Driving 2FA Adoption At Scale

Optimizing Two-Factor Authentication Notification Design Patterns

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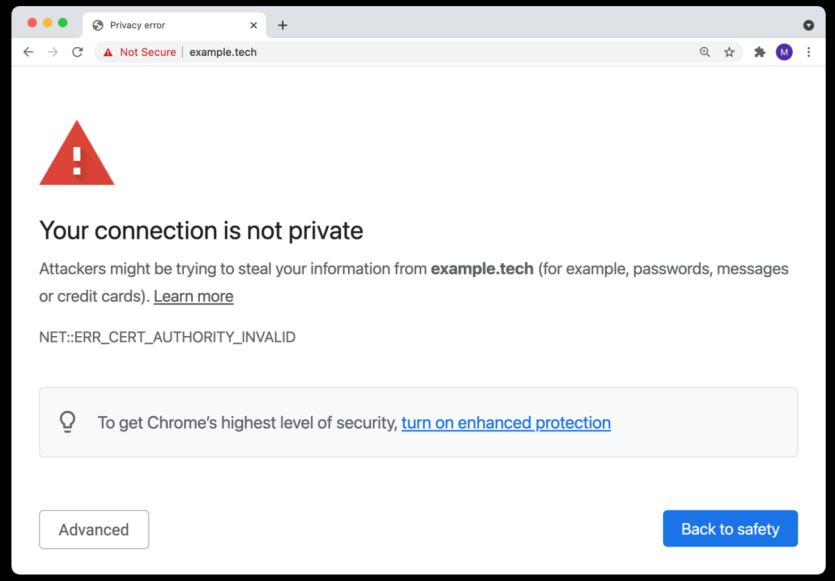
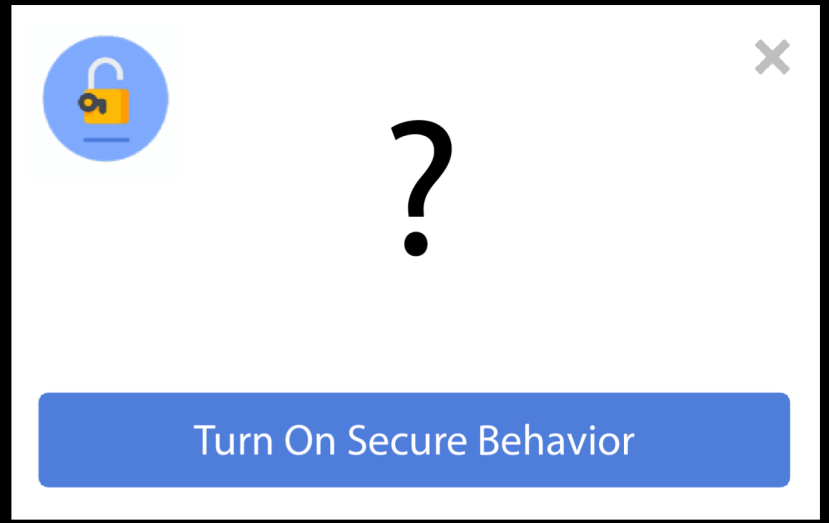
Prior field work on warning messages to discourage risky behavior



Little field work on messaging to encourage secure behavior



Research goal: Identify messaging principles to improve 2FA adoption

RQ1: Does messaging tailored to address:

- Motivations
- Mental models
- Concerns

improve 2FA adoption?

RQ2: Does applying UX design patterns from other domains work for adoption of 2FA?

We conducted a series of controlled field experiments on Facebook's 2FA prompts

Participants:

- Did not already have 2FA enabled
- Representative sample of U.S. Facebook users
- Selected by standard FB product experiment protocols

Metric of Interest:

- Click-to-enable (CTE): clicks to enable 2FA; correlated with actual 2FA enroll ($r=0.744$, $p<0.001$)

Our first experiment addresses RQ1 by varying 2FA prompt headline & body text

3 X 3 experimental design testing theory from prior work

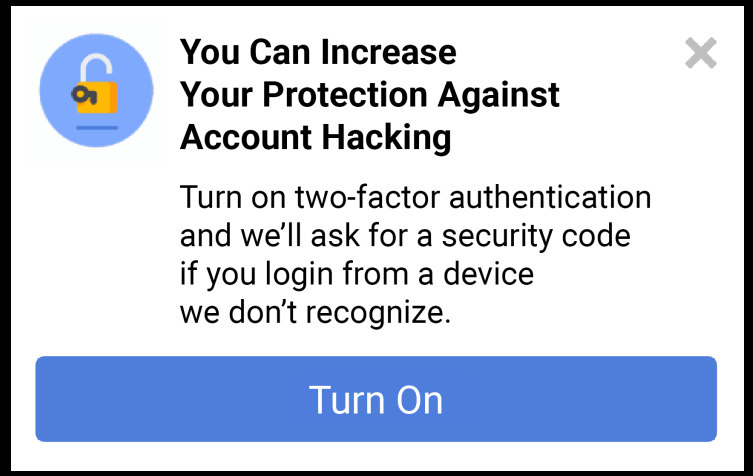
Average of 71,700 users per prompt (SD = 375.3)

