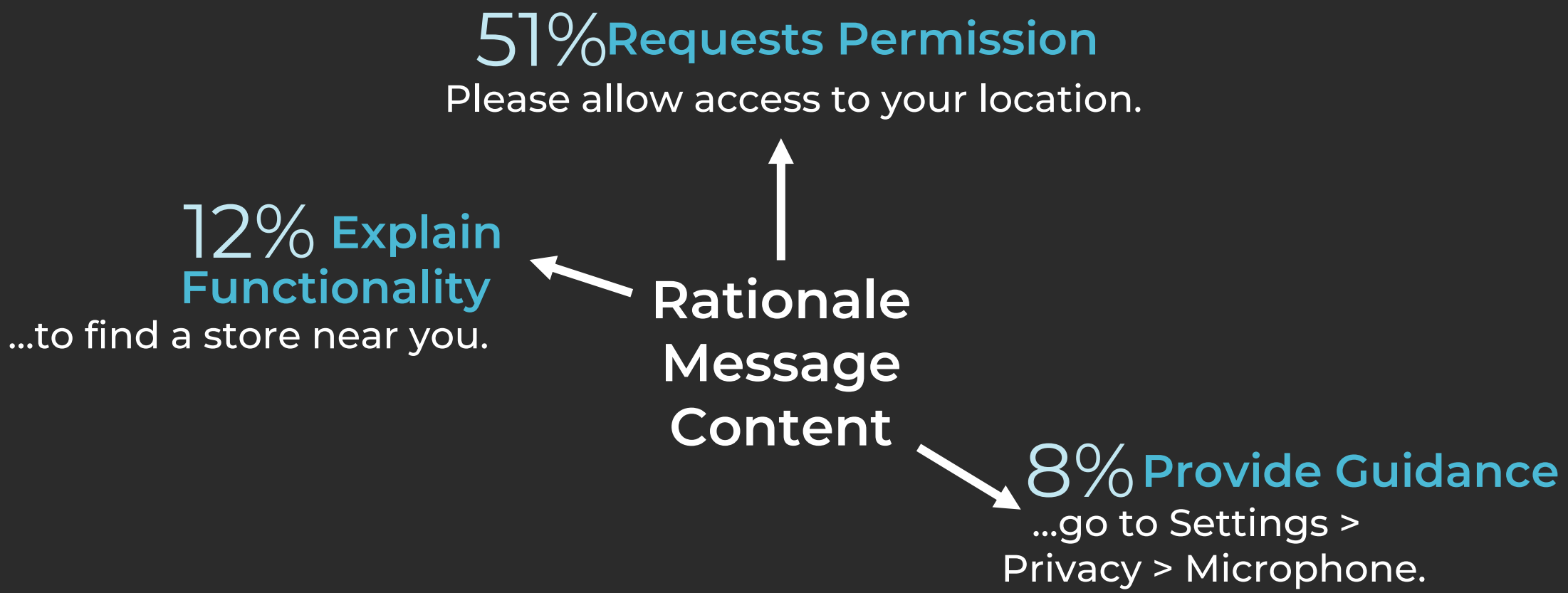
Please allow access to your location.

Rationale
Message
Content

Text Patterns & their Effects: Message Content



Text Patterns & their Effects: Message Content



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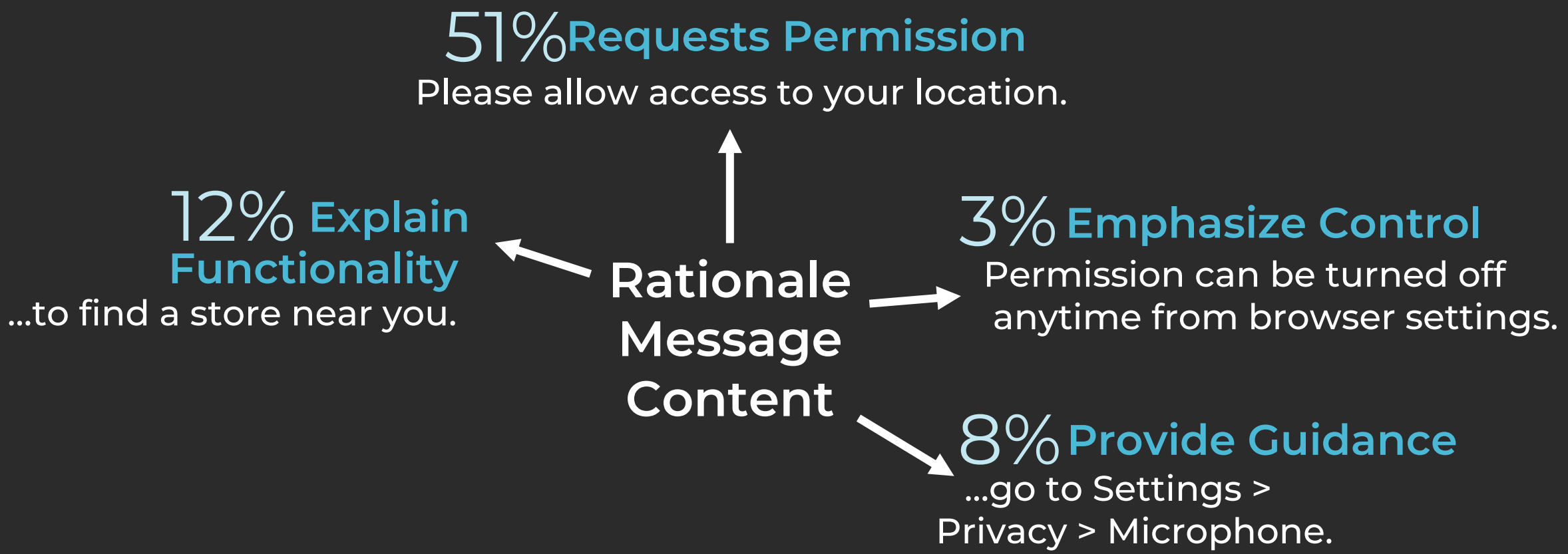

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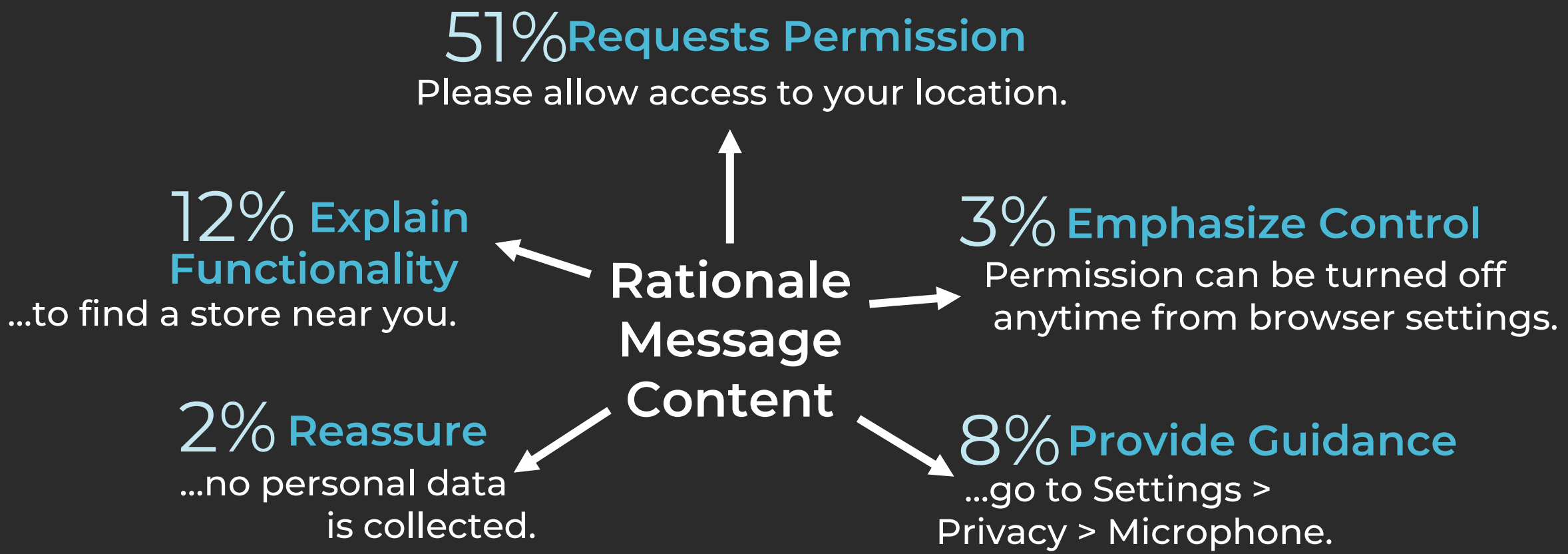

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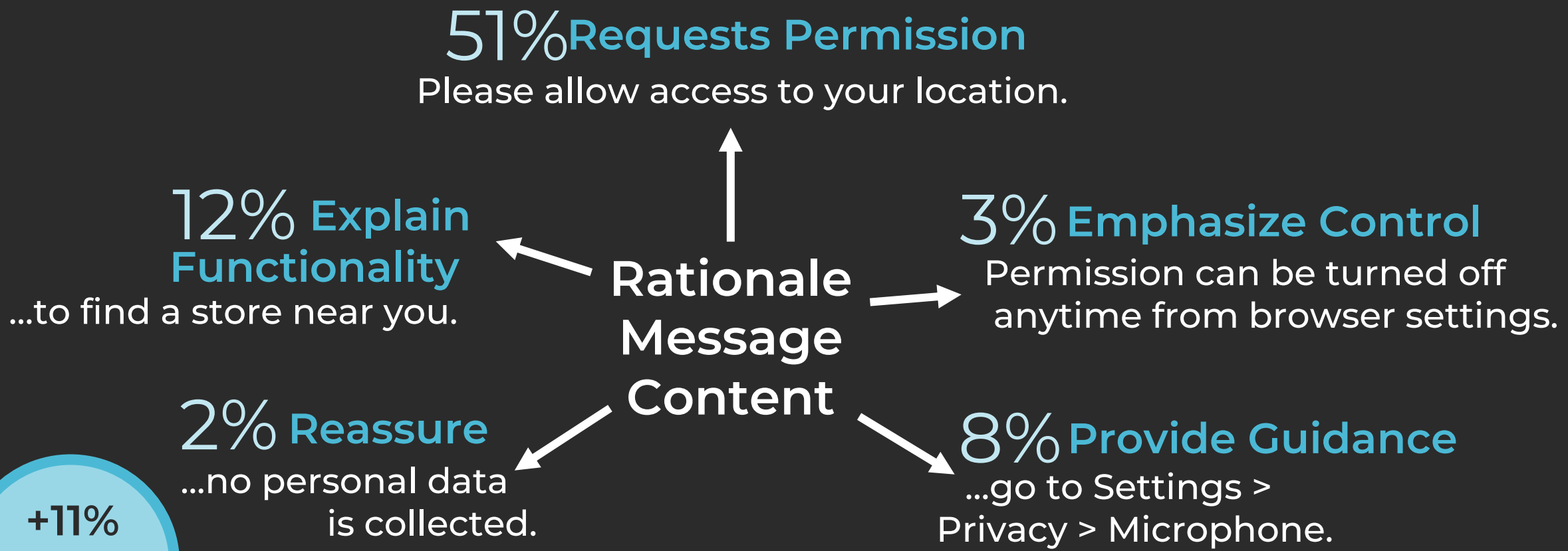

