A Typology of Perceived Triggers for End-User Security and Privacy Behaviors

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Challenge: Bridging the expert/end-user gap

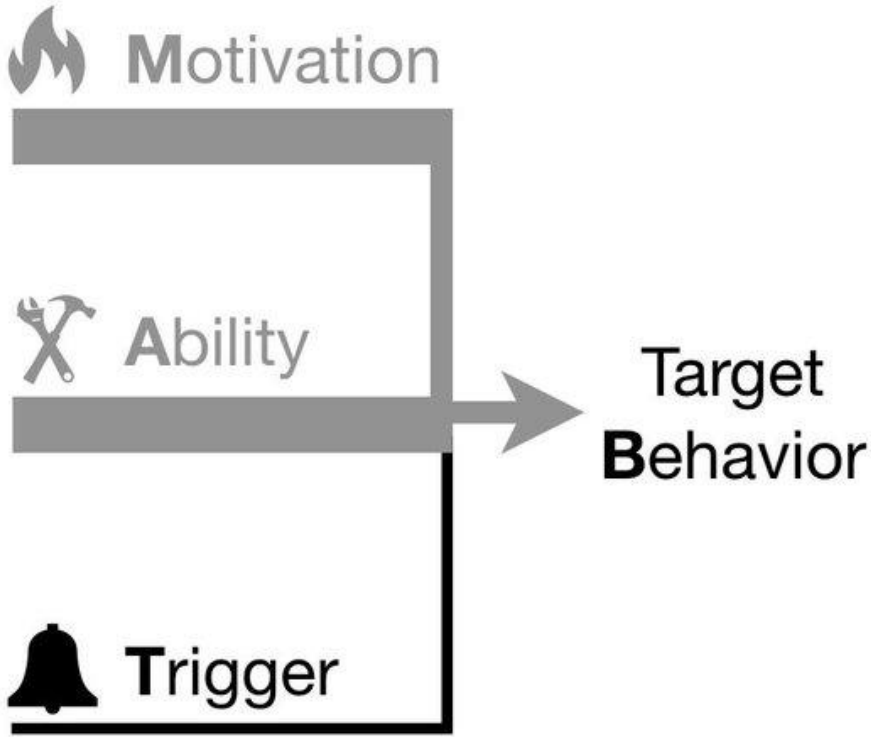
<10% of Google account holders use two-factor *(Milka, 2018)*

12% of US Internet users use password managers *(Pew, 2017)*

Img source: https://www.clinicalleader.com/

Behavior Change Model

(Fogg, 2009)

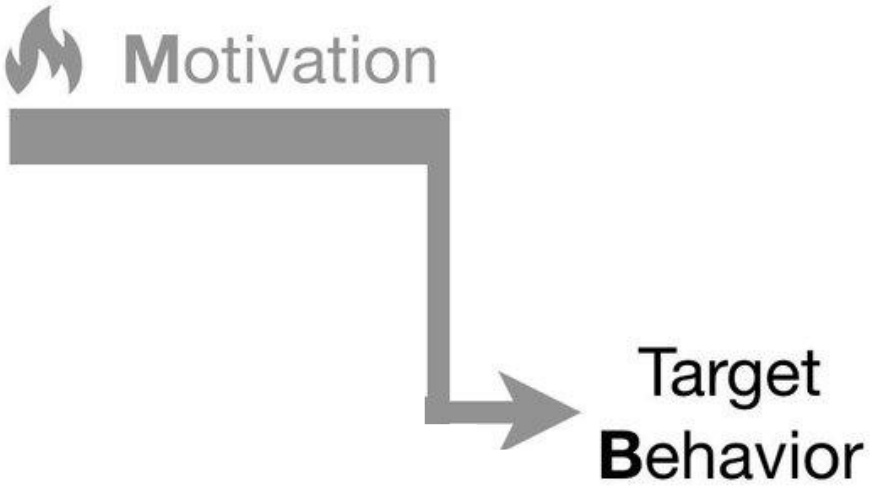


Motivation and ability are better understood

Security measures can block users goals in the moment *(Dourish et al 2004, Sasse 2003)*