Headline	Basis
User Responsibility: "You can increase your protection against account hacking"	Protection motivation theory
Company Responsibility: "Your security is our responsibility"	Stanton et al. 2016 Redmiles 2019
Control (Responsibility-Neutral): "Protect your account, pages, and friends"	

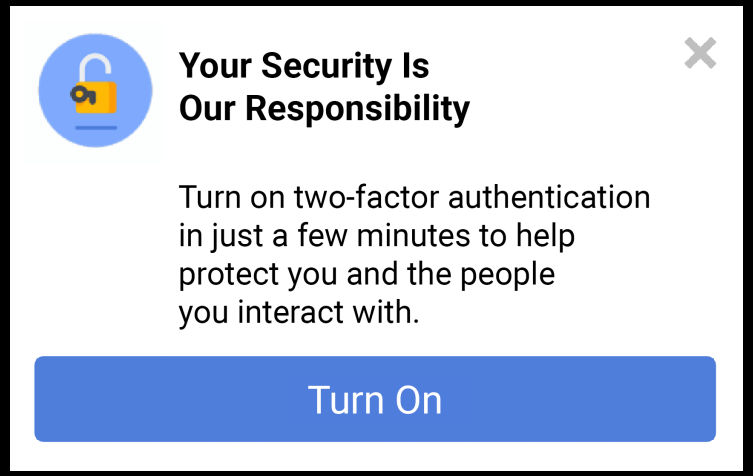
X

Body	Basis
Time Costs: "Turn on two-factor authentication in just a few minutes to help protect you and the people you interact with"	Herley 2009 Colnago et al. 2018 Redmiles et al. 2017 Redmiles et al. 2018
Mental Model: "Turn on two-factor authentication and we'll ask for a code if we see a login from a device we don't recognize"	Colnago et al. 2018 Redmiles et al. 2017
Control (Responsibility-Neutral): "Turn on two-factor authentication to increase protection for you and the people you interact with"	

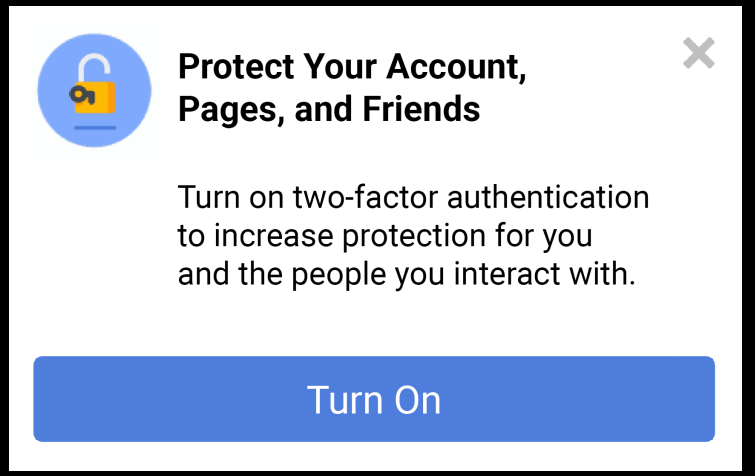
Examples of experimental prompts shown at the top of participants' Facebook newsfeeds



Headline: User Responsibility
Body: Mental Model



Headline: Company Responsibility
Body: Time Costs



Headline: Control
Body: Control

Most effective messaging emphasizes user responsibility + informs users' mental models

Compared to the control headline those shown the:

