

# Understanding Users' Interaction with Login Notifications

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# Login Notifications

**Company**

Jo,

Someone who knows your password is attempting to sign-in to your account.

When: Dec 12, 2023 07:13 AM Pacific Standard Time  
Device: Google Chrome Windows (Desktop)  
Near: California, USA

If this was you, use your verification code to

186018

If you didn't request it: [click here to deny](#).

Don't share it with others.

**Company**

!

## Sign-in attempt was blocked

jo.doe@gmail.com

password to try to sign in to your account.  
t you should check what happened.

Check activity

**COMPANY**

## Your Twitch Account - Successful Log-in

Dear Jo,

This email was generated because a new log-in has occurred for the account **Jo** on December 12, 2023 7:13:00 am PST (December 12, 2023 3:13:00 pm UTC) originating from:

**Location:** California, USA  
**Device:** Windows 11  
**Browser:** Chrome  
**IP address:** 123.456.78.901

If you initiated this log-in, awesome! We just wanted to make sure it's you.  
If you did NOT initiate this log-in, you should immediately [change your Twitch password](#) to ensure account security.

# Login Notifications

**Company**

Jo,

Someone who knows your password is attempting to sign-in to your account.

When: Dec 12, 2023 07:13 AM Pacific Standard Time  
Device: Google Chrome Windows (Desktop)  
Near: California, USA

If this was you,

**186018**

If you didn't

Don't share

**Company**

!

Sign-in attempt was blocked

jo.doe@gmail.com

in to your account.  
t happened.

1. Inform about logins
2. Help protect accounts

3:13:00 pm UTC) originating from:

**Location:** California, USA

**Device:** Windows 11

**Browser:** Chrome

**IP address:** 123.456.78.901

If you initiated this log-in, awesome! We just wanted to make sure it's you.

If you did NOT initiate this log-in, you should immediately [change your Twitch password](#) to ensure account security.

# Do they actually help?

1010  
1010

Technical  
jargon



Annoying



Confused to  
be malicious



Identify key components  
of **real-world** notifications



Test notification in  
**ecologically robust** manner

# Analyzing Real-World Notifications



72 Notifications

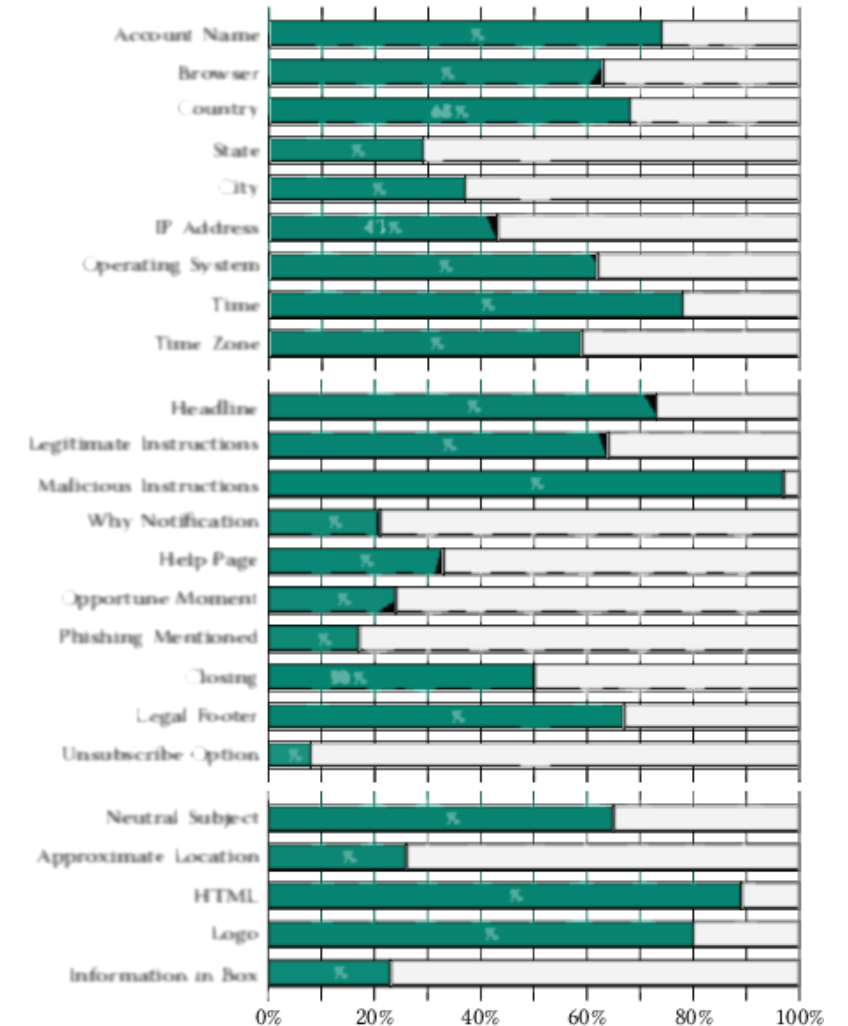


Sign-In Information,  
Components,  
Wording/Design

Sign-In Information

Components

Wording  
& Design



# Baseline Notification

Metadata,  
Logo, Greeting,  
Affected Account

## New sign-in to your AcmeCo account

From: AcmeCo <noreply@acmecoco.com>

Received: A few moments ago



## New sign-in to AcmeCo

Hi Jo,

We noticed a new sign-in to your AcmeCo account ([jo.doe@gmail.com](mailto:jo.doe@gmail.com)).

