



*“It builds trust with the customers”*

# Exploring User Perceptions of the Padlock Icon in Browser UI

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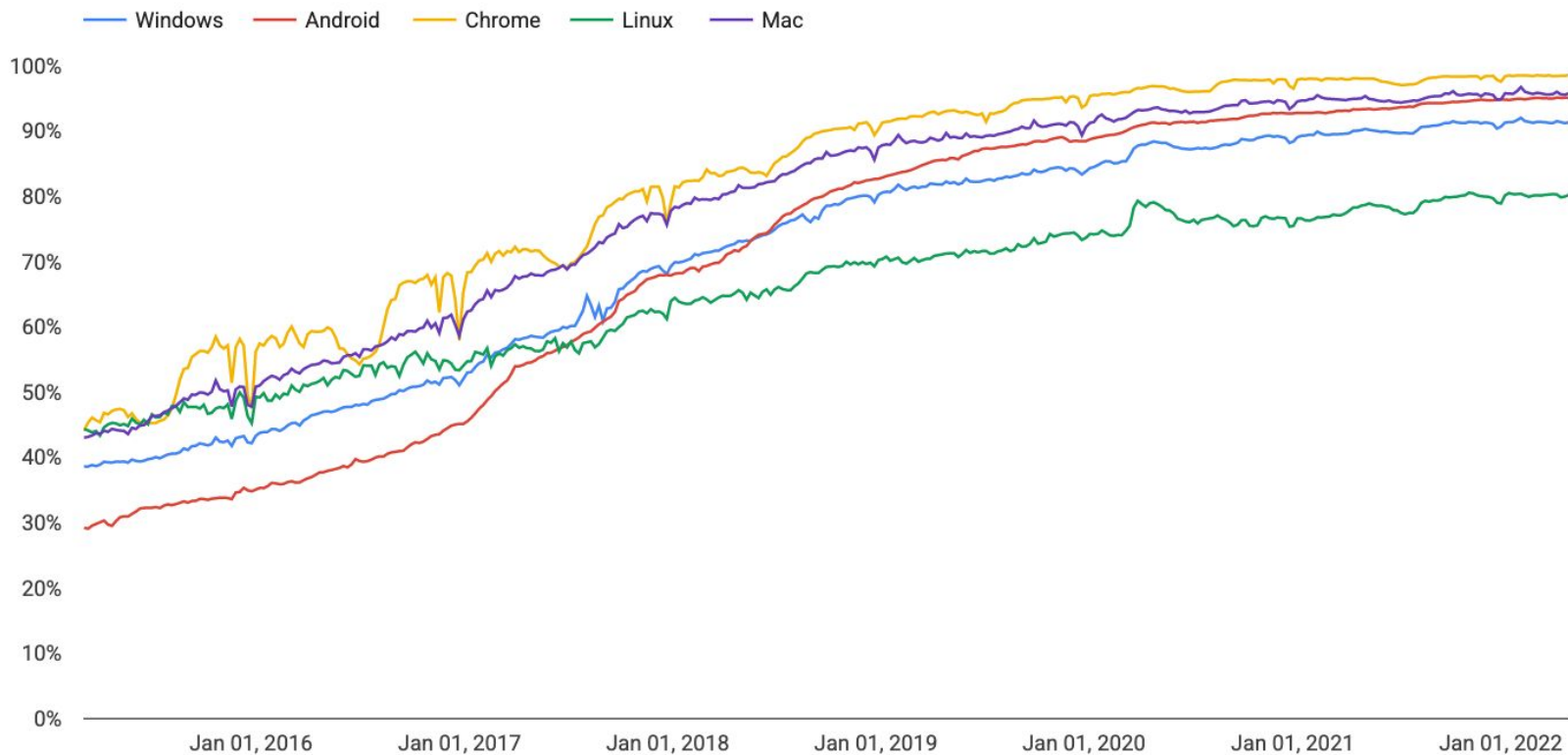
May 26th 2022

3rd Workshop of Designing Security for the Web (SecWeb 2022)

Emanuel von Zezschwitz, Serena Chen, Emily Stark  
Google Inc.

**Browsers have been  
on a decade-long  
mission to secure  
web transport...**

## Percentage of pages loaded over HTTPS in Chrome by platform



**“82.7% of phishing attacks used SSL Certificates.”**

*“Future research should explore how the browser can be used to inform users regarding the safety of the sites they visit. This could have **more impact than focusing on making users pay more attention to an indicator** (i.e., HTTPS lock icon) that they misunderstand.”*

Ruoti et al., 2017



padlock

*“[...] key or padlock – **convey the idea of a “place”** that can be made secure. Such a conception runs counter to the more accurate meaning of a secure connection that refers to the security of the information in transit.*

Friedman et al., 2002

*“even participants whose passwords are at risk **fail to react** as recommended when HTTPS indicators are absent.”*