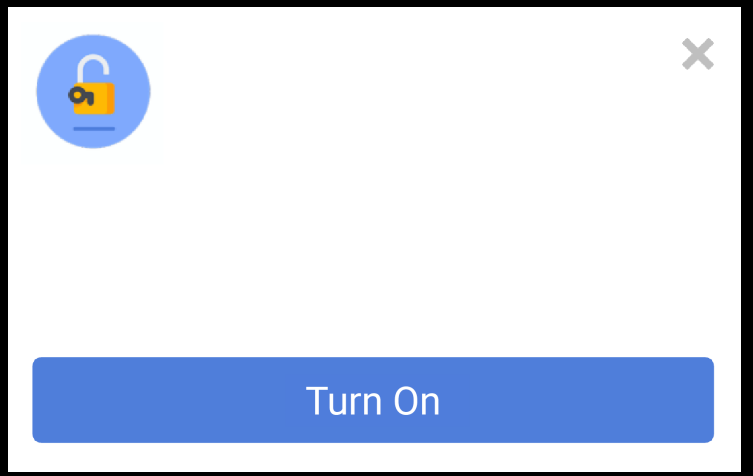
User responsibility headline were 33% more likely to click to enable 2FA (95% CI: 22% - 45%)

Corporate responsibility headline did not have a significantly different CTE rate

Compared to the control body text those shown the:

Mental Model body text were 28% more likely to click to enable 2FA (95% CI: 17% - 39%)

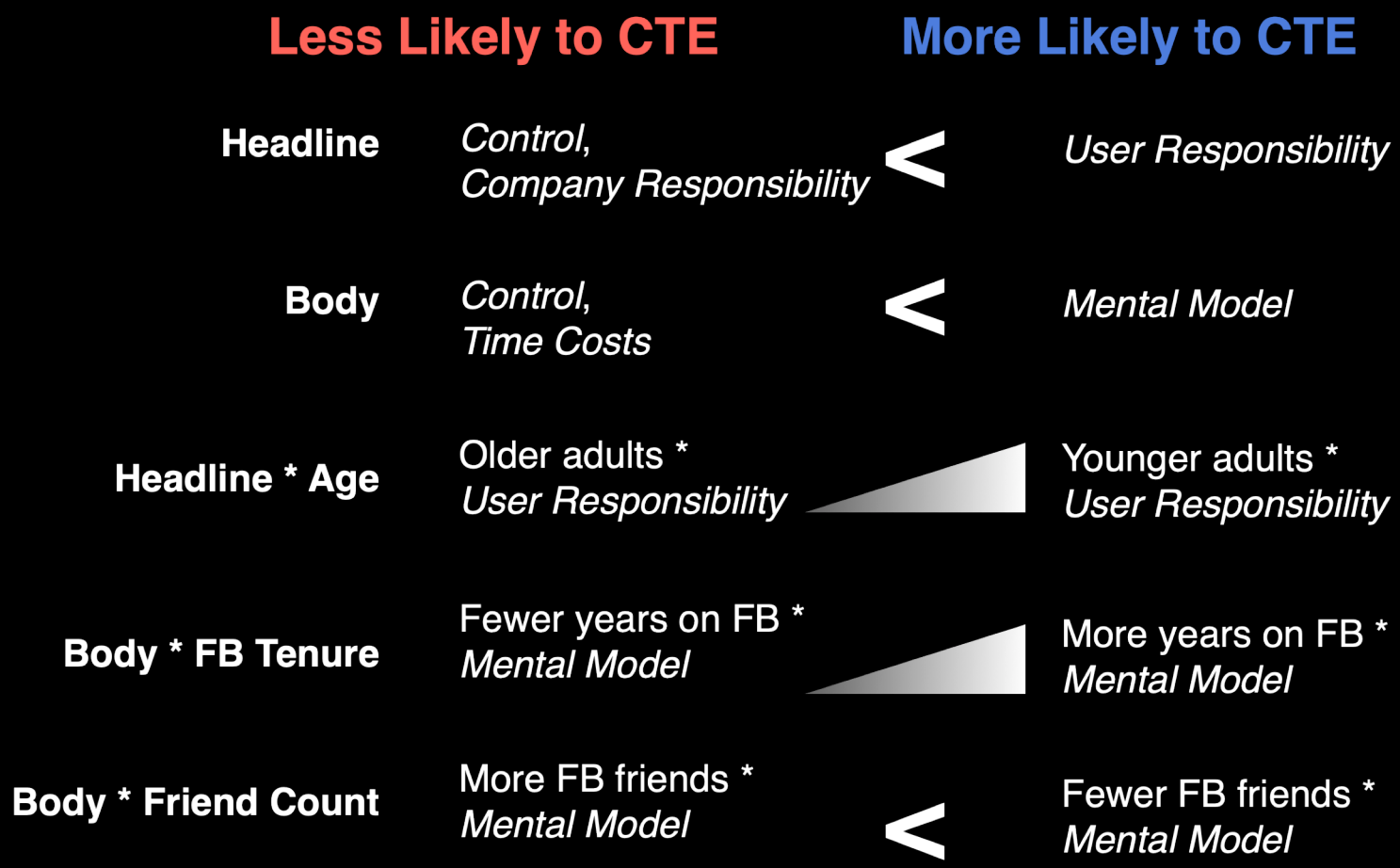
Time Costs body text did not have a significantly different CTE rate