**Location:** California, USA

**Date:** March 8, 2023 at 10:47 AM PDT

**Device:** Chrome on Windows

If it was you, you can safely ignore this email.

If it wasn't you, please [change your password](#) immediately to secure your account.

Thanks,

The AcmeCo account team

Closing,  
Legal Information

[Privacy Policy](#) | [Terms of Use](#) | [Support Center](#)

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Login Information

Instructions

# User Study

# Research Questions

RQ 1

## Reaction & Comprehension

Which **actions** do users take after receiving notifications?  
Do users understand **why** they received the notification?

RQ 2

RQ 3



# Research Questions

## Reaction & Comprehension

RQ 1

Which **actions** do users take after receiving notifications?  
Do users understand **why** they received the notification?

## Decision-Making & Execution

RQ 2

Do **state-of-the-art** notifications **help** users **distinguish** malicious and legitimate logins?  
**Which information** helps account owners with their decision?

RQ 3

# Research Questions

RQ 1

## Reaction & Comprehension

Which **actions** do users take after receiving notifications?  
Do users understand **why** they received the notification?

RQ 2

## Decision-Making & Execution

Do **state-of-the-art** notifications **help** users **distinguish** malicious and legitimate logins?  
**Which information** helps account owners with their decision?

RQ 3

## Perception & Expectation

How do login notifications **make users feel**?  
**When** do they **expect** notifications to be sent?