+11%
increase in grant rate

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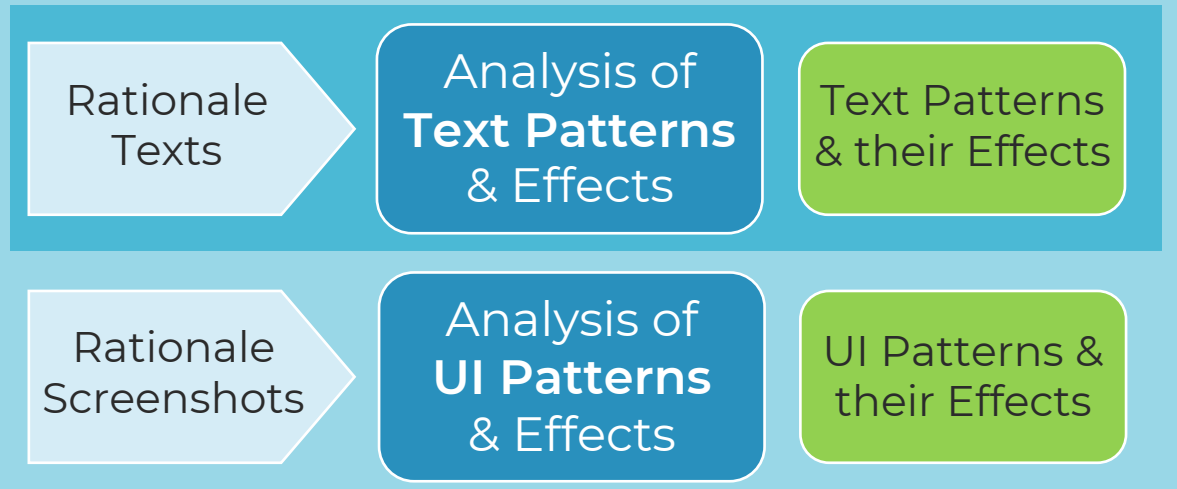

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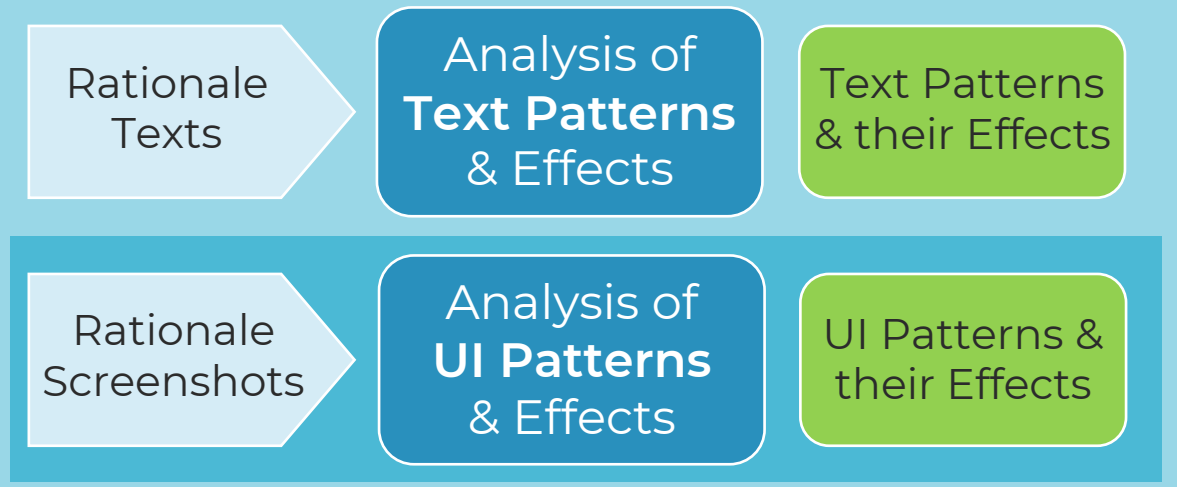

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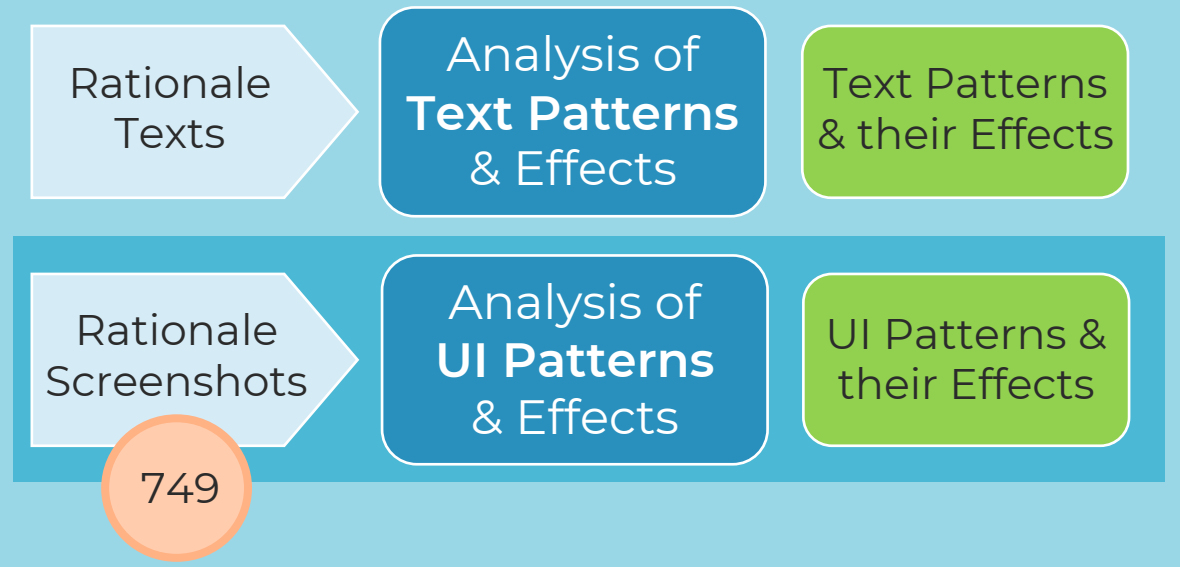

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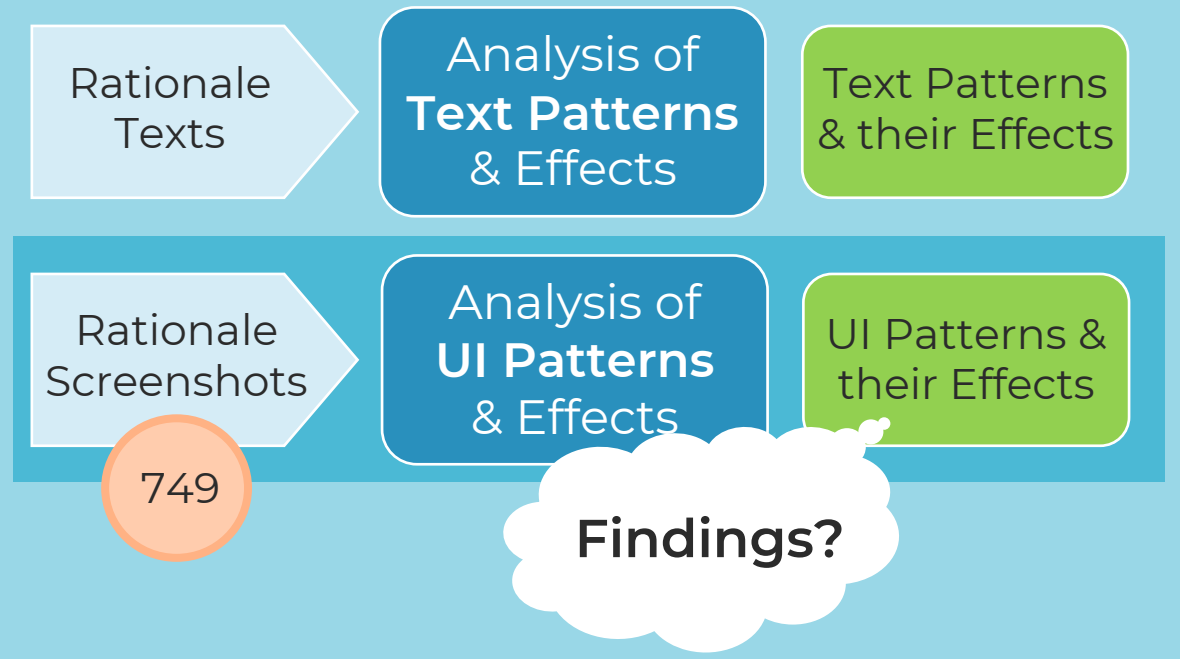


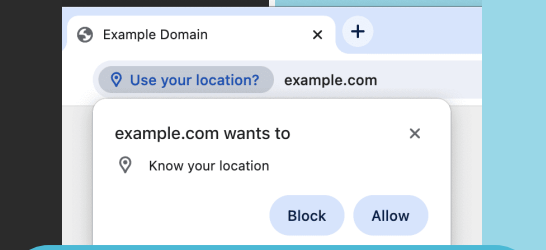
Common UI Patterns

and their effects

- Timing
- Position
- Elements
- Layout

UI Patterns & their Effects: Timing

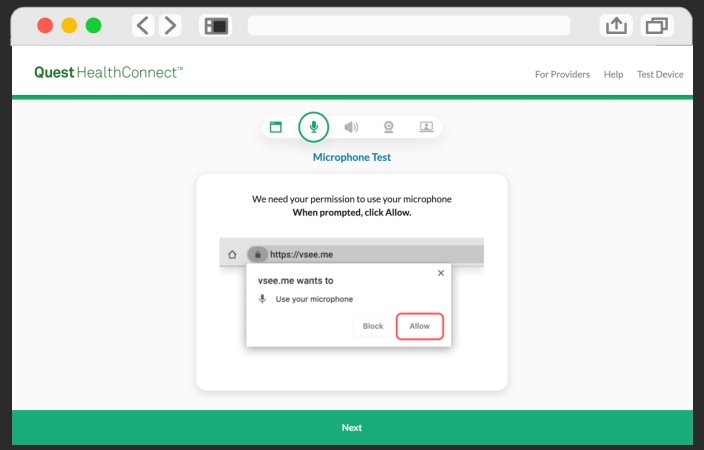
Browser Prompt

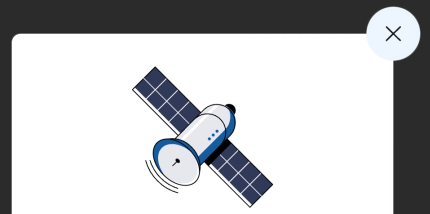


Timing

UI Patterns & their Effects: Timing

Before





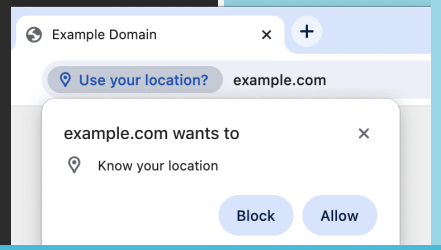
Enable Location Services

To pinpoint your local ModernMD!