Best Performing Message

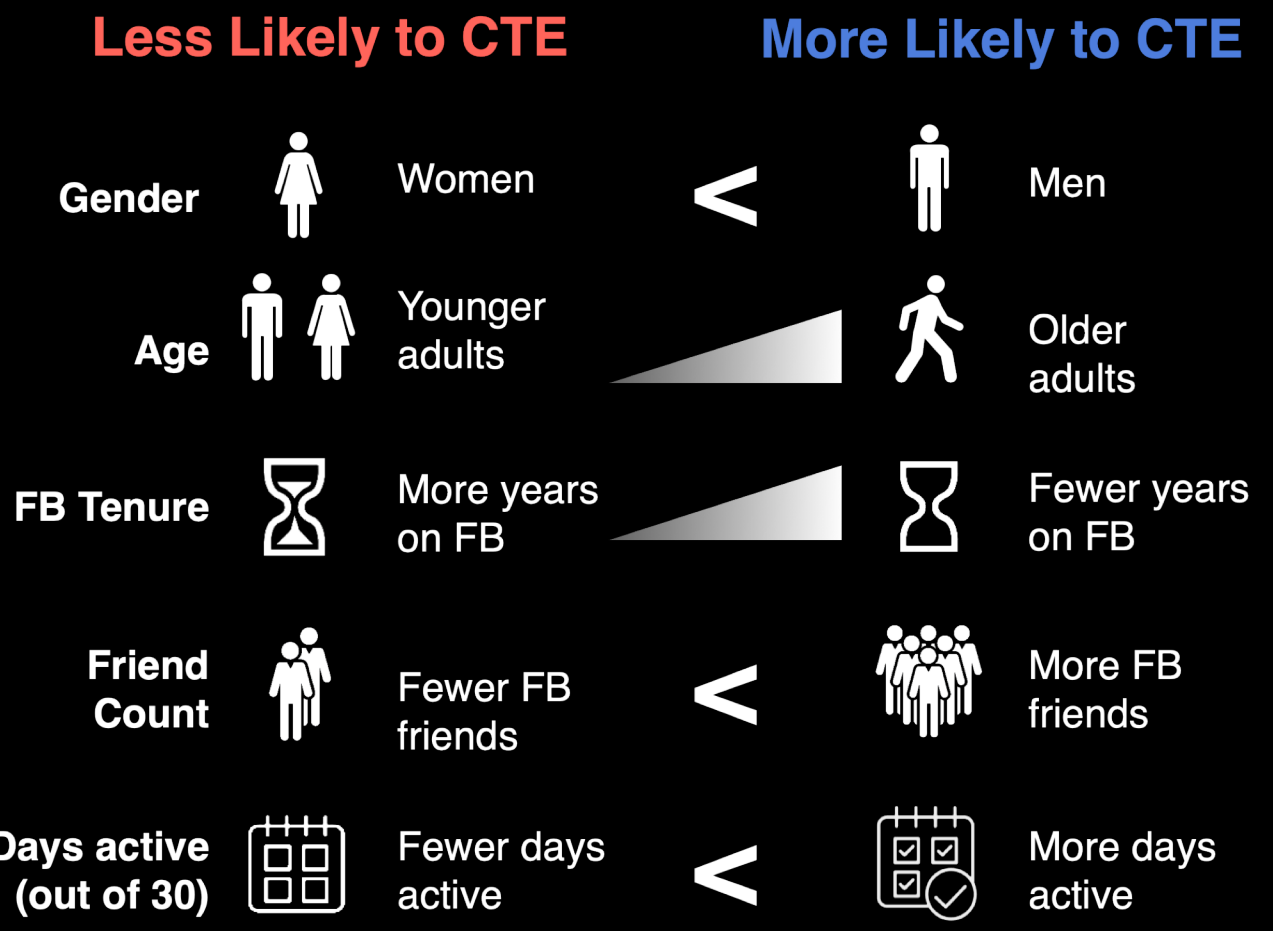
Results of a logistic regression model predicting whether a given user clicked to enable (CTE) 2FA on the prompt they were shown.

Controlling for demographics, user responsibility + mental model messaging remains most effective but efficacy varies with age & FB Use



Results of a logistic regression model predicting whether a given user clicked to enable (CTE) 2FA on the prompt they were shown.