# Study Structure



**Legitimate**



**Malicious**

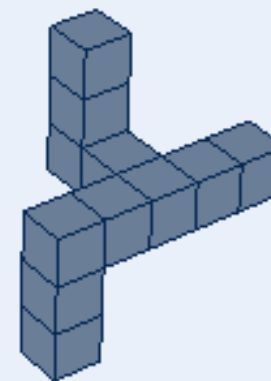
# Study Structure

## Stage 1

N = 625



Account Creation



Primary Task

Come back in



7 days



14 days

# Study Structure

## Stage 1

N = 625

- Account Creation
- Primary Task

7 days



## Stage 2



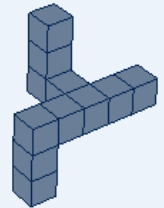
Legitimate



Login



Notification



Primary Task

# Study Structure

## Stage 1

N = 625

- Account Creation
- Primary Task

7 days



## Stage 2



### Legitimate

- Login
- Notification
- Primary Task



### Malicious



Unexpected  
Notification



# Study Structure

## Stage 1

N = 625

- Account Creation
- Primary Task

7 days



## Stage 2



### Legitimate

- Login
- Notification
- Primary Task



### Malicious

- Unexpected Notification

2 days



## Stage 3

N = 229



Debriefing

Survey

# Results

- Divers Age Range
- Average Education
- Mostly Non-technical



# How did users react?



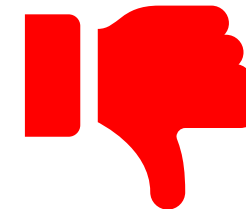
Legitimate

**0%** Changed Password



Malicious

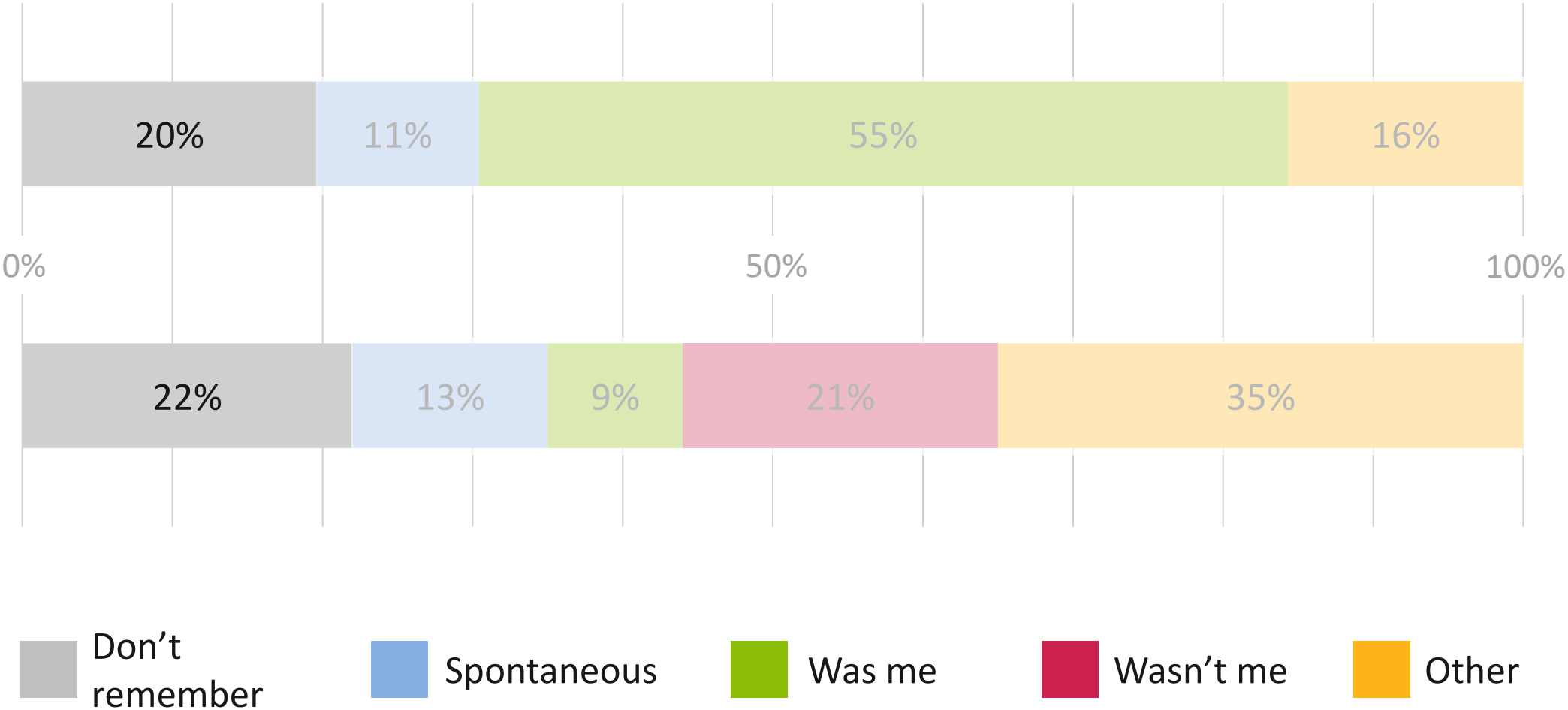
**20%** Changed Password



# How did users react? Why?

  
Legitimate

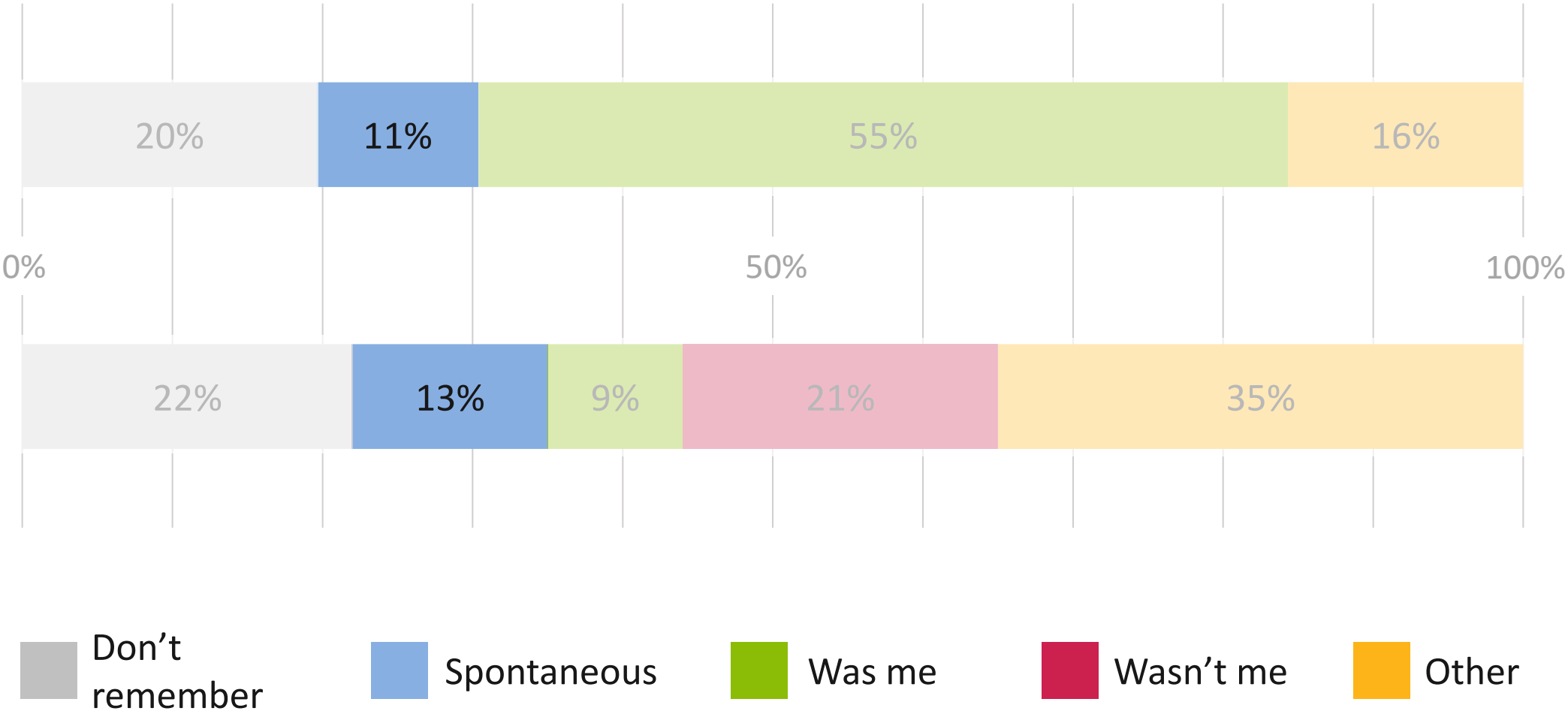
  