- *Example: 2 factor delaying email access*

People don't believe they are at risk *(Adams & Sasse, 1999; Wash 2010)*

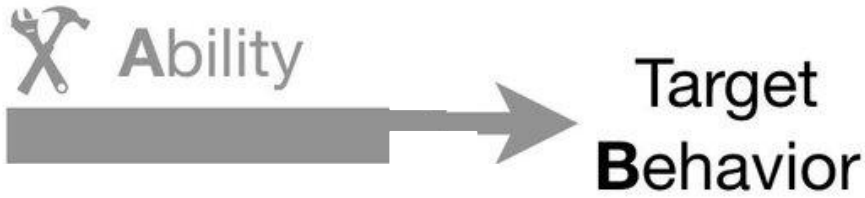


Motivation and ability are better understood

People lack awareness of relevant threats and protection measures
(Adams & Sasse, 1999, Ion et al., 2005)

People lack knowledge to use current tools *(Norman & Draper, ; Wash, 2010; Pew, 2017)*

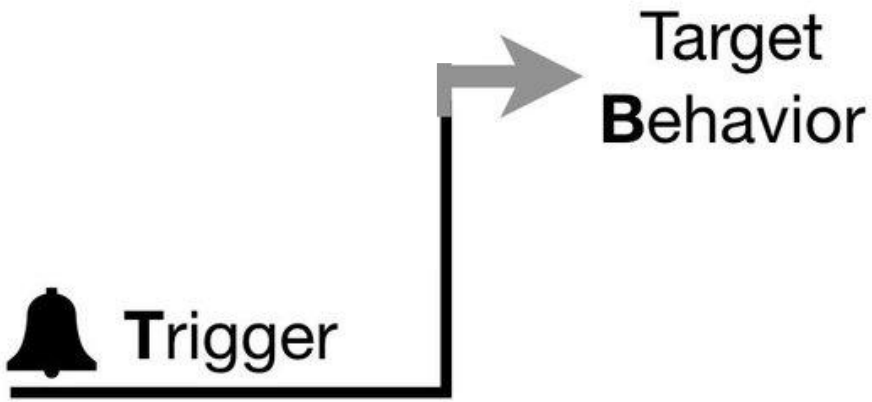
- *Example: URLs or email headers (Dhamija et al. 2006)*



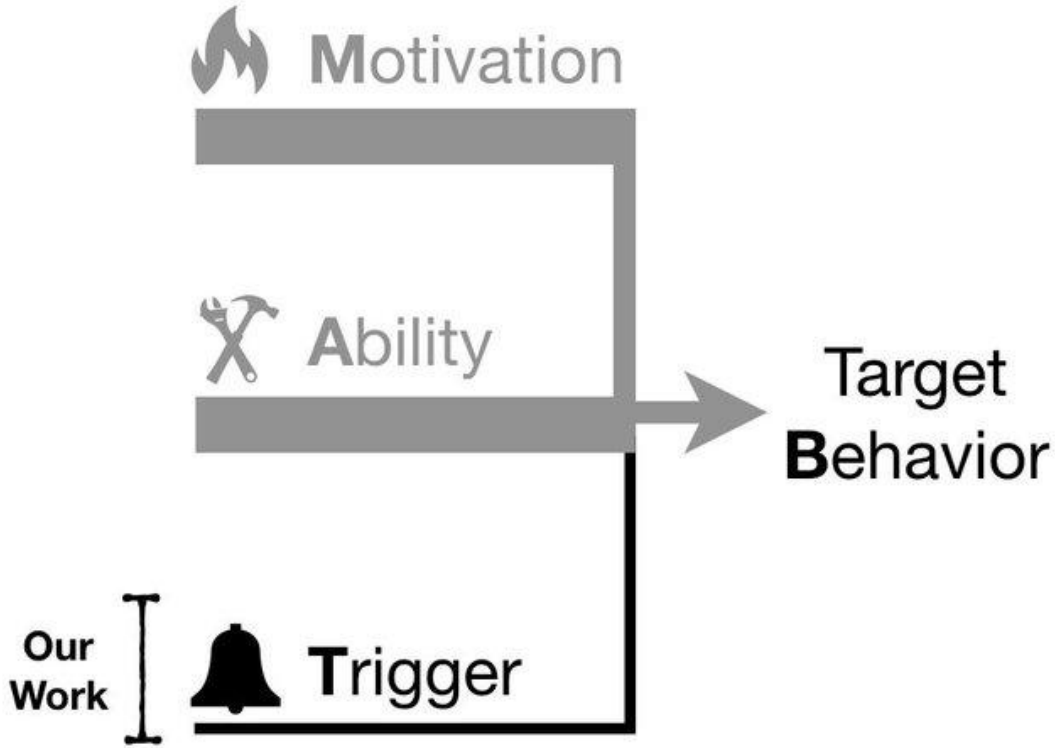
There's less work on behavioral triggers