Messaging is not the only thing that influences 2FA enablement; demographics matter too



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Our second set of experiments addresses RQ2 by testing three UX techniques from other domains

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Our first experiment tests personalizing the prompt with the user's name

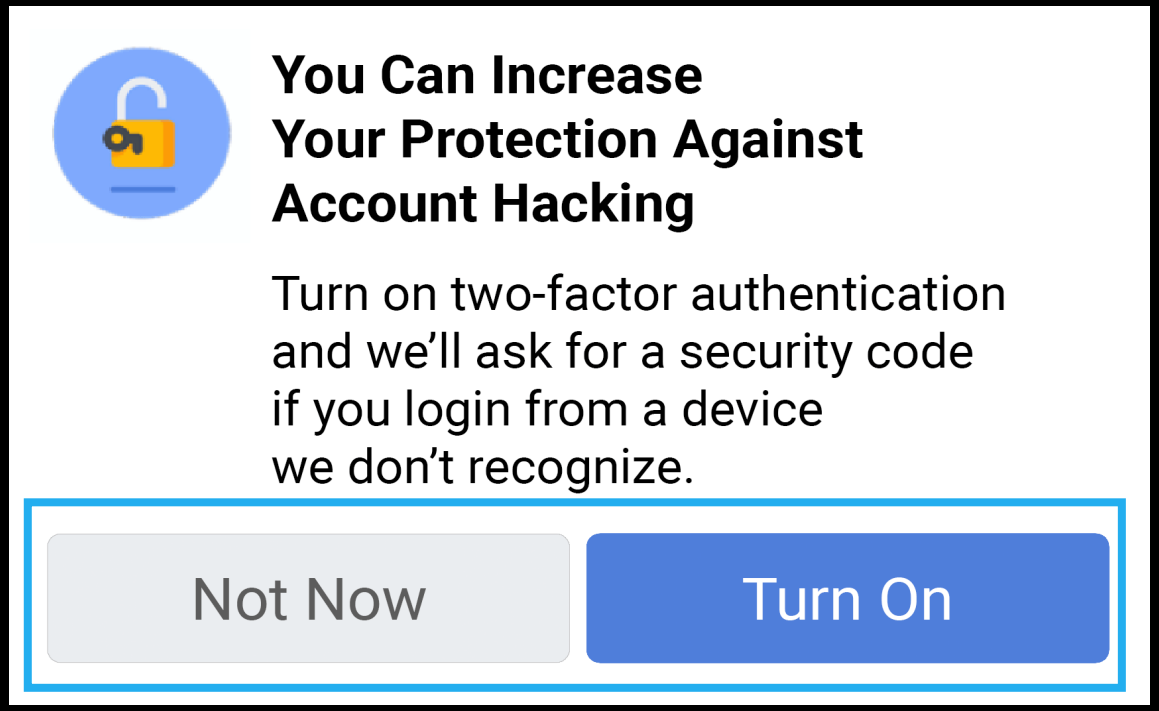
#1

Personalization

From marketing & public policy research:
Haynes et al. 2012
Sahni et al. 2016

Our second experiment tests a combination of reminder messaging & opinionated design