Share My Location!

Cancel

Browser Prompt

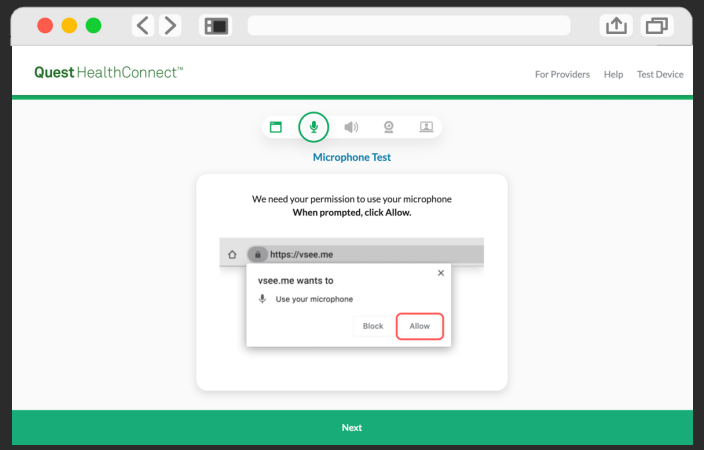


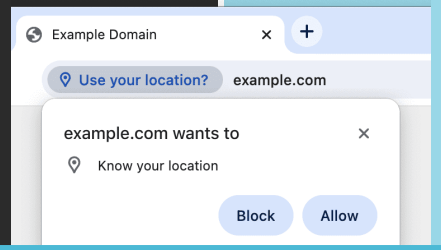
Timing

UI Patterns & their Effects: Timing

Before ---------- Along side ----------

Browser Prompt





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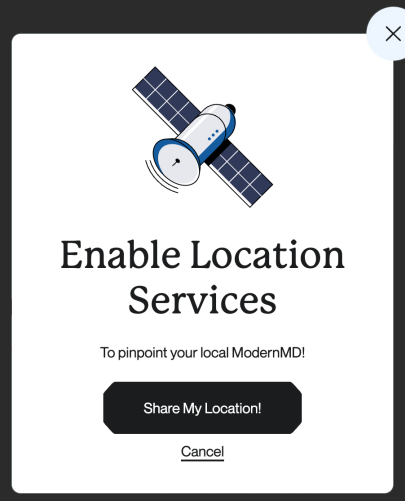
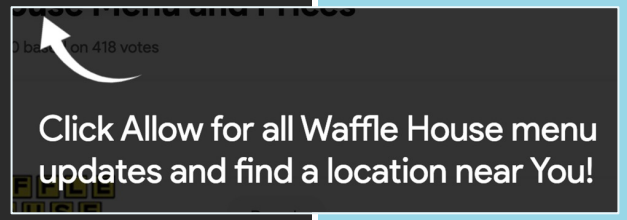
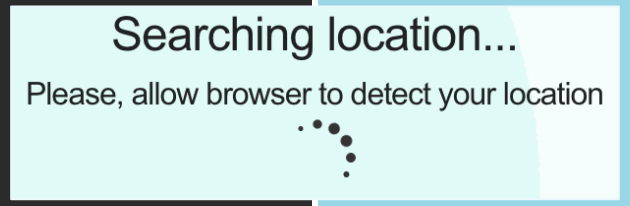


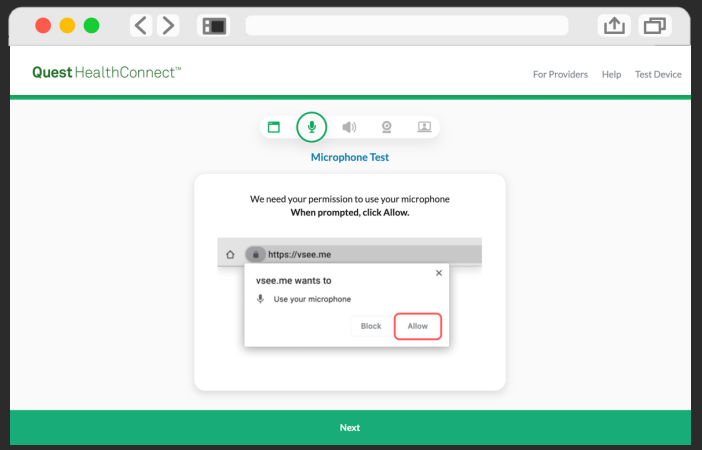


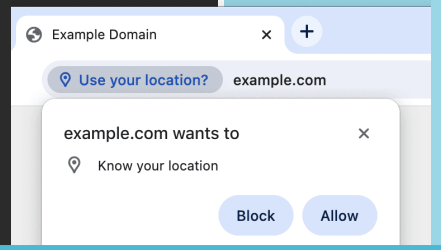


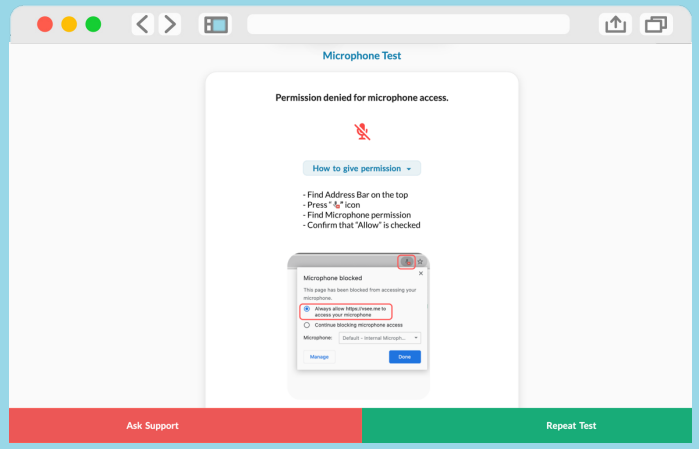
UI Patterns & their Effects: Timing

Before ---------- Along side ---------- After

Browser Prompt







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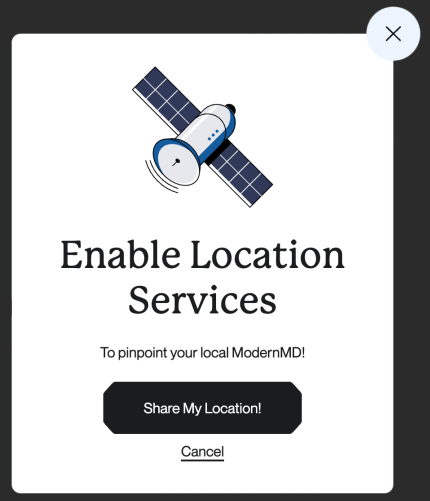
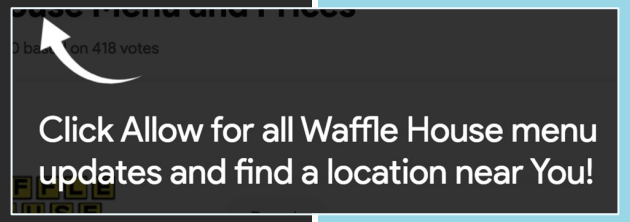
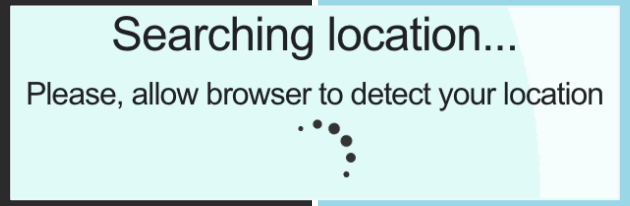
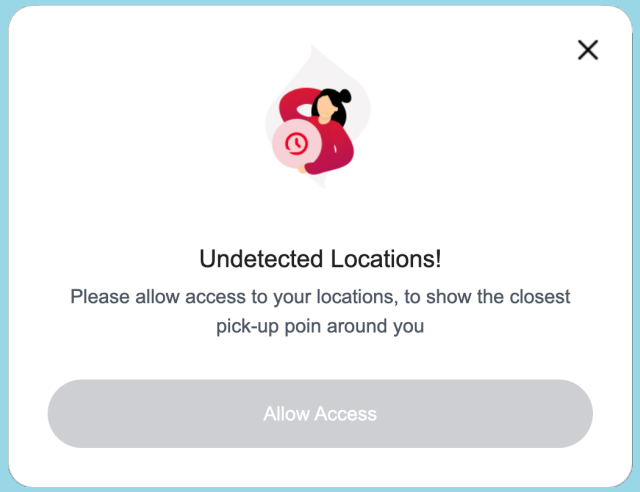