Schechter et al., 2007

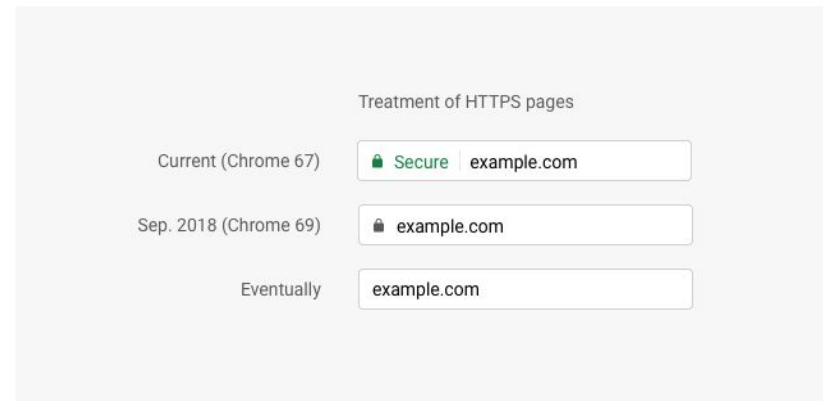
**“We will step towards removing Chrome’s positive security indicators so that the default unmarked state is secure.”**

## Evolving Chrome’s security indicators

Thursday, May 17, 2018

Previously, we posted [a proposal](#) to mark all HTTP pages as definitively “not secure” and remove secure indicators for HTTPS pages. HTTPS usage on the web has [taken off](#) as we’ve evolved Chrome security indicators. Later this year, we’ll be taking several more steps along this path.

Users should expect that the web is safe by default, and they’ll be warned when there’s an issue. Since we’ll soon [start marking](#) all HTTP pages as “not secure”, we’ll step towards removing Chrome’s positive security indicators so that the default unmarked state is secure. Chrome will roll this out over time, starting by removing the “Secure” wording and HTTPS scheme in September 2018 (Chrome 69).



Chrome treatment for HTTPS pages

“Do not trust a website just because it has a lock icon or ‘https’ in the browser address bar.”



## Public Service Announcement

FEDERAL BUREAU OF INVESTIGATION



June 10, 2019

Alert Number  
I-061019-PSA

Questions regarding this PSA should be directed to your local **FBI Field Office**.

Local Field Office Locations:  
[www.fbi.gov/contact-us/field-offices](http://www.fbi.gov/contact-us/field-offices)

### Cyber Actors Exploit 'Secure' Websites In Phishing Campaigns

Websites with addresses that start with "https" are supposed to provide privacy and security to visitors. After all, the "s" stands for "secure" in HTTPS: Hypertext Transfer Protocol Secure. In fact, cyber security training has focused on encouraging people to look for the lock icon that appears in the web browser address bar on these secure sites. The presence of "https" and the lock icon are supposed to indicate the web traffic is encrypted and that visitors can share data safely. Unfortunately, cyber criminals are banking on the public's trust of "https" and the lock icon. They are more frequently incorporating website certificates—third-party verification that a site is secure—when they send potential victims emails that imitate trustworthy companies or email contacts. These phishing schemes are used to acquire sensitive logins or other information by luring them to a malicious website that looks secure.

#### RECOMMENDATIONS:

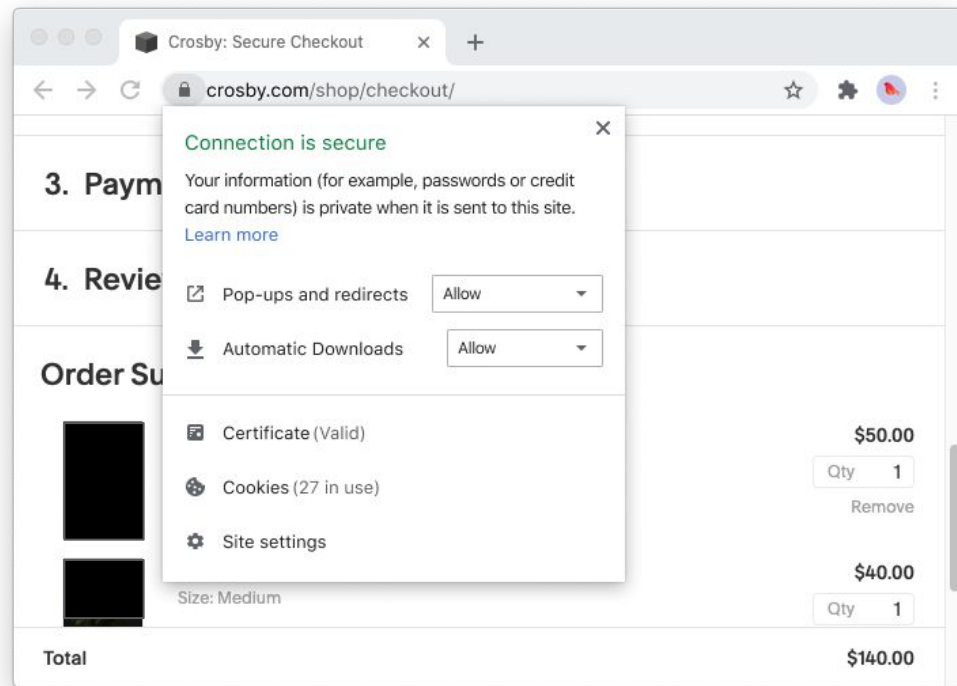
The following steps can help reduce the likelihood of falling victim to HTTPS phishing:

- Do not simply trust the name on an email: question the intent of the email content.
- If you receive a suspicious email with a link from a known contact, confirm the email is legitimate by calling or emailing the contact; do not reply directly to a suspicious email.
- Check for misspellings or wrong domains within a link (e.g., if an address that should end in ".gov" ends in ".com" instead).
- Do not trust a website just because it has a lock icon or "https" in the browser address bar.