#2



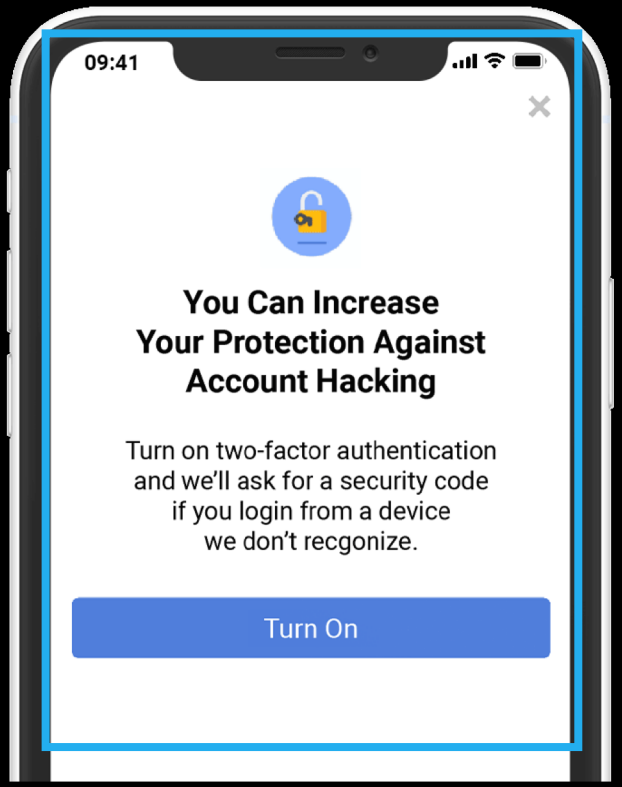
Opinionated Reminders

Reminder Messaging:
Frick et al. 2019

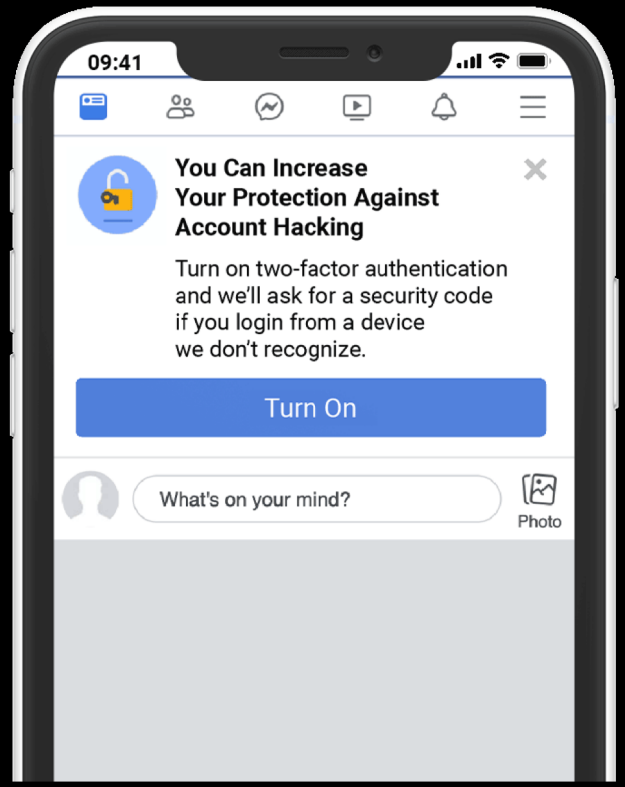
Opinionated Design:
Felt et al. 2015
Gray et al. 2018
Chromik et al. 2019

Our third experiment tests the impact of an interstitial (blocking) prompt

#3



Interstitial



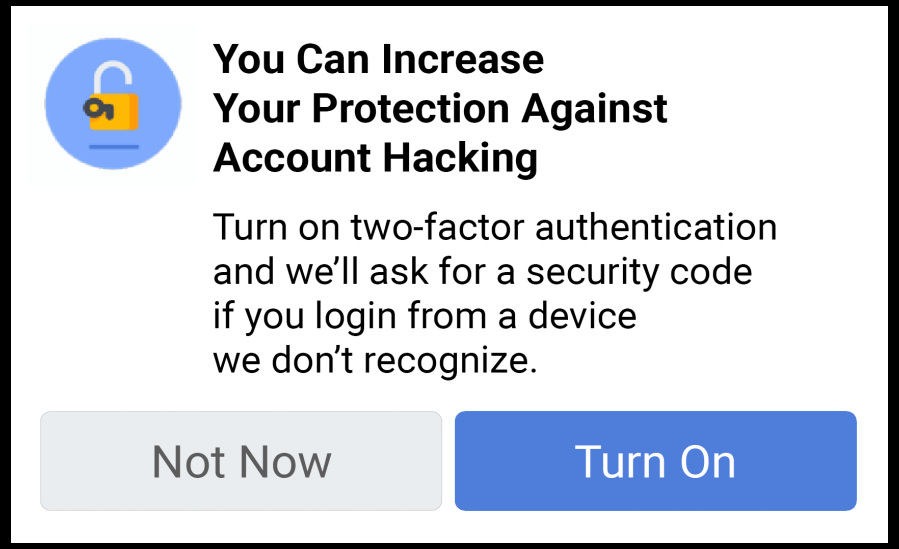
Control

Effective:
Felt et al. 2014
Kaiser et al. 2021

But not preferred by users:
Brajnik & Gabrielli. 2010
Stanton et al. 2016

Our second set of experiments addresses RQ2 by testing three UX techniques from other domains