Warning design has improved but they are just one trigger
(Akhawe & Felt, 2005; Bravo-Lillo et al 2013;)

Some qualitative work describes momentary triggers
(Das, Kim, Dabbish & Hong, 2014; Das, Kramer, Dabbish & Hong, 2014; Rader, Wash Brooks, 2012; Redmiles et al, 2016)



How are triggers associated with behavior?



Triggers for security & privacy behaviors

Synthesized from (Das, Kim, Dabbish & Hong, 2014; Das, Kramer, Dabbish & Hong, 2014; Rader, Wash Brooks, 2012; Redmiles et al, 2016)

Source: shutterstock

Social - direct social interactions (e.g. observing a friend providing advice or observing others' security behaviors)

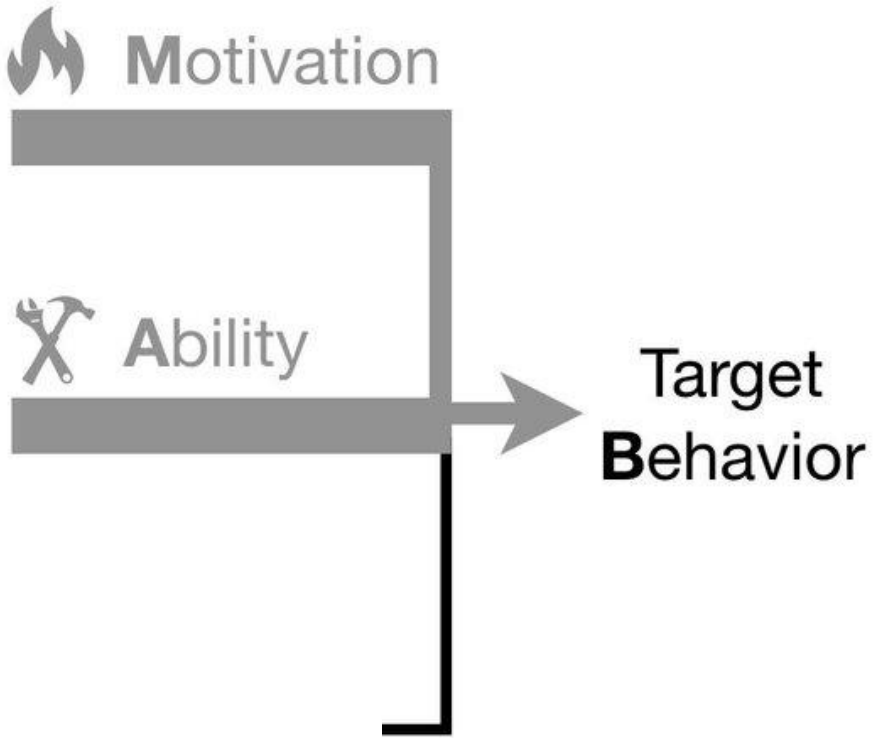
Source: noun project

Forced - non-social, external stimuli or situations (e.g. experiencing a personal data breach, or employer requiring password update)

Source: flaticon

Proactive - non-social, internal processes - routines, habits (e.g. enabling lock screen or routine password updates)

Our focus: Understand behavior triggers



Research Questions

1: How frequent are different triggers leading to security and privacy behaviors?