#### VICTIM REPORTING

The FBI encourages victims to report information concerning suspicious or criminal activity to their local FBI field office, and file a complaint with the IC3 at [www.ic3.gov](http://www.ic3.gov). If your complaint pertains to this particular scheme, please note "HTTPS phishing" in the body of the complaint.

The padlock provides an entry point for site-related information.

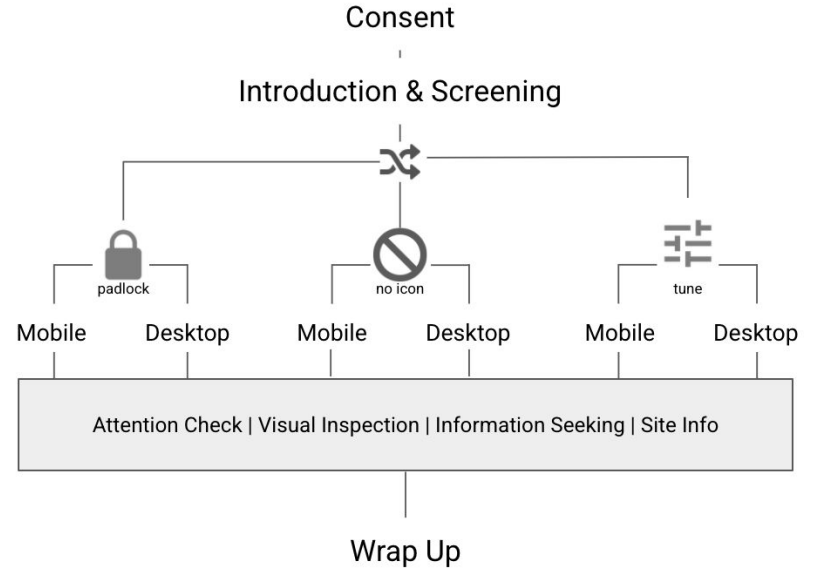
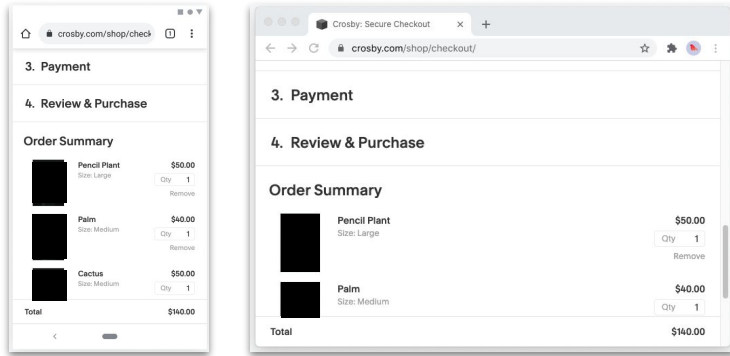
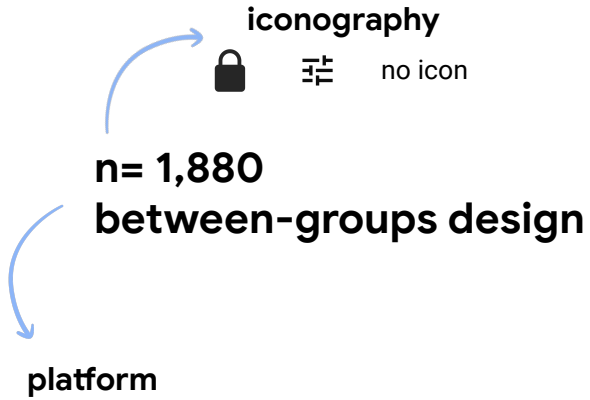




## Research questions

- How does the padlock icon impact **perceived trustworthiness** of an unfamiliar web shop?
- How do users react if we **remove or replace** the padlock icon?
- Will surfacing connection security inside **secondary UI** be sufficient for users relying on the padlock icon?