Personalization



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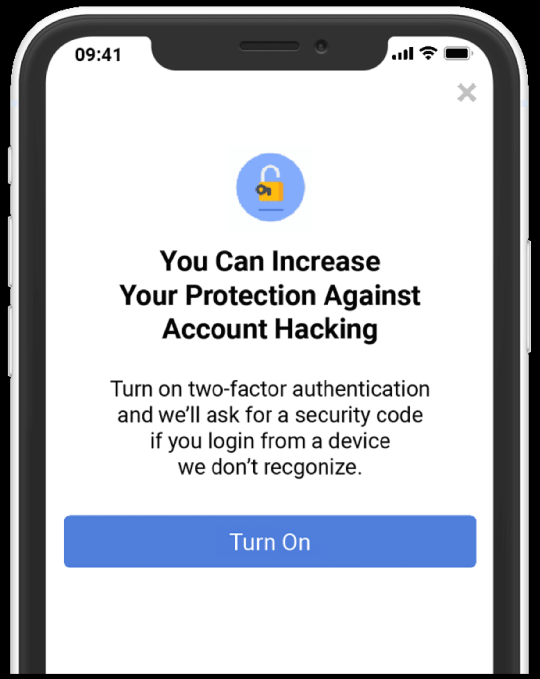
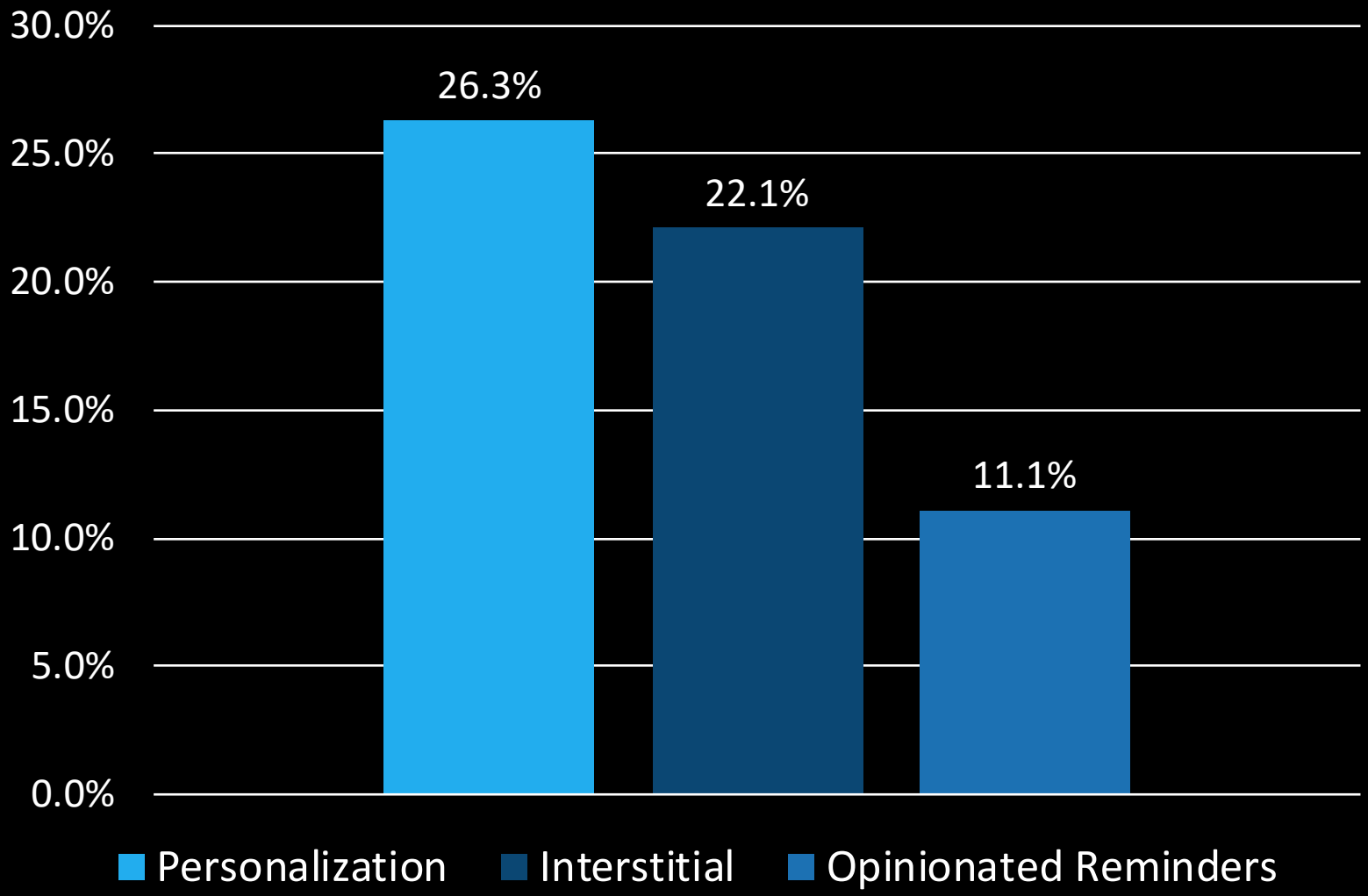