Malicious



# How did users react? Why?

  
Legitimate

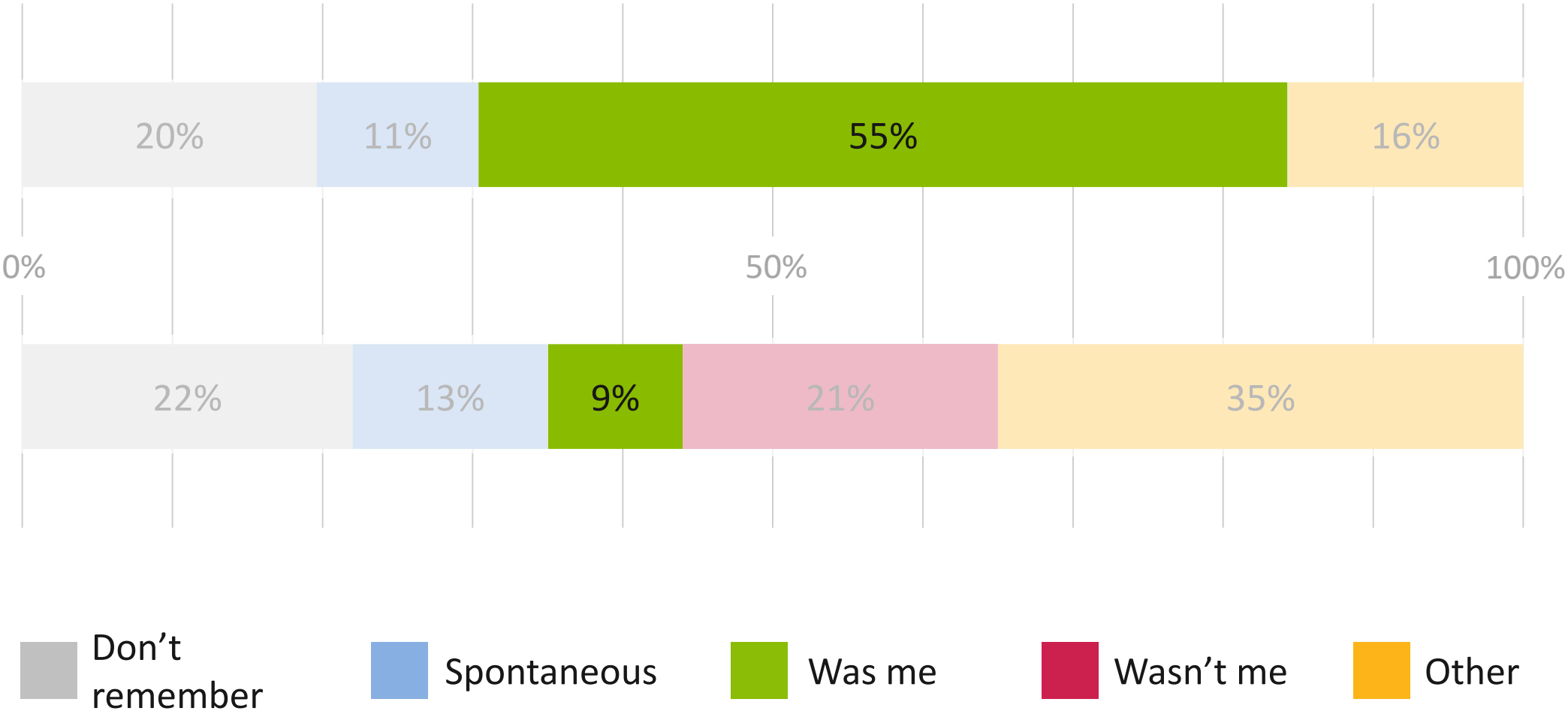
  
Malicious



# How did users react? Why?

  
Legitimate

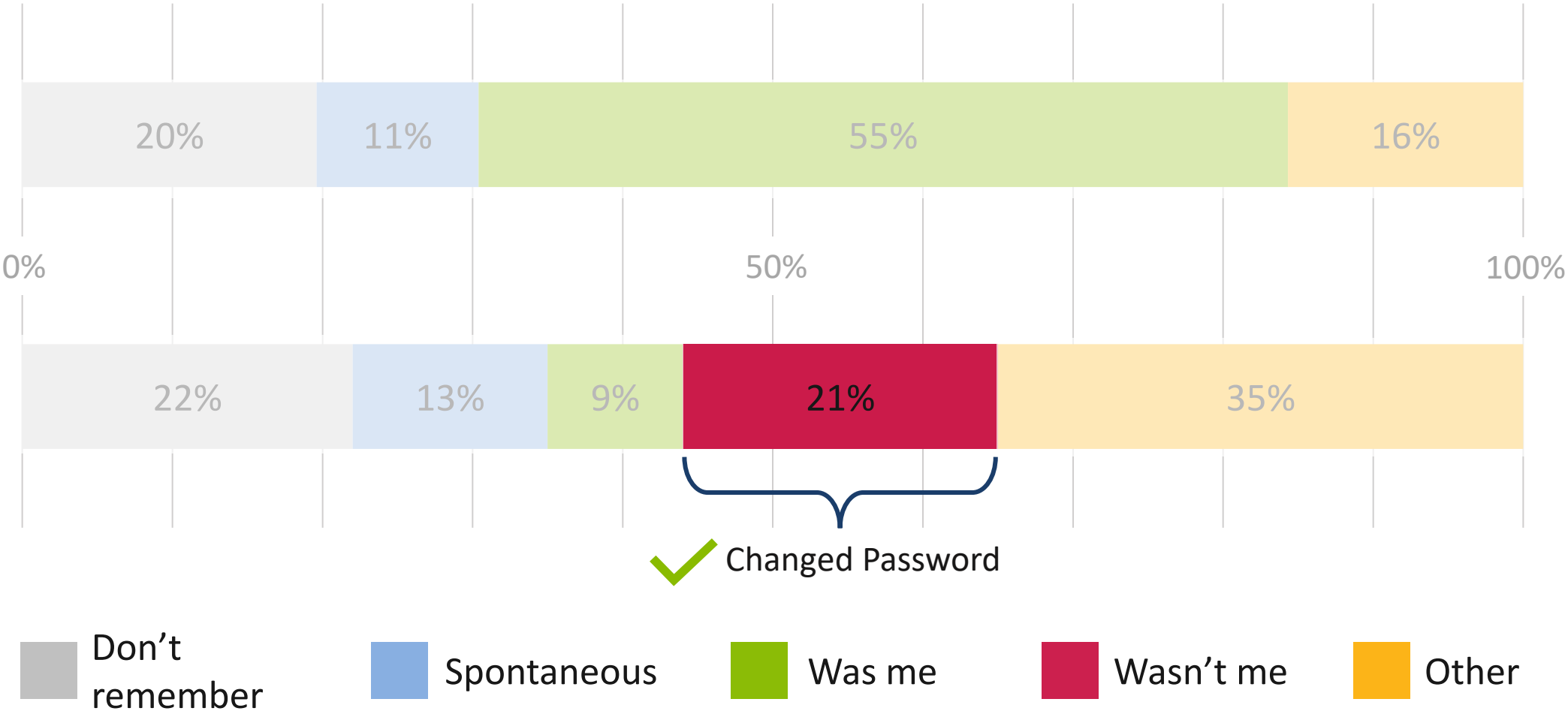
  
Malicious



# How did users react? Why?

  
Legitimate

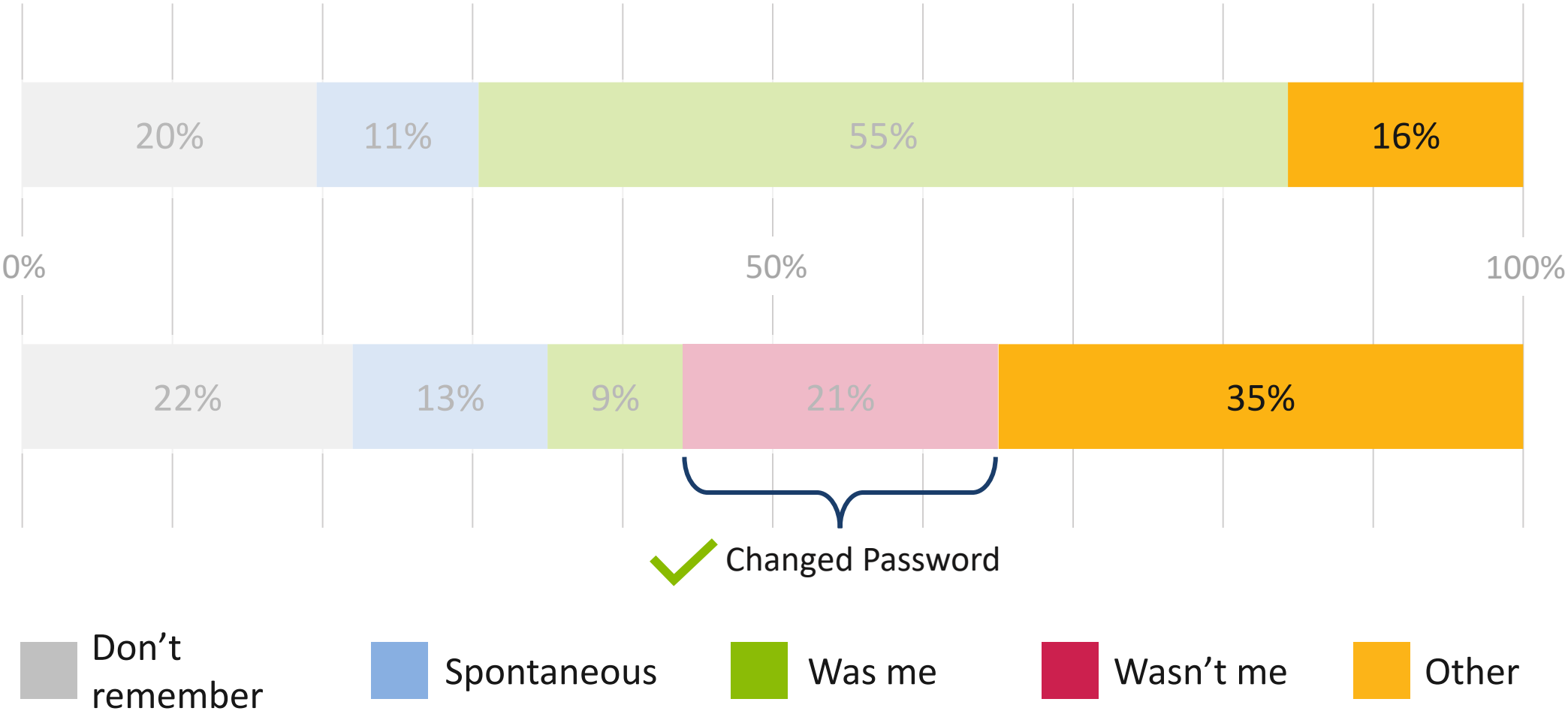
  
Malicious



# How did users react? Why?

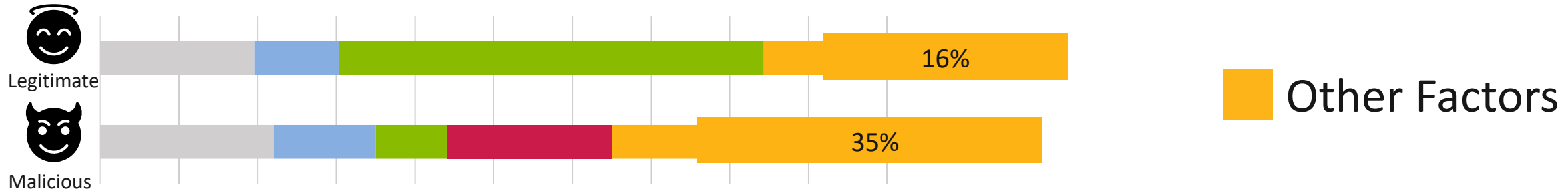
  
Legitimate

  
Malicious



# How did users react?

## Why?



- Seems suspicious
- Notifications are annoying
- Feel protected

# What helps users decide?

RQ 2



Affected  
Account Name



Location



Date



Device

## New sign-in to your AcmeCo account

From: AcmeCo <noreply@acmecore.com>

Received: A few moments ago



## New sign-in to AcmeCo

Hi Jo,

We noticed a new sign-in to your AcmeCo account ([jo.doe@gmail.com](mailto:jo.doe@gmail.com)).

**Location:** California, USA

**Date:** March 8, 2023 at 10:47 AM PDT

**Device:** Chrome on Windows

If it was you, you can safely ignore this email.

If it wasn't you, please [change your password](#) immediately to secure your account.

Thanks,  
The AcmeCo account team

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# What helps users decide?