2: How do triggers differ across people and levels of security behavioral intentions (SBI)?

3: How often and why do people share their security and privacy behaviors with others?

Method: Online survey about recent behavior

Participants were asked if they did any of the following in the last 6 months:

- **Mobile Auth:** enabling or changing one's method of authenticating into a mobile device (e.g., smartphone, laptop, tablet or other portable electronic device)
- **App Uninstallation:** uninstalling a smartphone application, specifically for privacy or security reasons
- **Password Update:** changing or updating a password for an online account
- **Facebook Privacy:** updating one's Facebook account privacy settings

We then asked about behavioral triggers for each change, whether they shared the change with others and why.

Method: Online survey about recent behavior

Participants were also asked:

- **Demographics:** gender, age, nationality, professional background
- **Security Behavior Intentions** *(Egelman & Peer, 2015)*
  - Identify users who have low to medium security behavioral intention

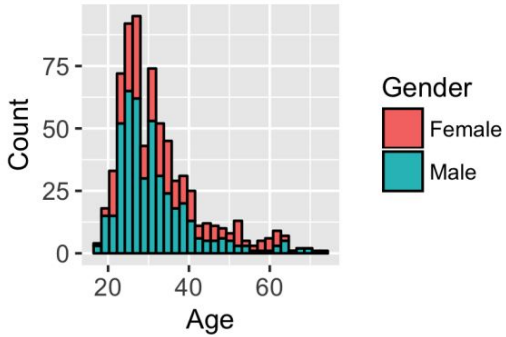
Sample

852 MTurk respondents completed the survey and passed attention checks

- 807 (95%) reported doing at least one behavior in the past 6 months
- Reported on 1947 behavior changes and 2954 triggers leading up to those behaviors

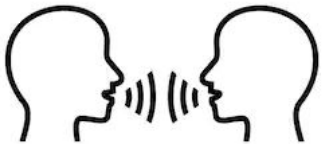
Demographics

- Age - Mean = 33 years (Standard dev: 10, Range: 18-74)
- Gender - 63% Male, 36% Female
- Nationality - 53% from US, 47% from India
- Tech expertise - 47% had technology background



RQ1: How frequent are different triggers leading to security and privacy behaviors?