Interstitial

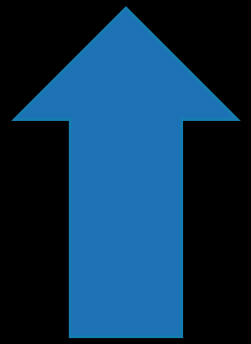
All three UX experimental designs significantly improved CTE



Participants who enabled kept 2FA enabled

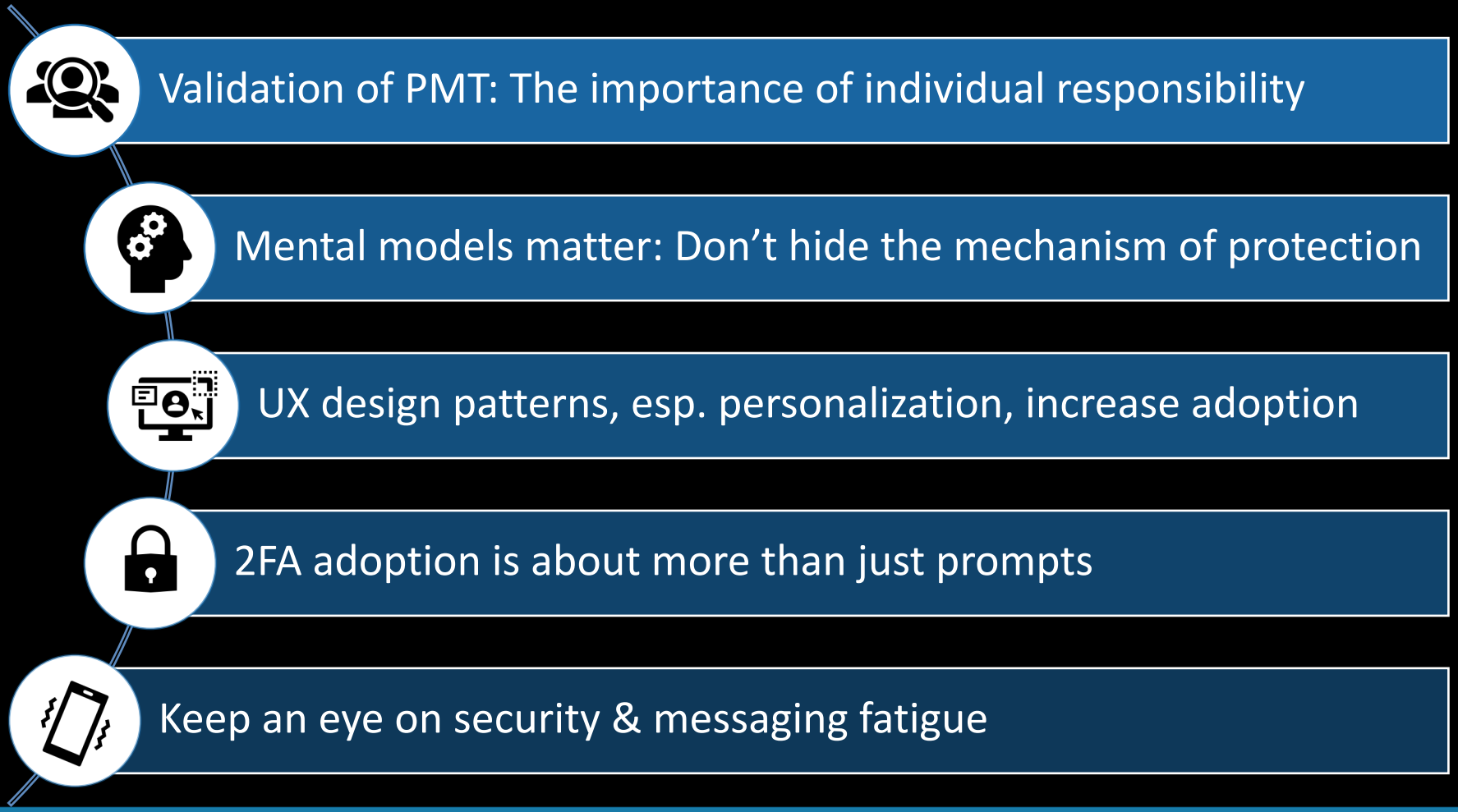
95%

participants kept 2FA enabled after 90 days



8% higher retention in prompted participants
vs. unprompted population

Lessons learned: 2FA adoption field experiments



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