Affected  
Account Name



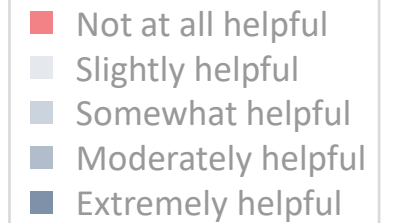
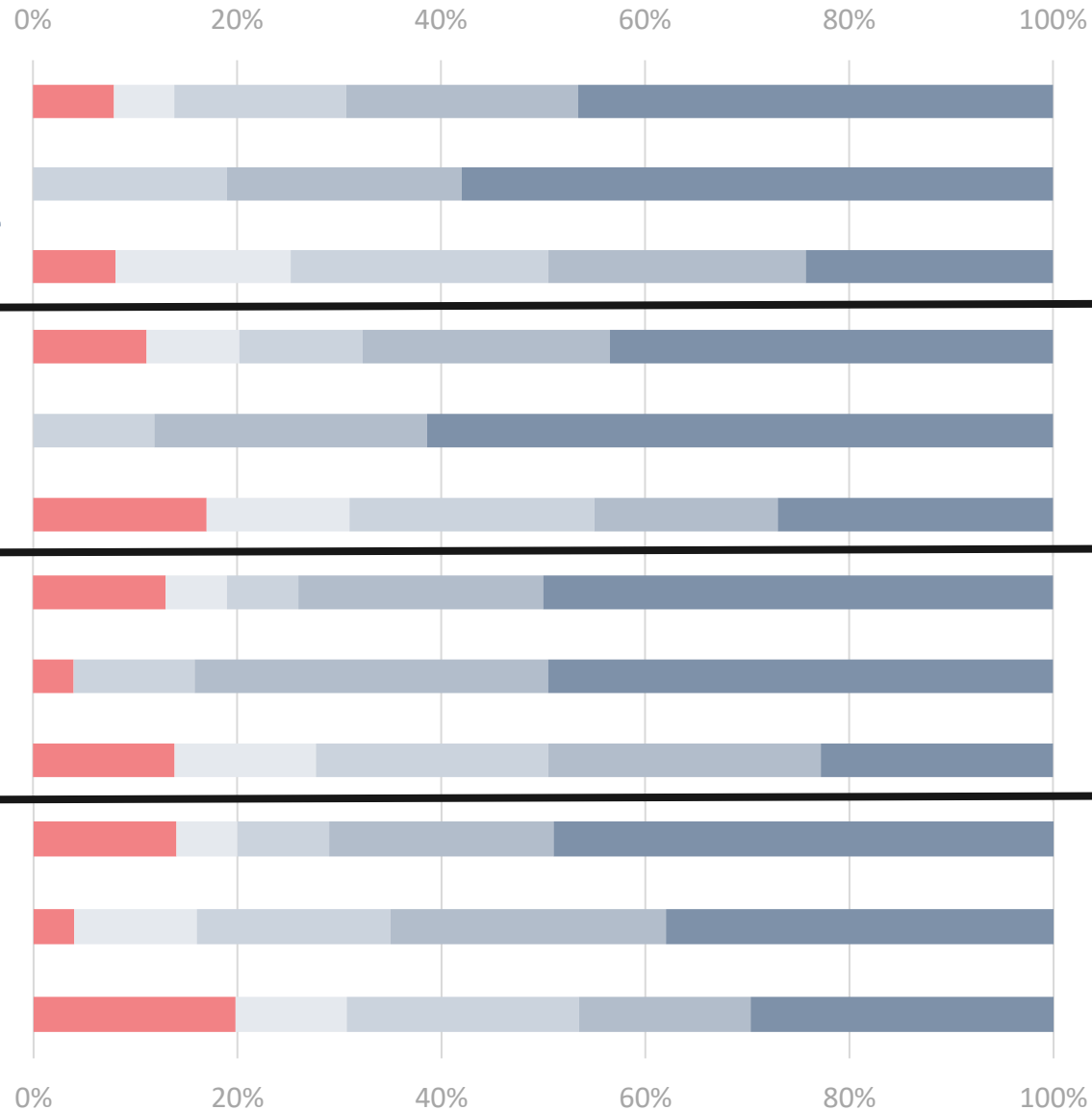
Location



Date



Device



RQ 2

# What helps users decide?



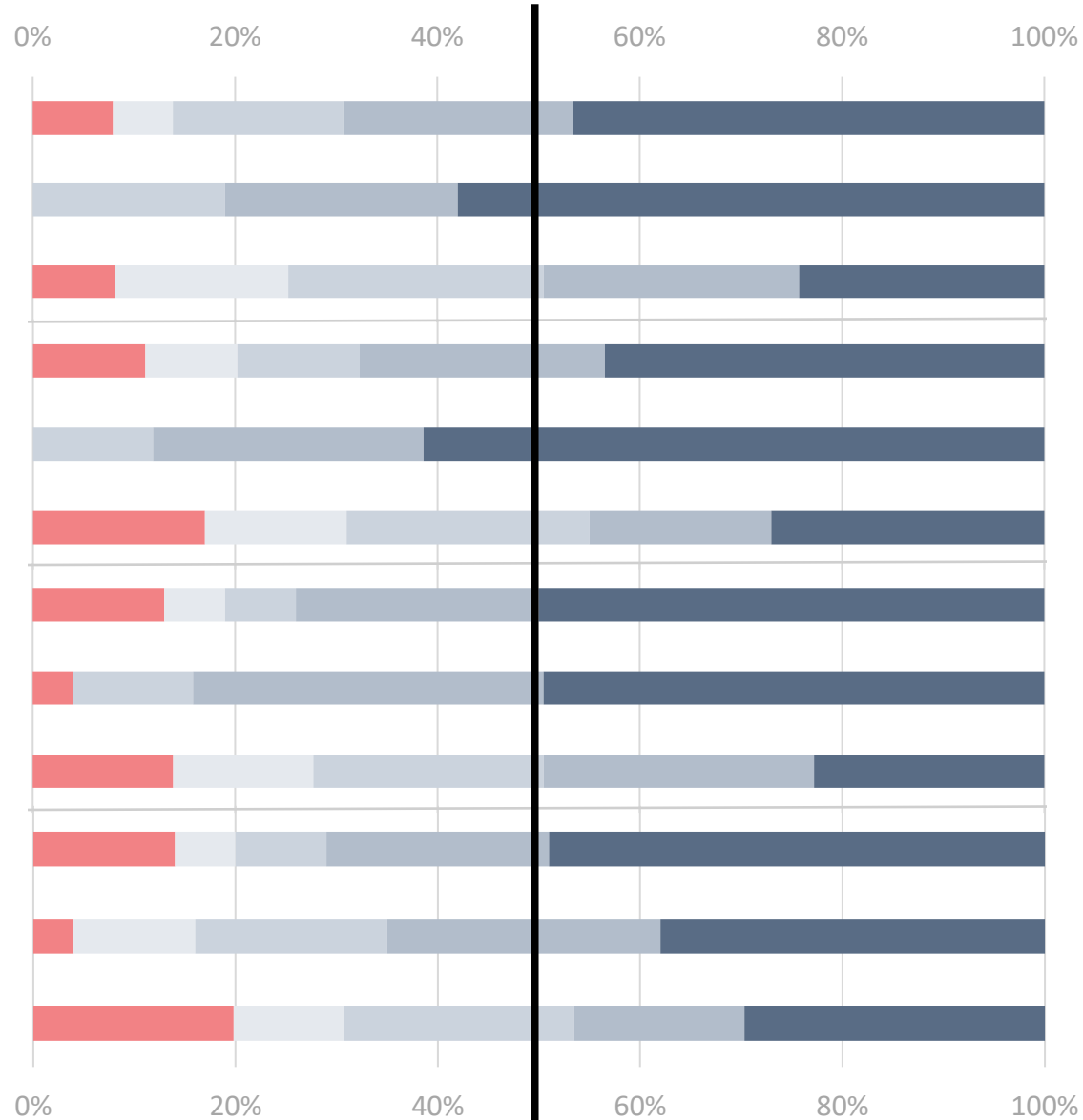
# What helps users decide?