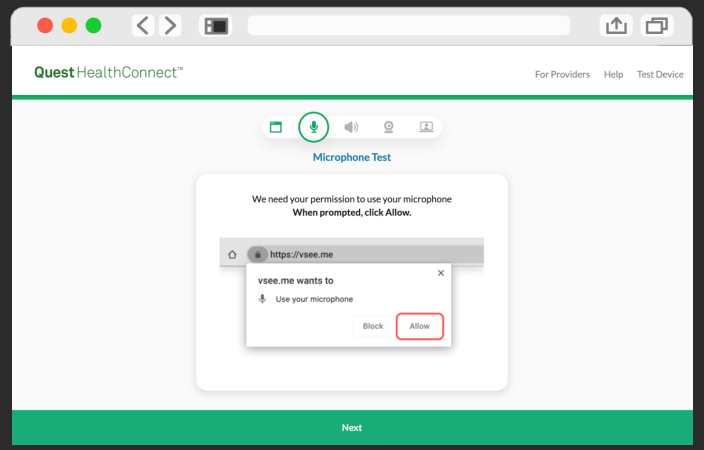


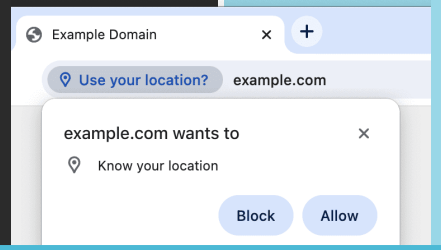


UI Patterns & their Effects: Timing

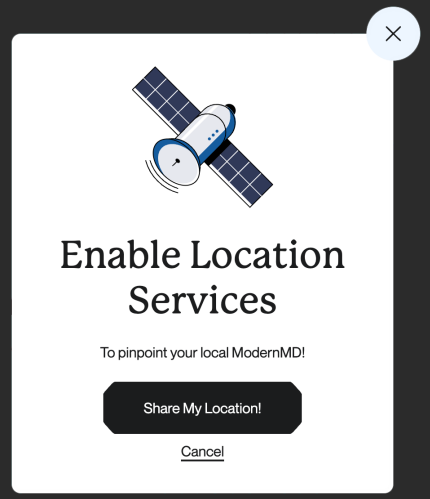
Before

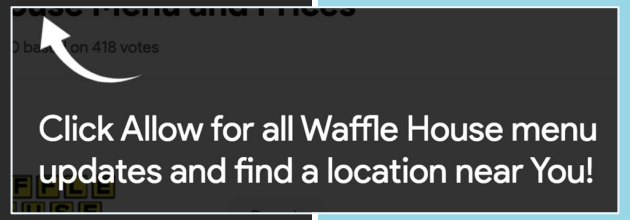
Along side Browser Prompt

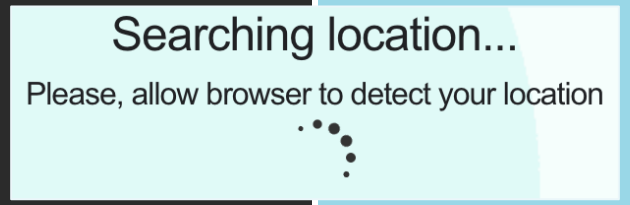




Timing



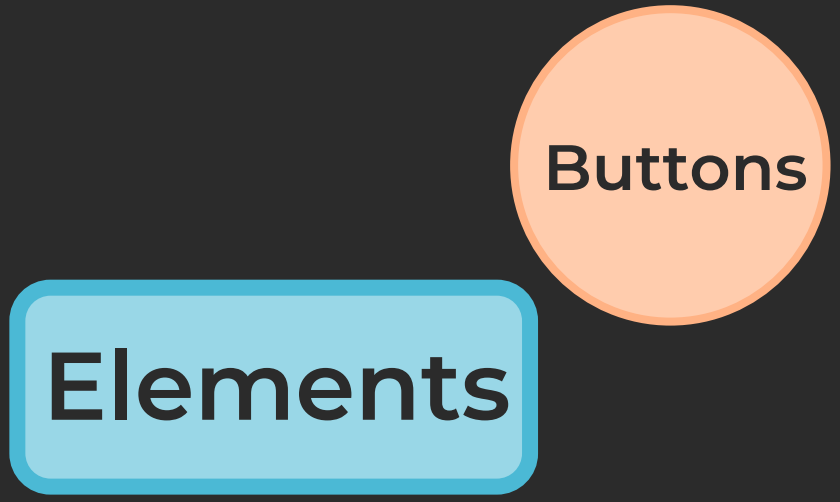




UI Patterns & their Effects: Elements

Elements

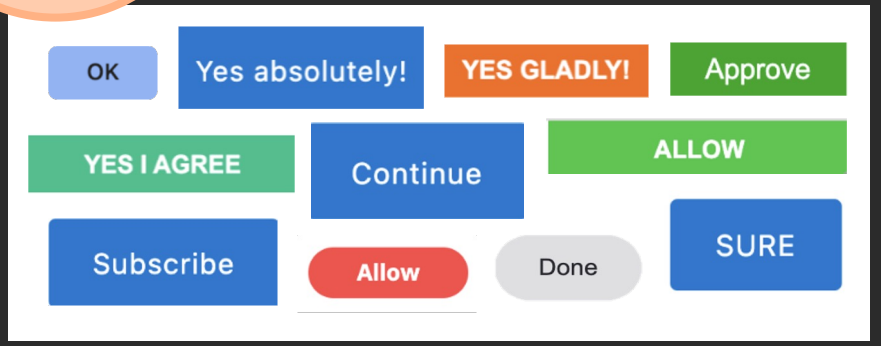
UI Patterns & their Effects: Elements



UI Patterns & their Effects: Elements

Elements

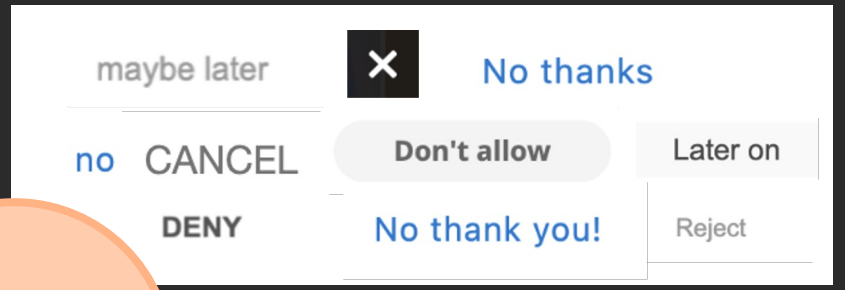
Buttons

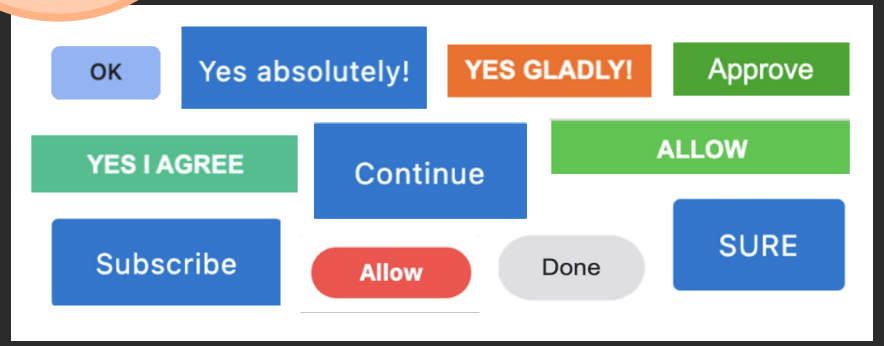


UI Patterns & their Effects: Elements

Elements

Buttons





UI Patterns & their Effects: Elements

Elements

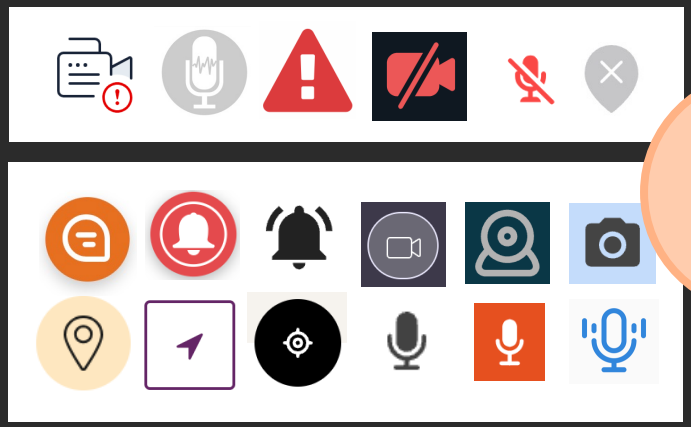
Buttons

UI Patterns & their Effects: Elements

Elements

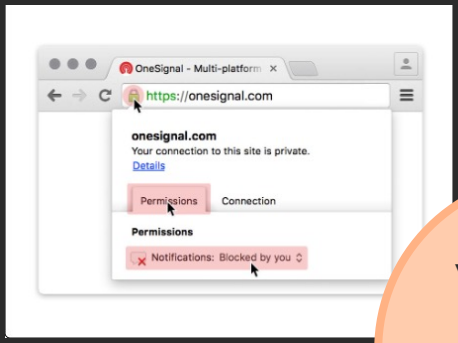
Buttons

Icons



UI Patterns & their Effects: Elements

Allow access to the camera in your browser. To do this, click on the camera icon or the lock icon in your browser window and select Allow from the drop-down menu.

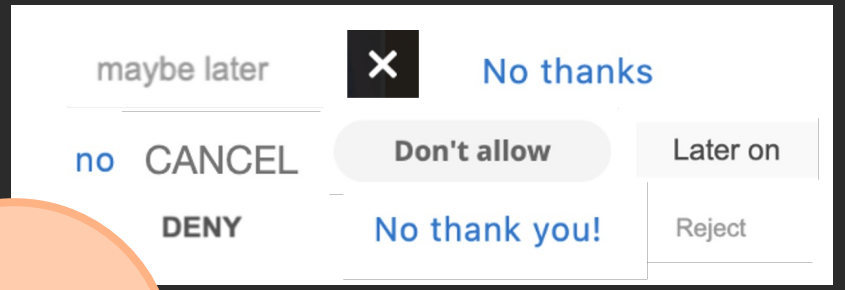


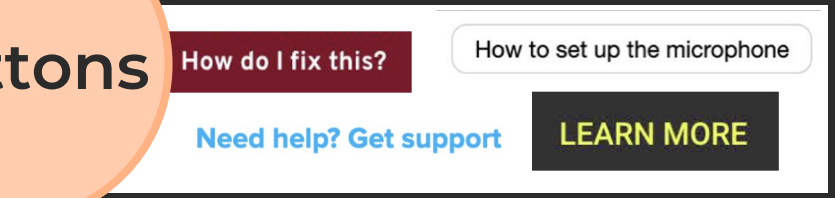
Meet requires access to your camera. Click the camera blocked icon in your browser's address bar.