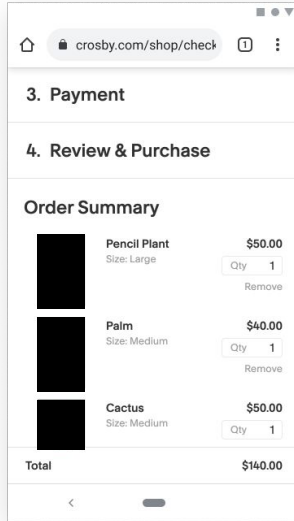
# Research approach



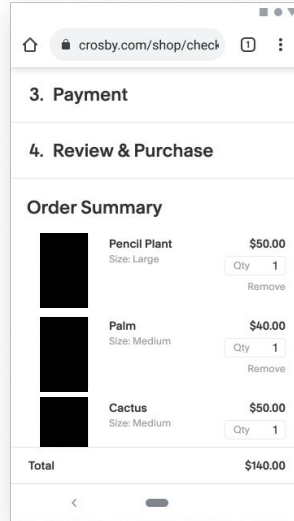
# Procedure

platform = mobile  
icon = padlock

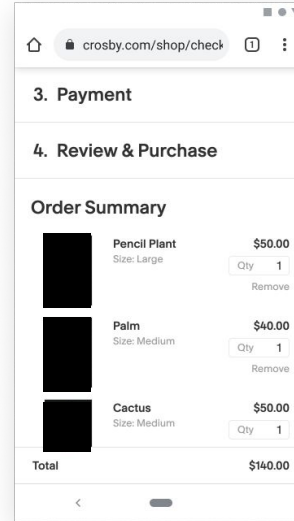
### Attention Check



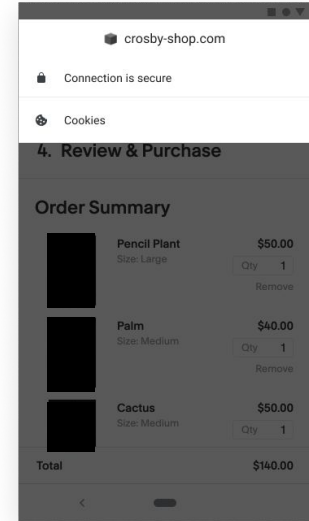
### Visual Inspection



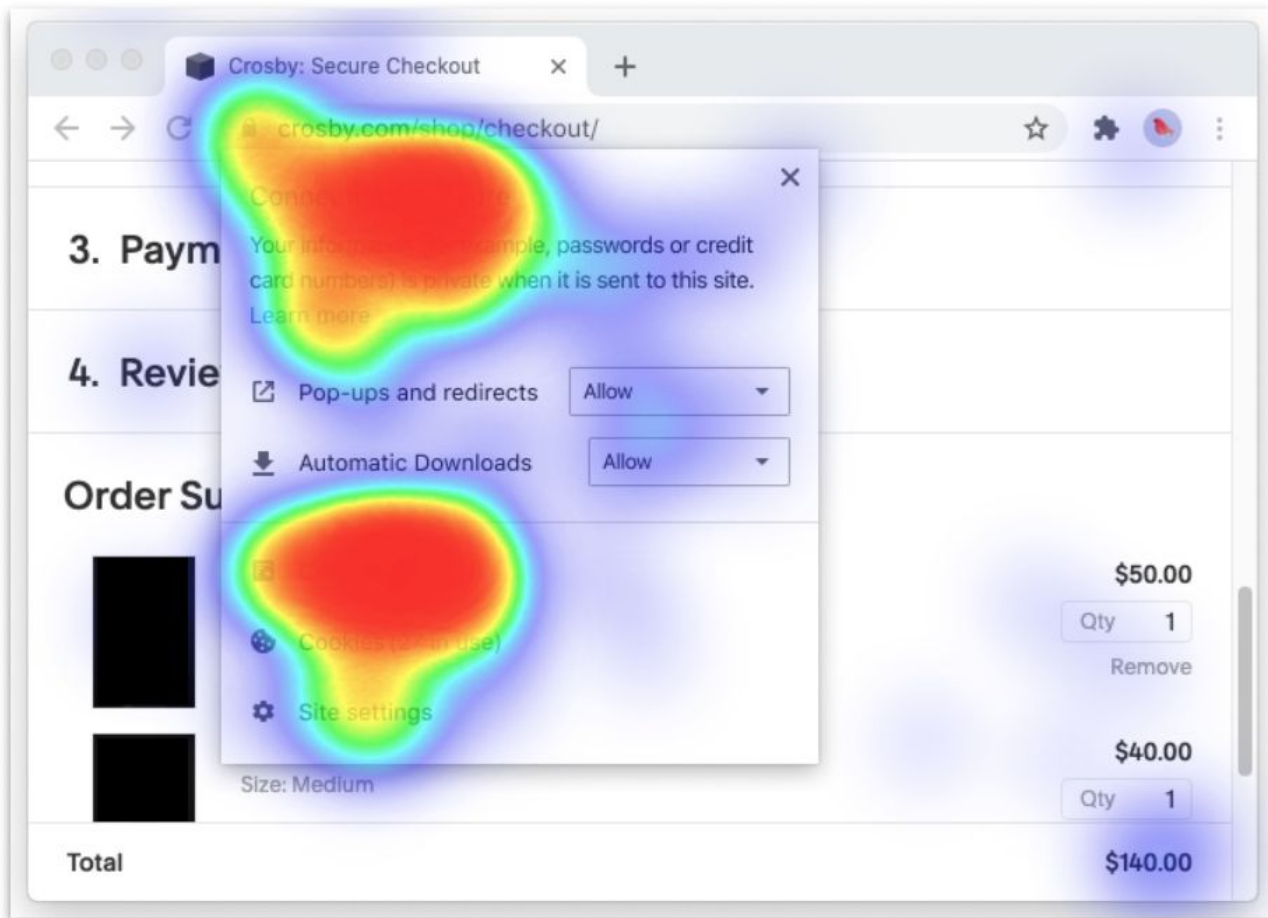
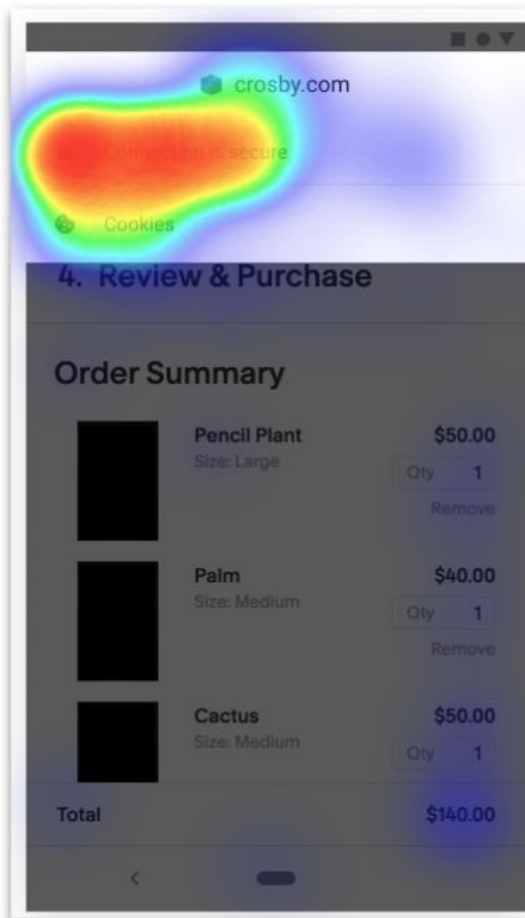
### Information Seeking