50%

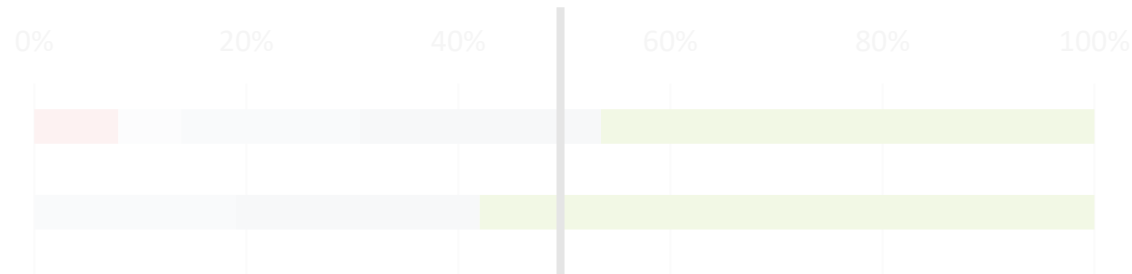
RQ 2

Not helpful

Extremely  
helpful



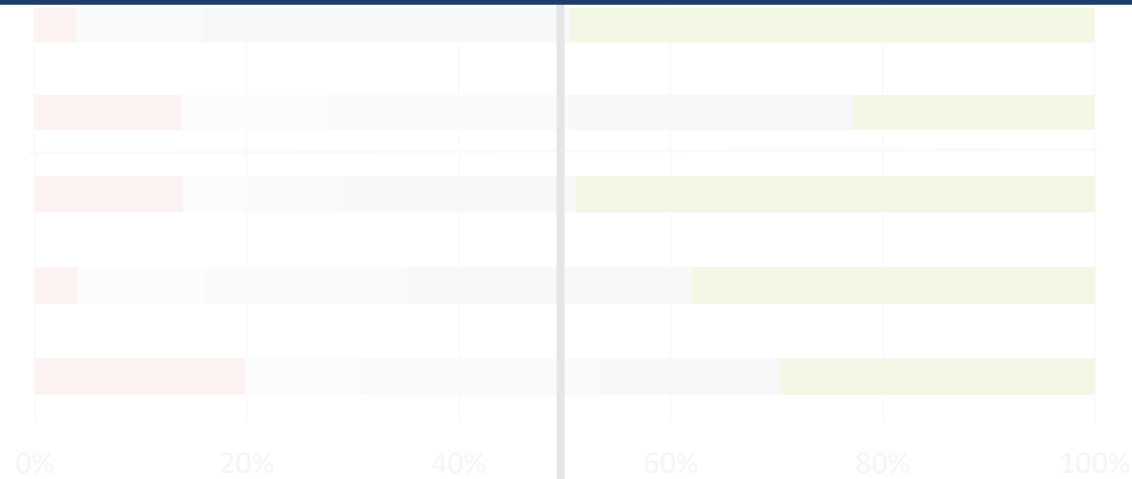
# What helps 50%rs decide?



RQ 2

> 80% All info is **at least slightly** helpful

~ 50% All info is **extremely** helpful



# What do users expect?

**97%** expect login notifications  
**BUT *not*** for *every login*



**66%** after suspicious account activity



**60%** on new device



**47%** in new location

# Recommendations



1. Notify about:  
Devices, Locations, Suspicious Logins



“unusual login”



3. Include Information in *Metadata*



4. Provide *Specific Instructions*



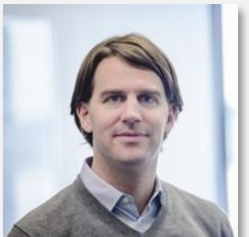
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