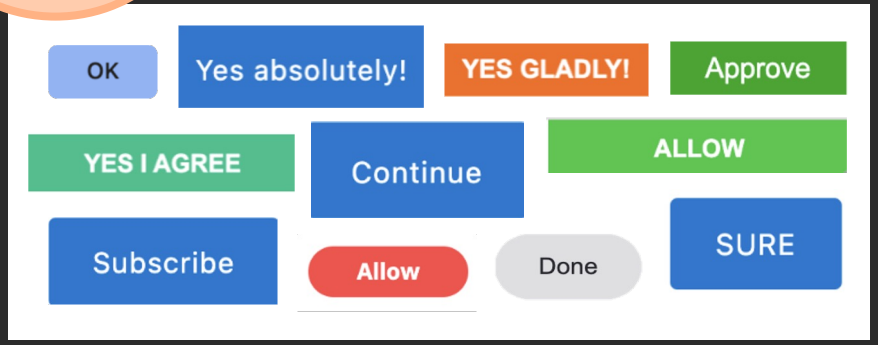
Visual & Textual Instruction

Elements

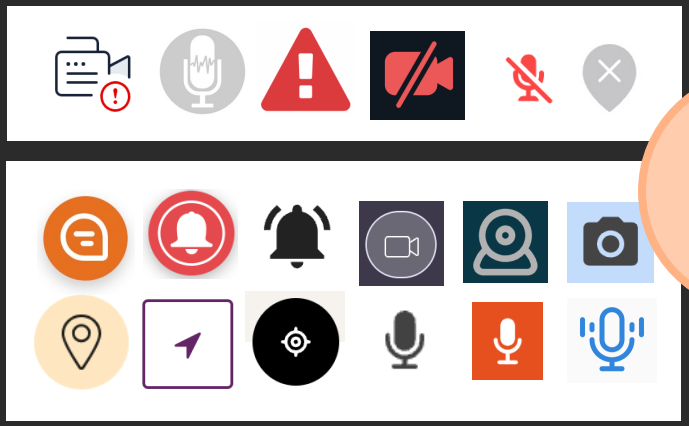
Buttons





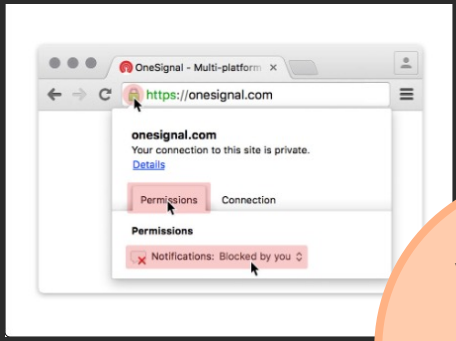


Icons



UI Patterns & their Effects: Elements

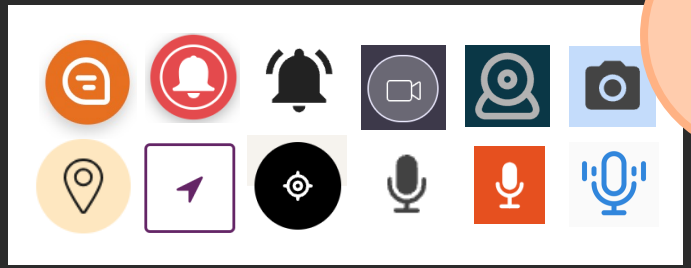
Allow access to the camera in your browser. To do this, click on the camera icon or the lock icon in your browser window and select Allow from the drop-down menu.



Meet requires access to your camera. Click the camera blocked icon in your browser's address bar.

Visual & Textual Instruction

Elements

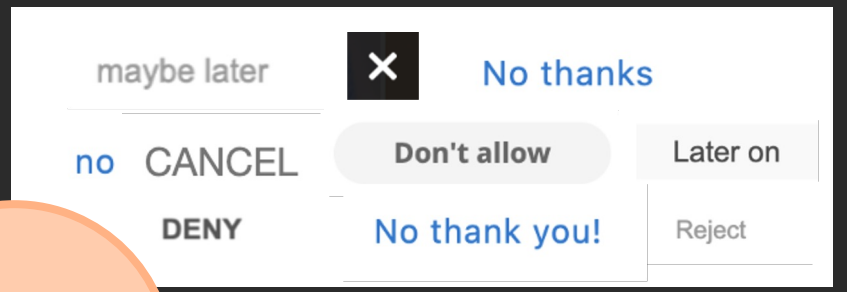


Icons

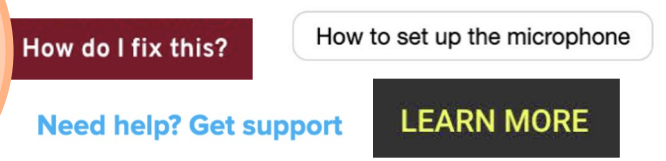
Join without camera and mic

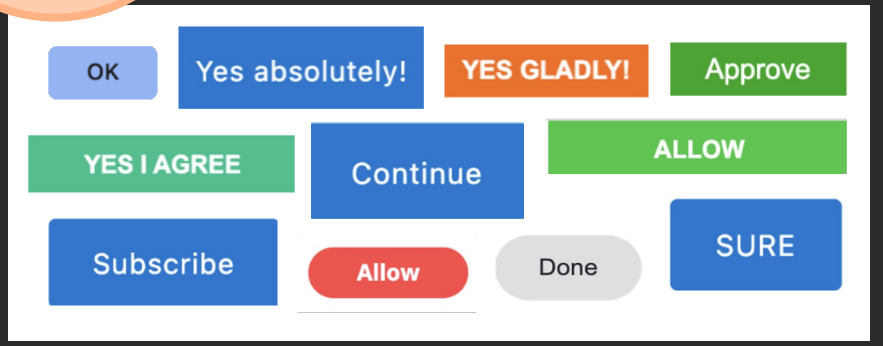
Search by ZIP code or city, state

Alternative Option



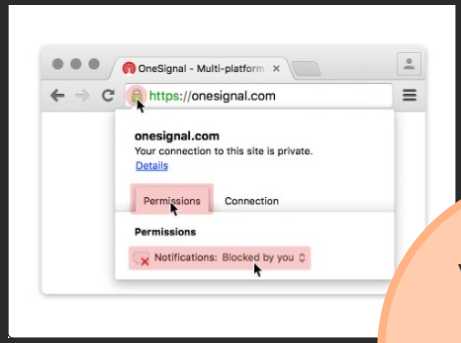
Buttons





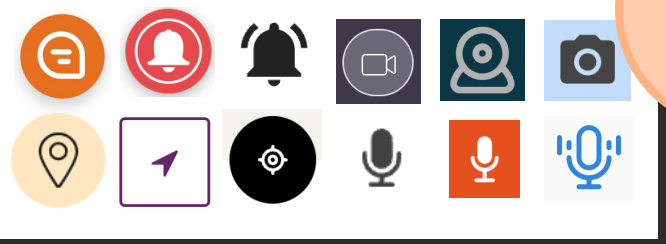
UI Patterns & their Effects: Elements

Allow access to the camera in your browser. To do this, click on the camera icon or the lock icon in your browser window and select Allow from the drop-down menu.



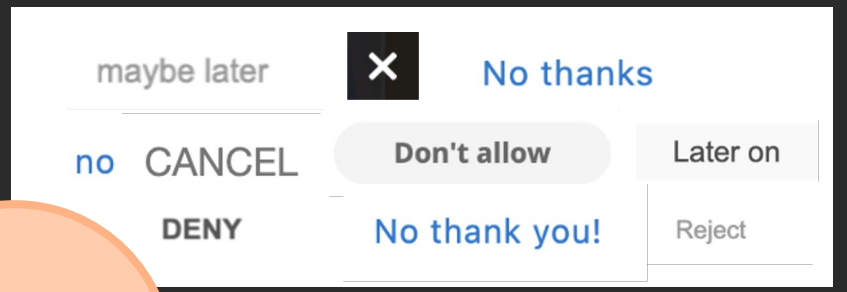
Meet requires access to your camera. Click the camera blocked icon in your browser's address bar.

Visual & Textual Instruction

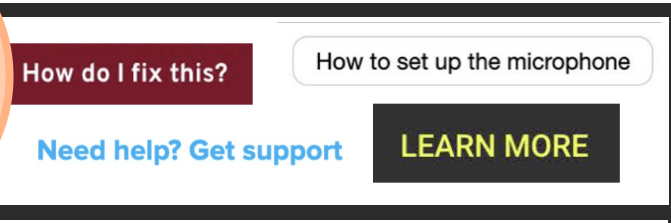


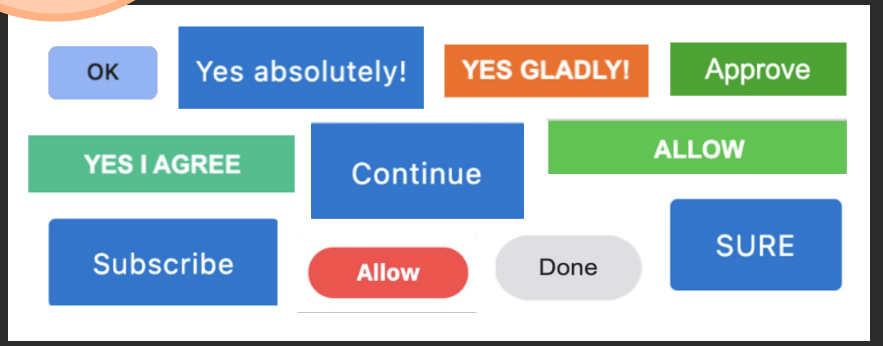
Icons

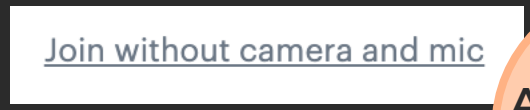
Elements

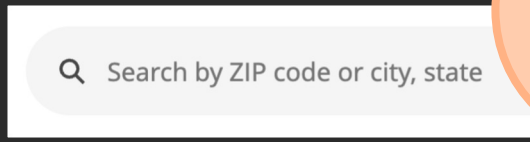


Buttons







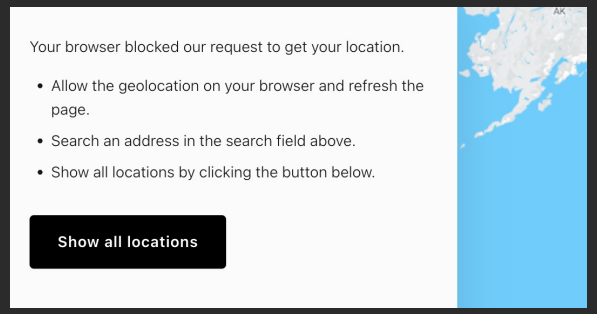


Alternative Option

-9% decrease in grant rate

UI Patterns & their Effects: Layout

Side of Map

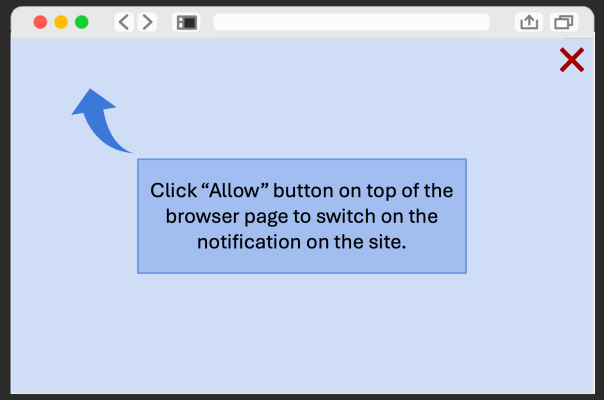


Text

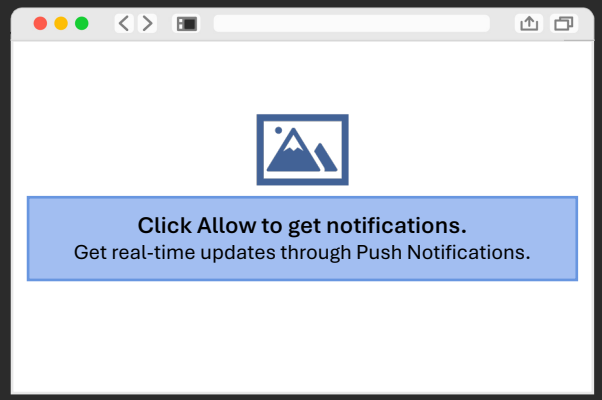
"To use live audio input, please allow access to your browser microphone"