### Page Info



# Procedure



# Results

## **Padlock Expectations**

Visual Inspection

Information Seeking

Secondary browser UI

## Padlock expectations

11%

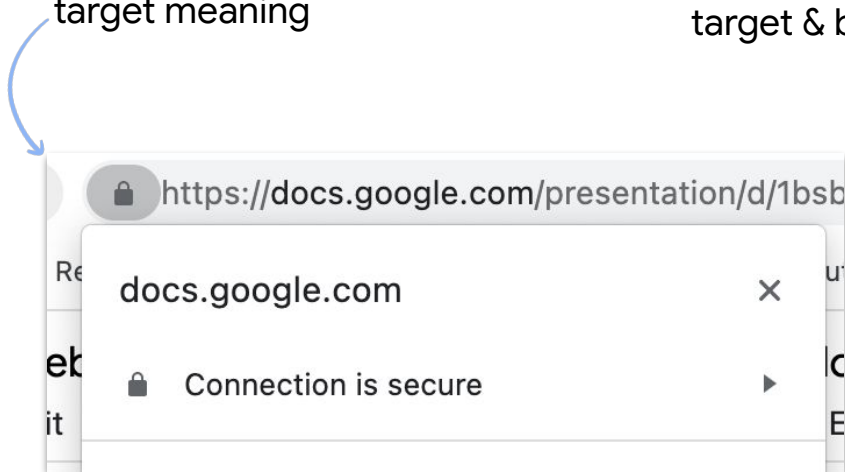
target meaning

59%

target & beyond

30%

other expectations



Padlock expectations

11%

target meaning

59%

target & beyond

30%

other expectations

51% *"it is safe to enter data on this web site."*

30% *"the web site respects my privacy."*

# Results

Padlock Expectations

**Visual Inspection**

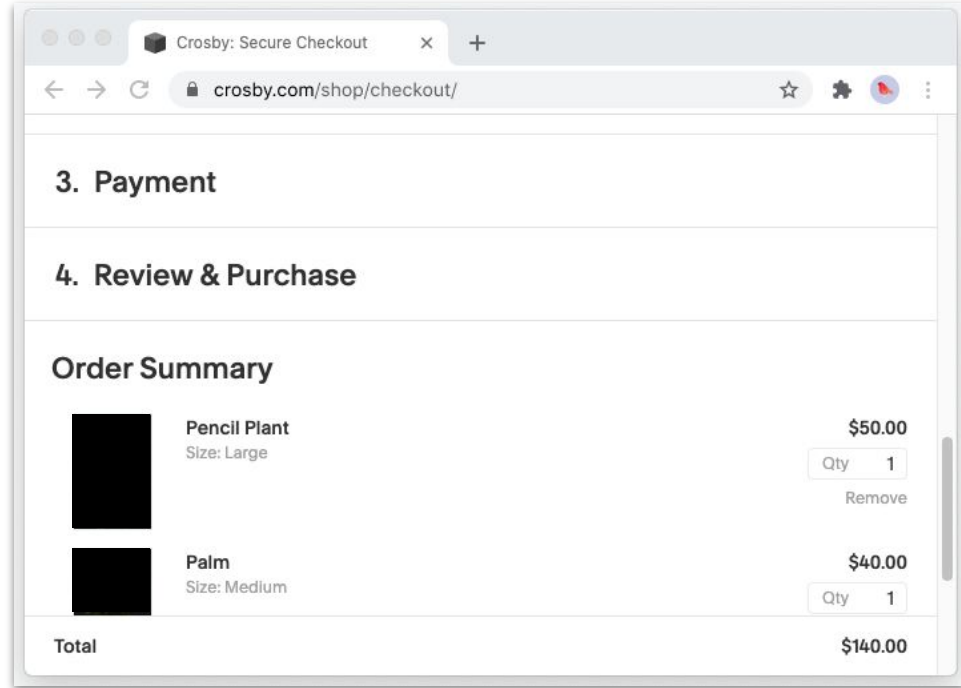
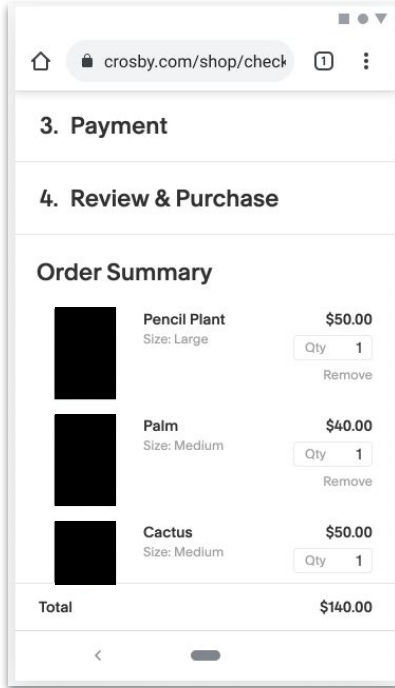
Information Seeking