UI Layout Patterns

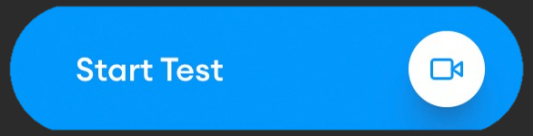
Overlay



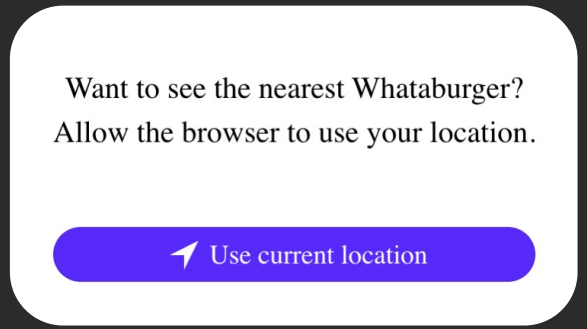
Fullscreen



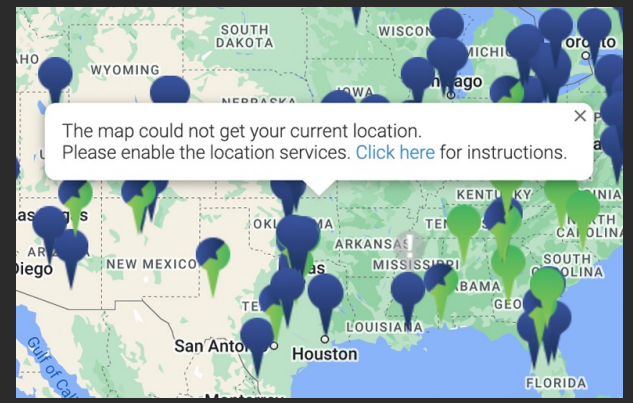
Button



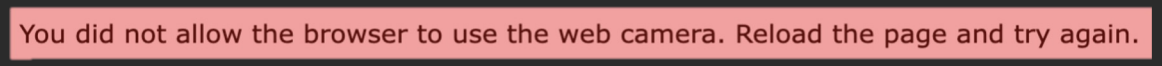
Dialog



On Permission-Protected Content

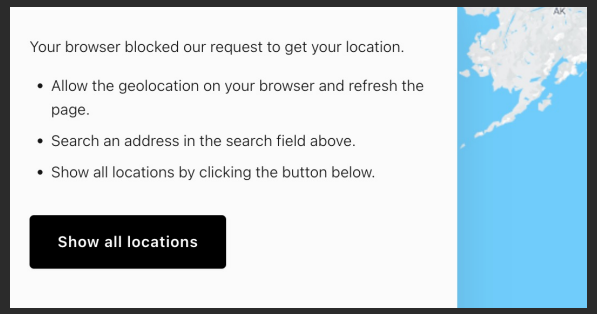


Banner



UI Patterns & their Effects: Layout

Side of Map

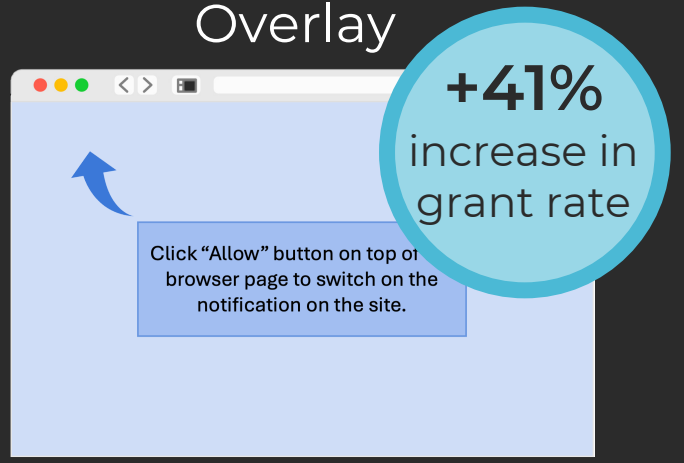


Text

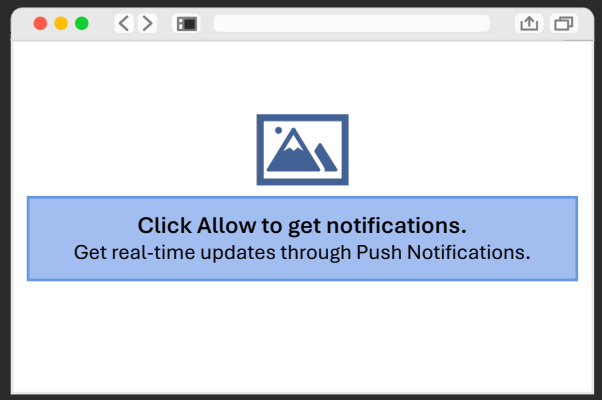
"To use live audio input, please allow access to your browser microphone"

UI Layout Patterns

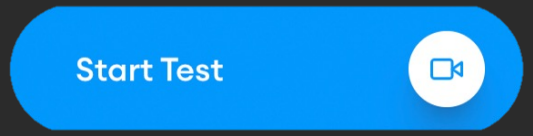
Overlay



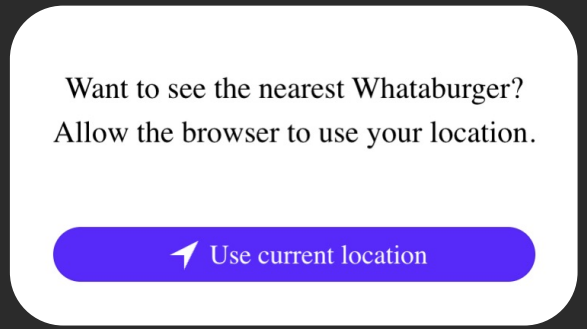
Fullscreen



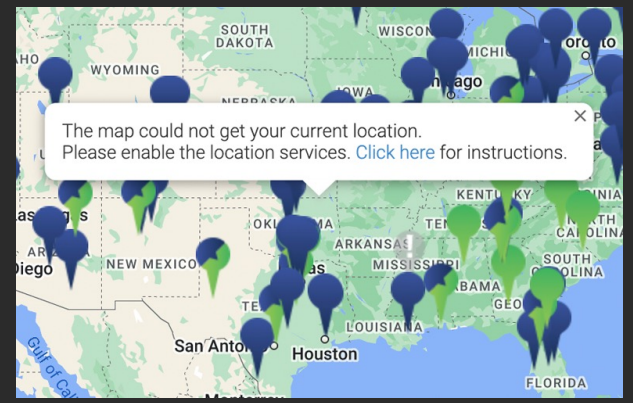
Button



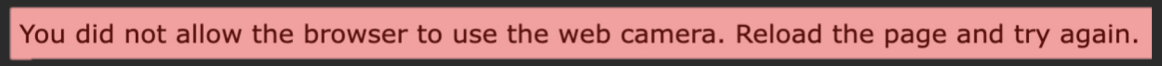
Dialog



On Permission-Protected Content

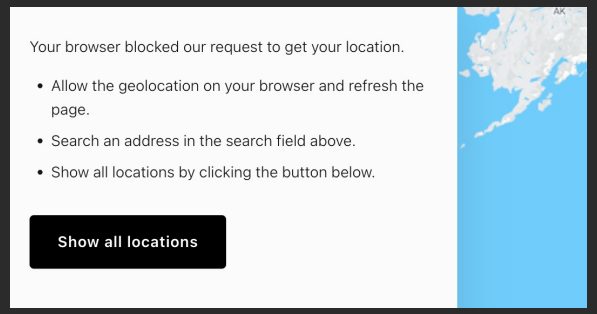


Banner



UI Patterns & their Effects: Layout

Side of Map



Text

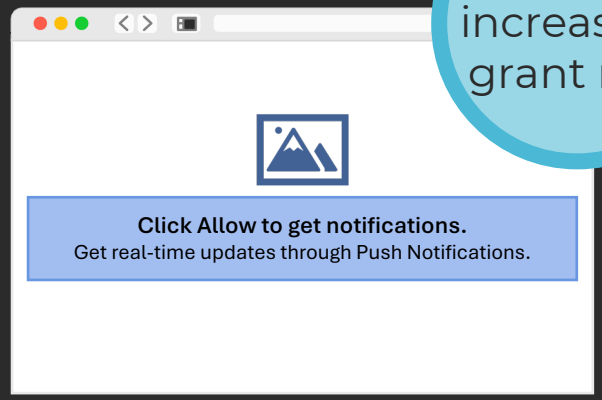
"To use live audio input, please allow access to your browser microphone"

UI Layout Patterns

Overlay

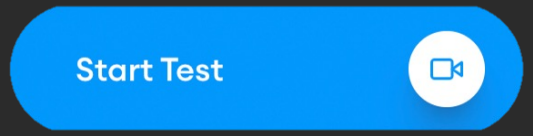
+41% increase in grant rate

Fullscreen

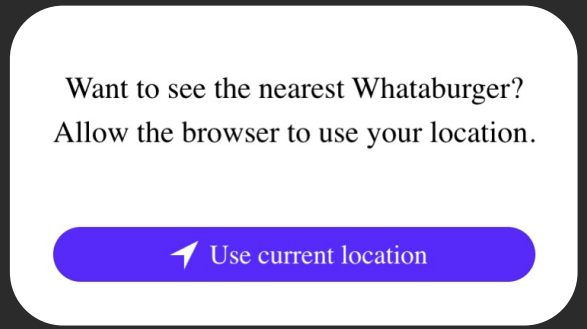


+33% increase in grant rate

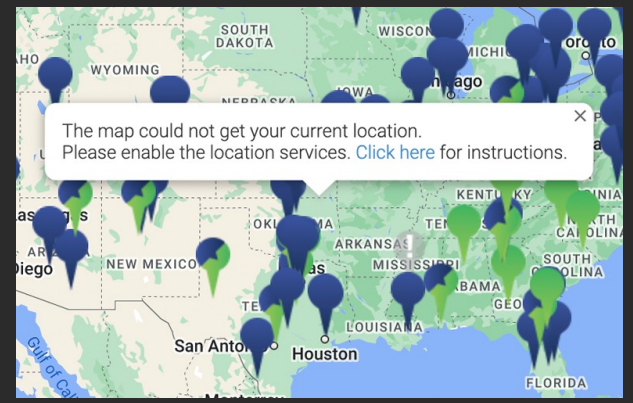
Button



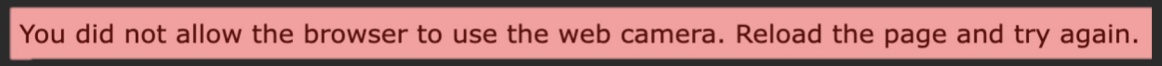
Dialog



On Permission-Protected Content

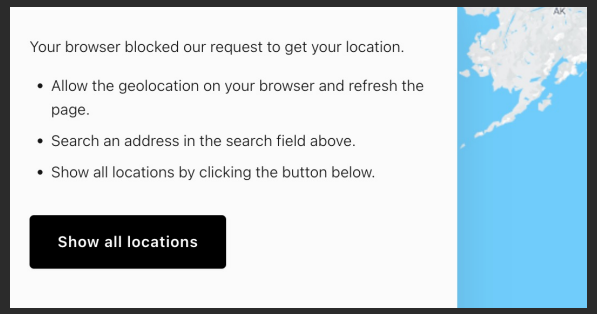


Banner



UI Patterns & their Effects: Layout

Side of Map



Text

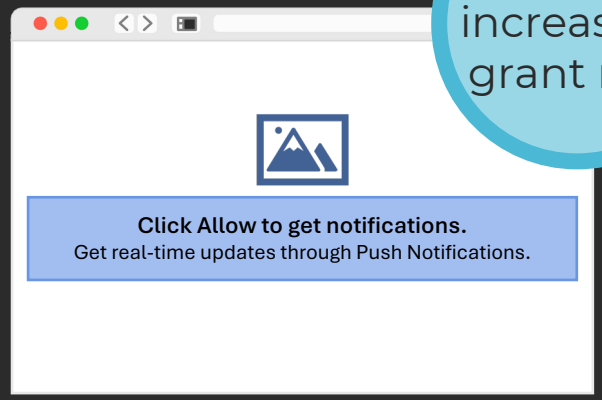
"To use live audio input, please allow access to your browser microphone"

UI Layout Patterns

Overlay

+41% increase in grant rate

Fullscreen

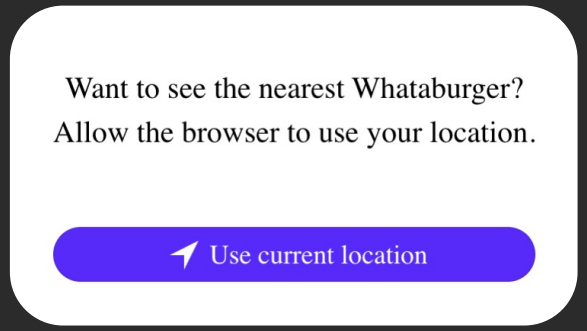


+33% increase in grant rate

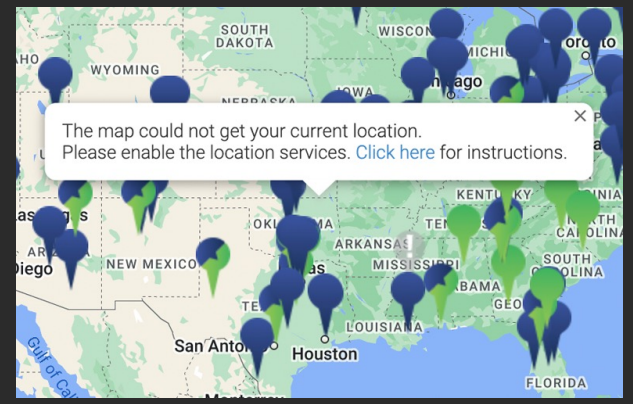
Button

+23% increase in grant rate

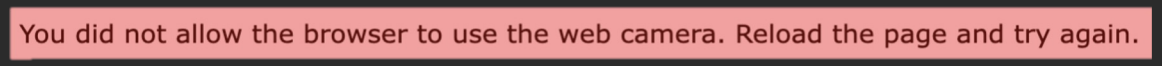
Dialog



On Permission-Protected Content

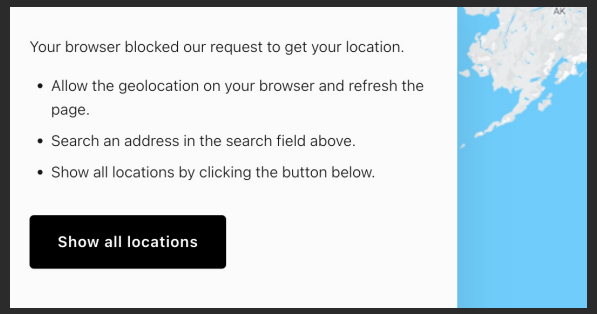


Banner



UI Patterns & their Effects: Layout

Side of Map



Text

+19% increase in grant rate

"To use live audio input, please allow access to your browser microphone"

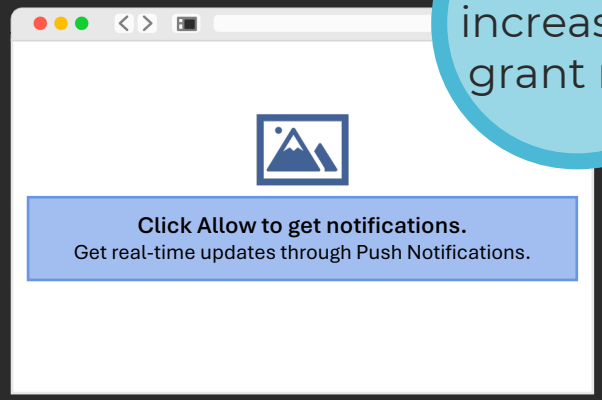
UI Layout Patterns

Overlay

+41% increase in grant rate

Fullscreen

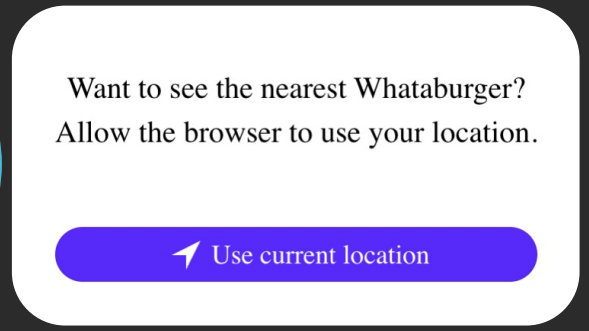
+33% increase in grant rate



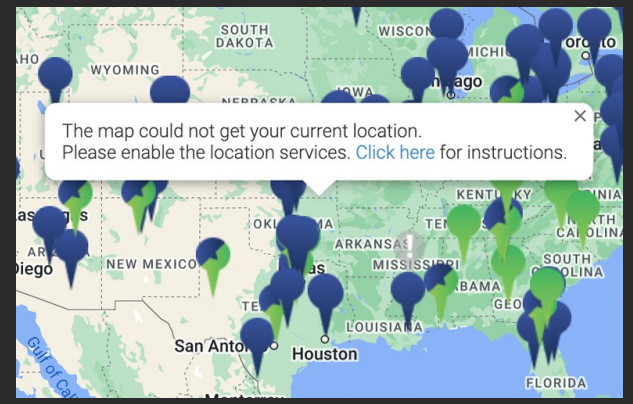
Button

+23% increase in grant rate

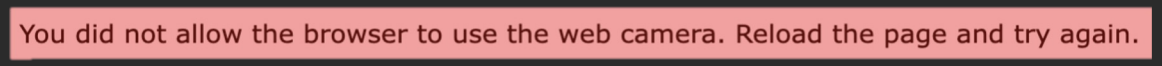
Dialog



On Permission-Protected Content

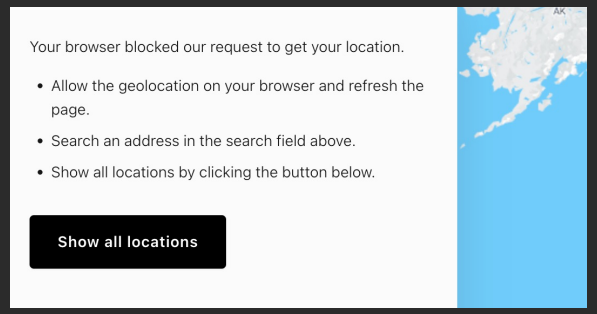


Banner



UI Patterns & their Effects: Layout

Side of Map



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UI Layout Patterns

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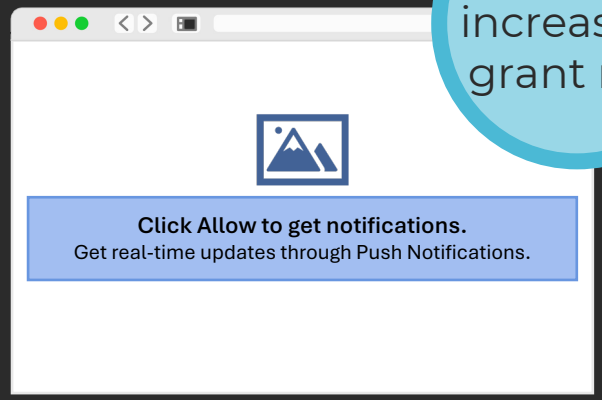
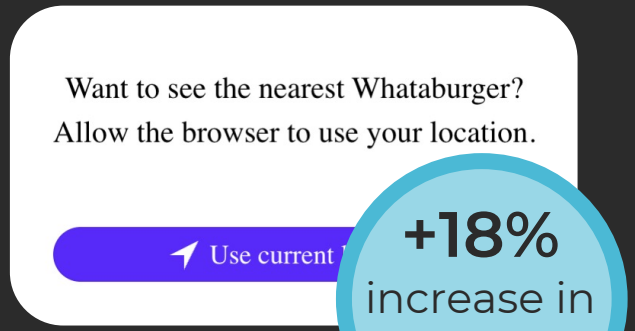