Secondary browser UI



## Visual Inspection

*“Since you never visited this web shop before, you wonder if it is safe to order the plants.”*



Visual Inspection



44%

mentioned presence



23%

mentioned absence

no icon

26%

mentioned absence

Visual Inspection

 **44%**

mentioned presence

 **23%**

mentioned absence

no icon **26%**

mentioned absence



**89%** would continue with their order. (vs. 69%)

Visual Inspection



44%

mentioned presence



**89%** would continue with their order. (vs. 69%)



23%

mentioned absence

no icon

26%

mentioned absence



**17%** would continue with their order. (vs. 61%)

# Results

Padlock Expectations

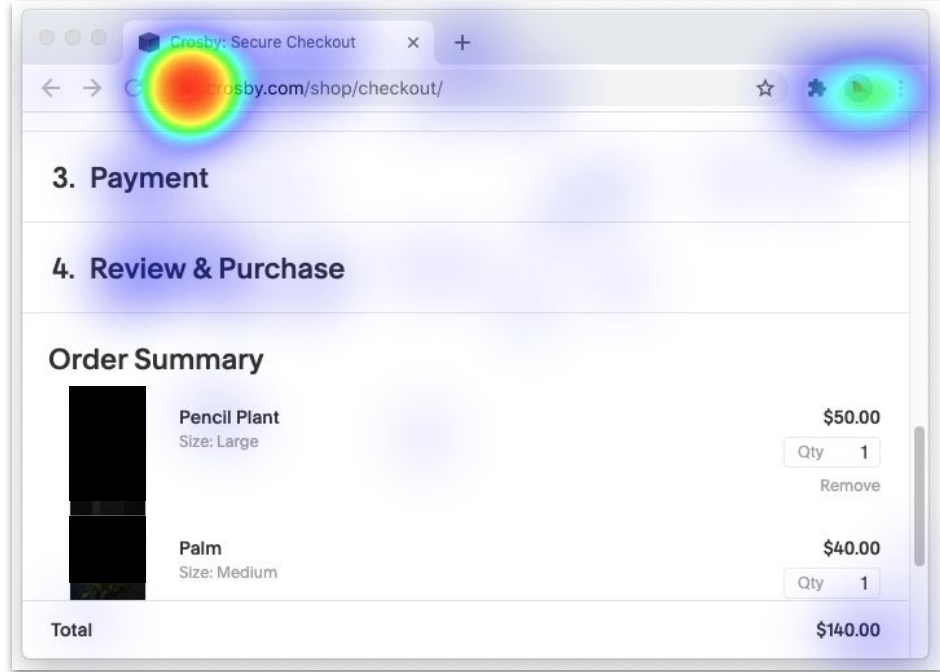
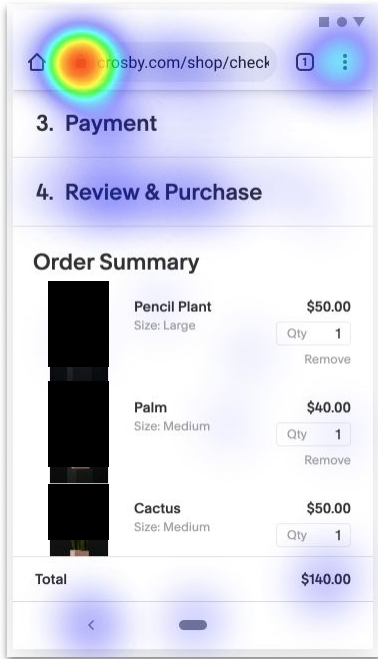
Visual Inspection

**Information Seeking**

Secondary browser UI

## Information Seeking


*“Where would you usually click to learn more about the trustworthiness and the security of the web shop?”*



Information Seeking

 50%

clicked on the padlock

 40%

clicked on the tune

no icon 16%

clicked in the icon region

## Information Seeking

 **50%**

clicked on the padlock

 **40%**

clicked on the tune

no icon **16%**

clicked in the icon region



**81%** who had mentioned the presence of the padlock clicked on it. (vs. 26%)




Information Seeking

 **50%**

clicked on the padlock



**81%** who had mentioned the presence of the padlock clicked on it. (vs. 26%)

 **40%**

clicked on the tune



**65%** who had mentioned the absence of the padlock clicked on tune. (vs. 32%)

no icon **16%**

clicked in the icon region



**36%** who had mentioned the absence of the padlock clicked on the region. (vs. 9%)


## Information Seeking

 **50%**

clicked on the padlock



**81%** who had mentioned the presence of the padlock clicked on it.  
(vs. 26%)

 **40%**

clicked on the tune



**65%** who had mentioned the absence of the padlock clicked on tune.  
(vs. 32%)

no icon **16%**

clicked in the icon region



**36%** who had mentioned the absence of the padlock clicked on the region.  
(vs. 9%)

# Results

Padlock Expectations

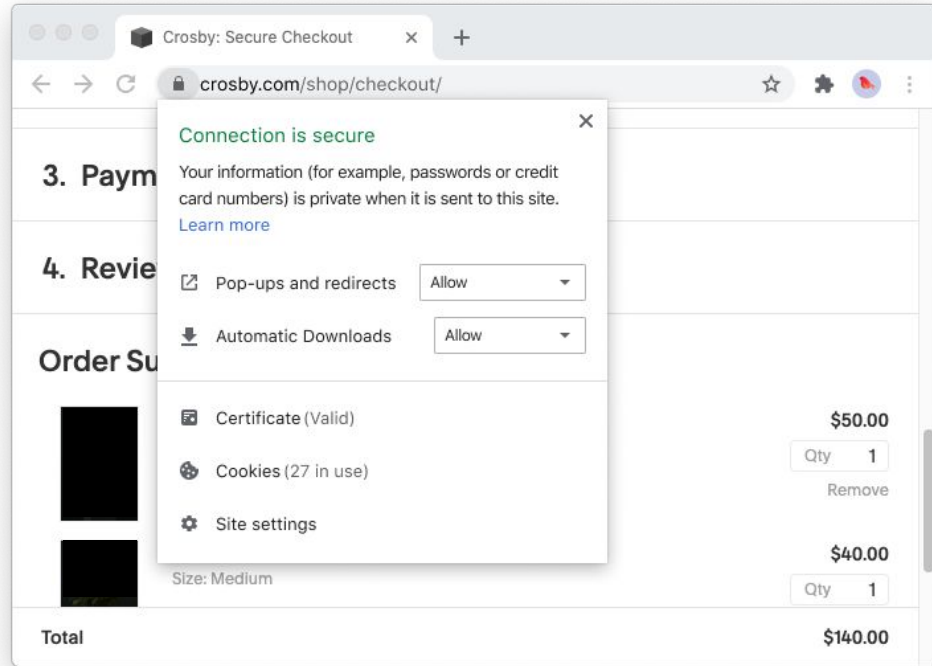
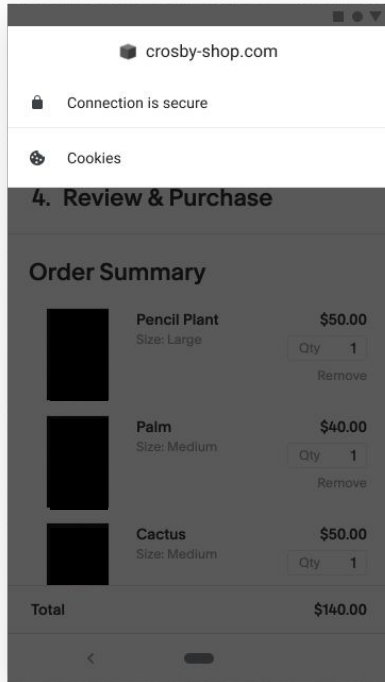
Visual Inspection

Information Seeking

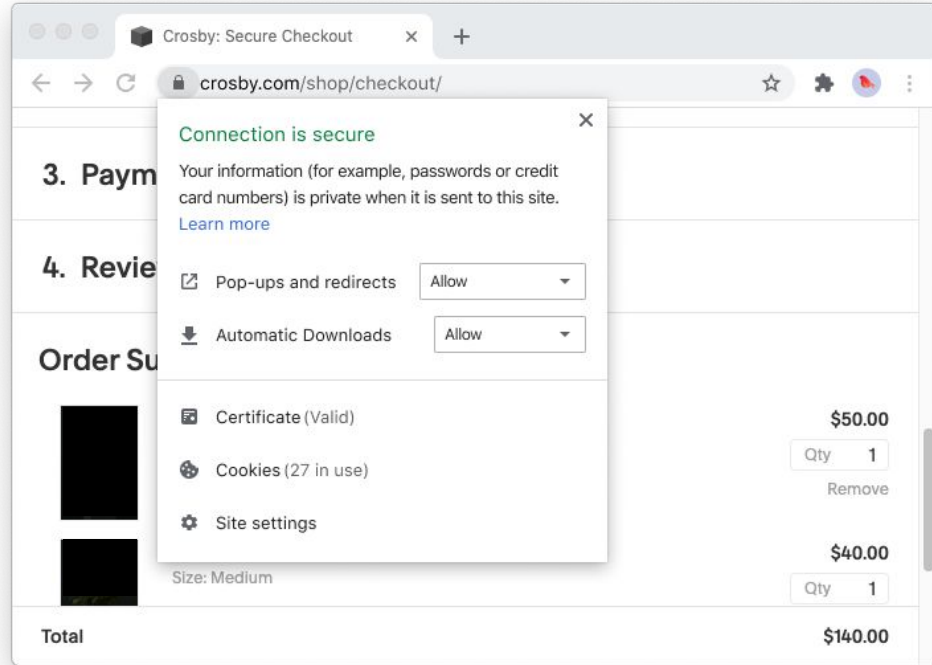
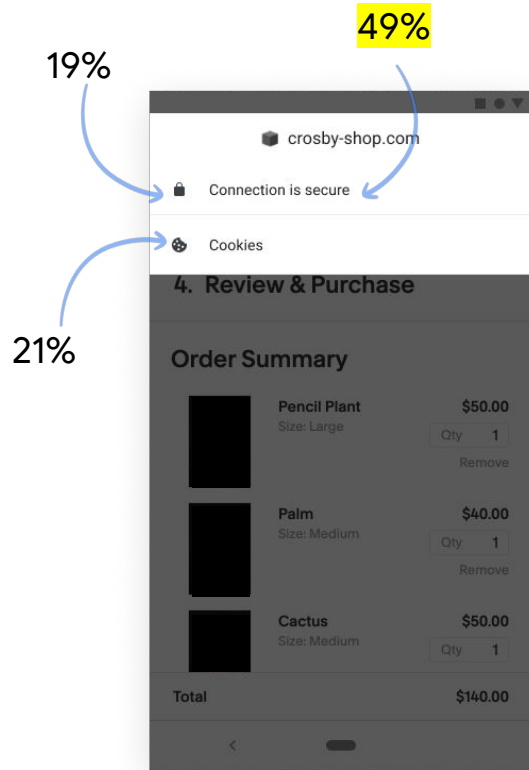
**Secondary browser UI**