Button

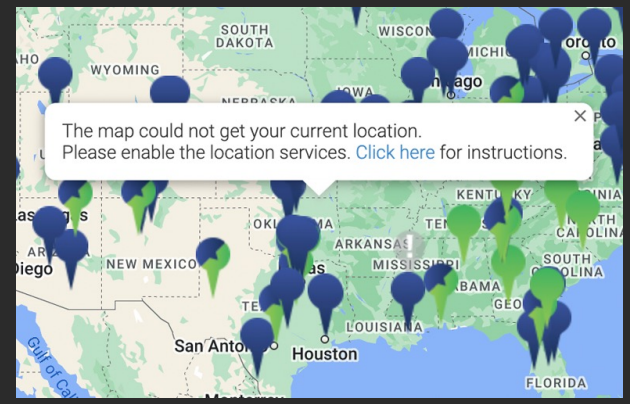
+23% increase in grant rate

Dialog

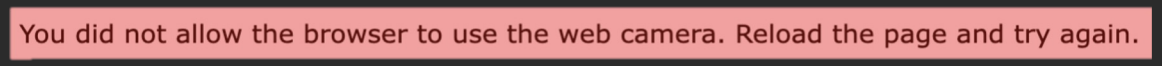
+18% increase in grant rate



On Permission-Protected Content



Banner

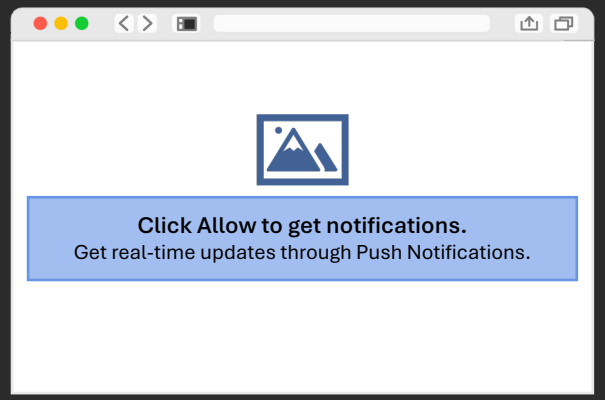


UI Patterns & their Effects: Layout

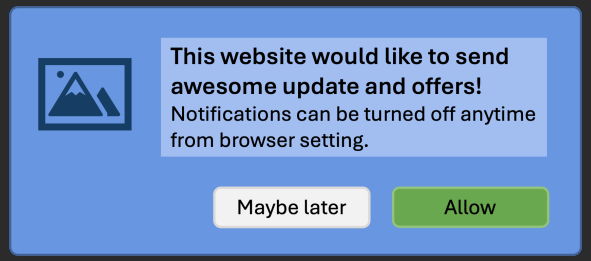
Notification Rationales

Overlay

Fullscreen

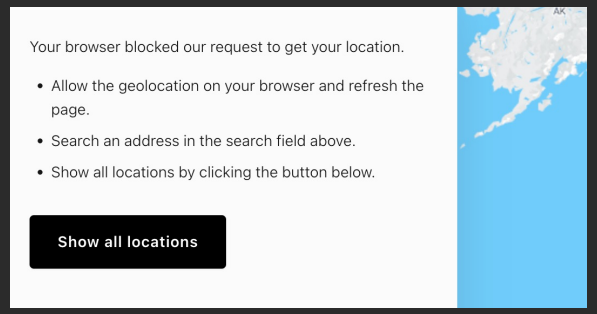


Dialog



UI Patterns & their Effects: Layout

Side of Map



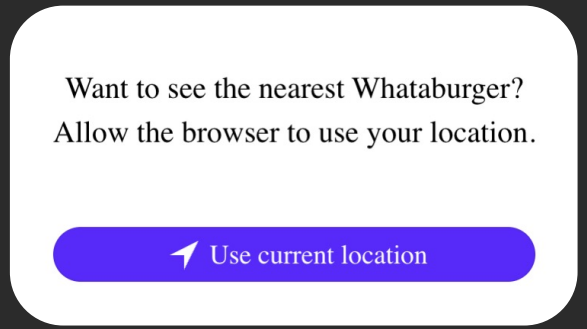
Text

"Could not get your current position! Location service must be enabled."

Geolocation Rationales

Button

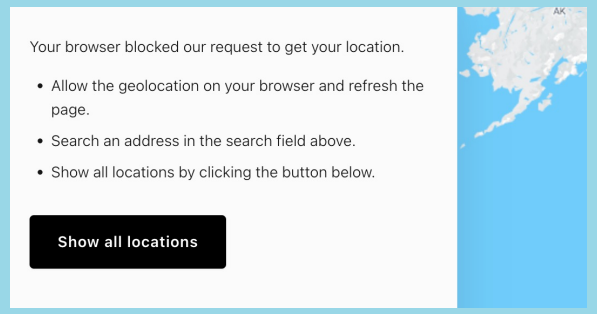
Dialog



Banner

UI Patterns & their Effects: Layout

Side of Map



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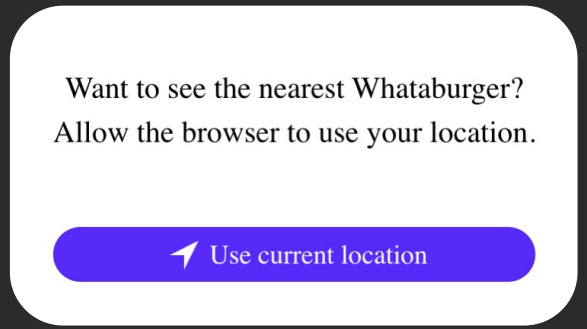


Banner

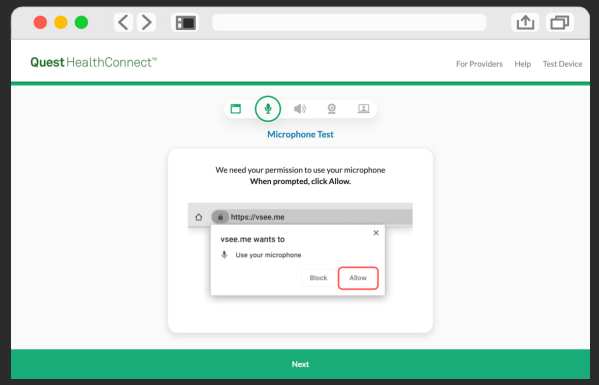
UI Patterns & their Effects: Layout

Text

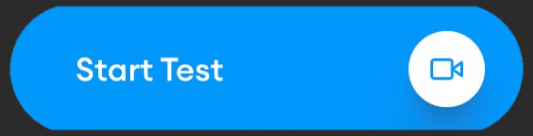
"To use live audio input, please allow access to your browser microphone"

Camera & Mic. Rationales

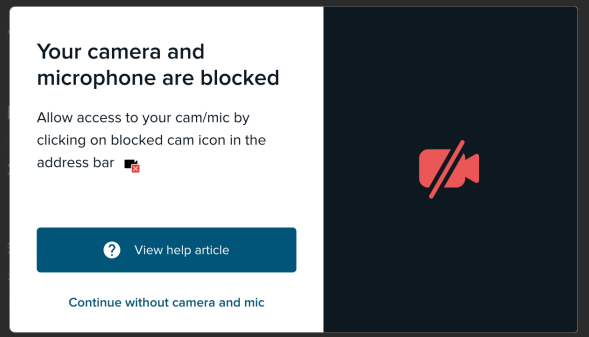
Fullscreen



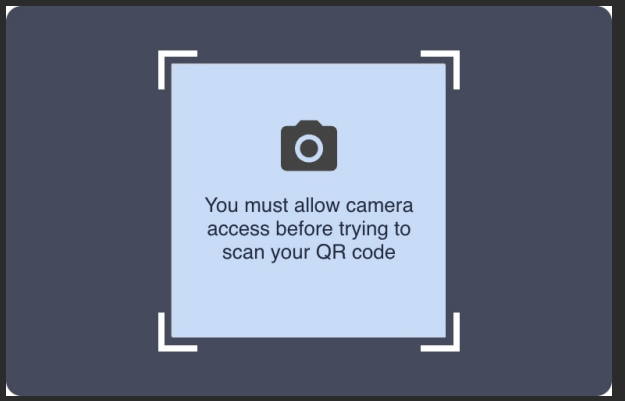
Button



Dialog



On Permission-Protected Content



Banner

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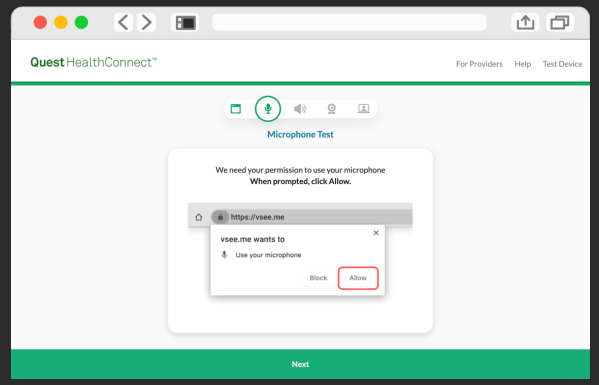
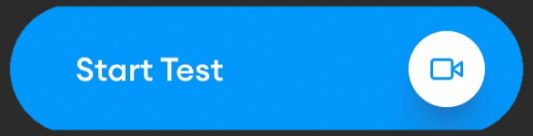
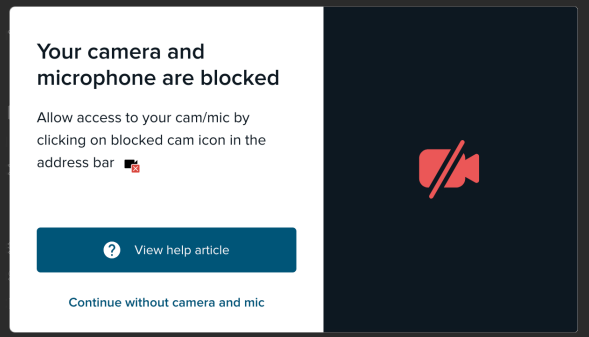


Button



Dialog



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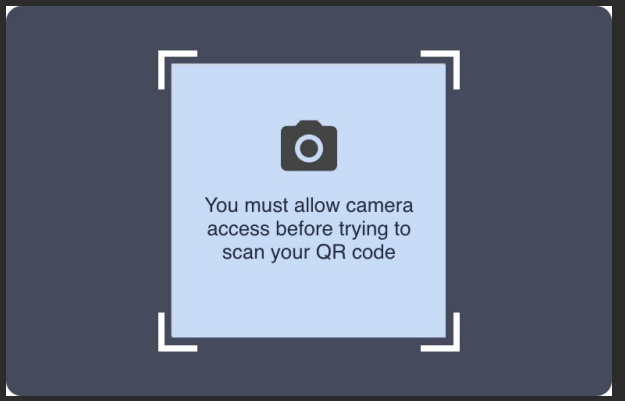

Banner

You did not allow the browser to use the web camera. Reload the page and try again.

What We Discovered

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I. *We presented the first approach to systematically detect and study web permission rationales at scale.*

II. *We created a comprehensive catalog of 3.6K unique, manually-vetted rationale text samples and 749 UIs.*

III. Our exploratory analysis showed that different rationale patterns affect users' permission decisions

Thank you very much!

Yusra Elbitar
CISPA

Soheil Khodayari
CISPA

Marian Harbach
GOOGLE

Gianluca De Stefano
CISPA

Balazs Csaba Engedy
GOOGLE

Giancarlo Pellegrino
CISPA

Sven Bugiel
CISPA