## Secondary Browser UI

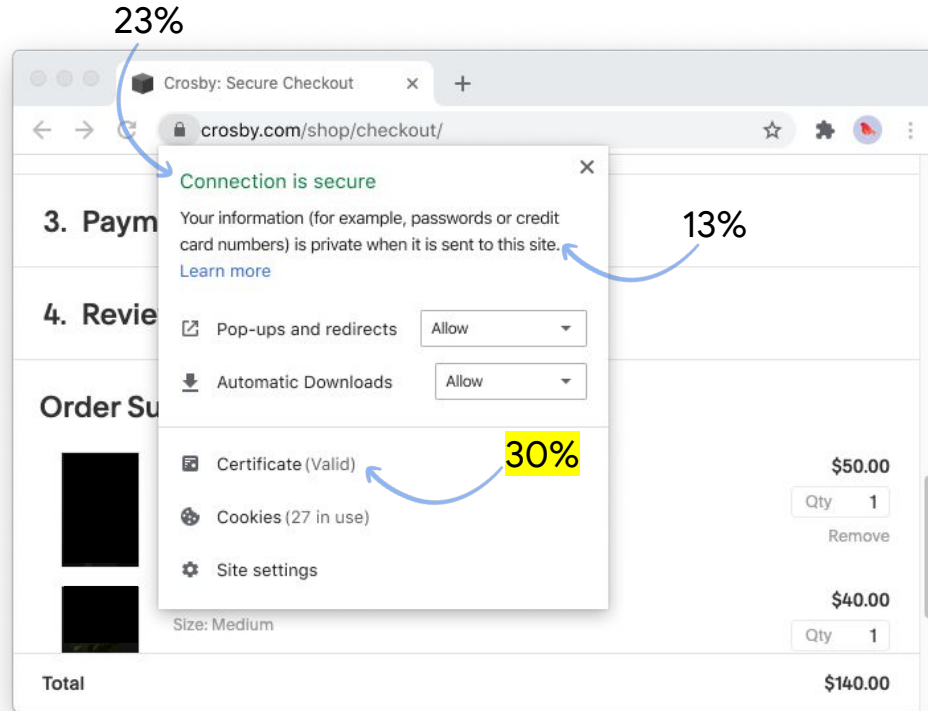
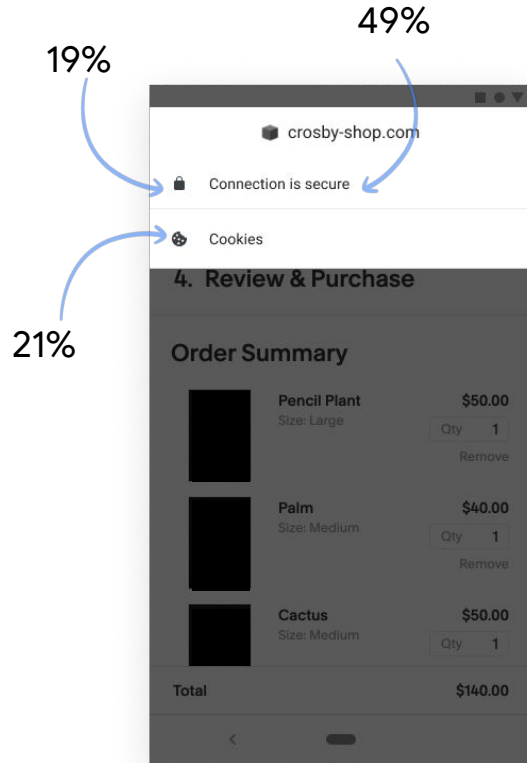
*“Please indicate the information (if any) that would help you most to make a purchase decision (i.e., continue or cancel the order).”*



## Secondary Browser UI



## Secondary Browser UI



Visual Inspection

## Before reviewing the secondary browser UI



89%

mentioned presence  
& would purchase



21%

mentioned absence &  
would purchase

no icon

17%

mentioned absence &  
would purchase

Visual Inspection

## After reviewing the secondary browser UI

 89%

mentioned presence & trusted site

 21%

mentioned absence & trusted site

no icon 17%

mentioned absence & trusted site



94%

mentioned presence & trusted site



78%

mentioned presence & trusted site



78%

mentioned presence & trusted site



# Summary

- The target meaning of the padlock icon is often not clear.
- Only a subset of participants relied on the padlock icon when making trust decisions.
- For padlock-aware users, the absence of the icon was often a deal breaker.
- Padlock-aware users were more likely to explore other iconography.
- Seeing secondary browser UI significantly reassured participants in all conditions.

# Summary

- The target meaning of the padlock icon is often not clear.
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- Padlock-aware users were more likely to explore other iconography.
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