Social triggers were most prevalent



Source: shutterstock

Social - 39% (1153) of reported triggers

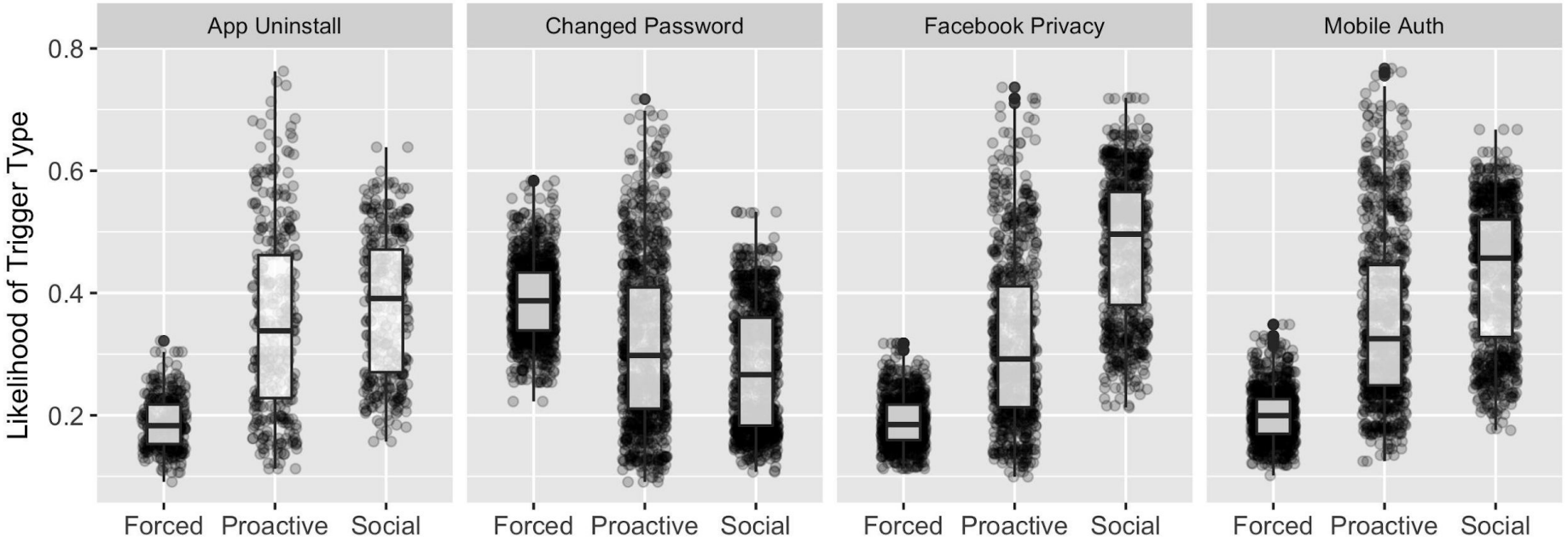
Source: noun project

Forced - 26% (773)

Source: flaticon

Proactive - 34% (1005)

Trigger likelihood varied by system

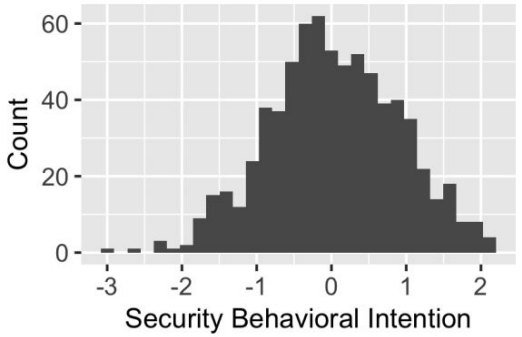


RQ2: How does the frequency of triggers differ across levels of security behavioral intentions (SBI)?

RQ2: How does trigger frequency vary across levels of security behavioral intentions?

Collapsed 16-item SeBIS scale into “Security Behavioral Intention” (SBI) construct capturing 17% of the variance based on a factor analysis

Conducted a series of logistic regressions on behavioral trigger likelihood as a function of behavior type, age, gender, nationality and SBI

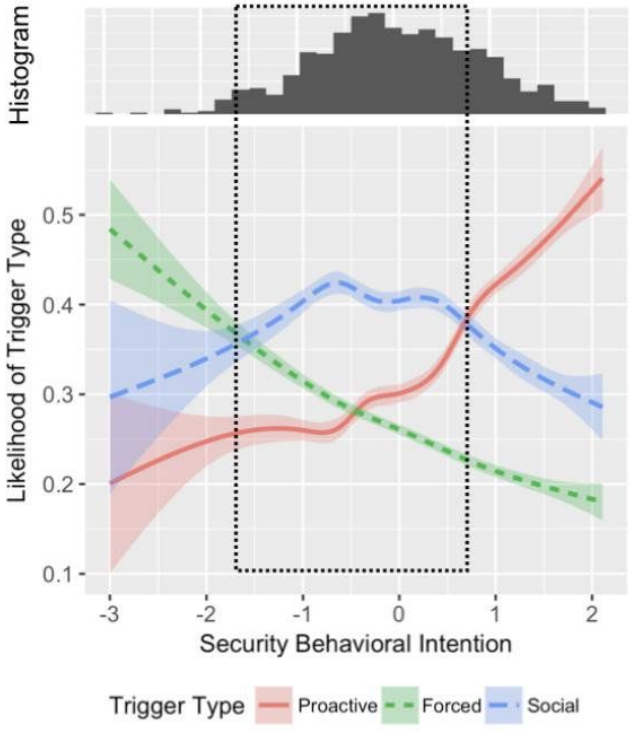


People with low-medium SBI were more likely to report social triggers

People with higher SBI were more likely to report proactive triggers (sbi = 0.36, p<0.001)

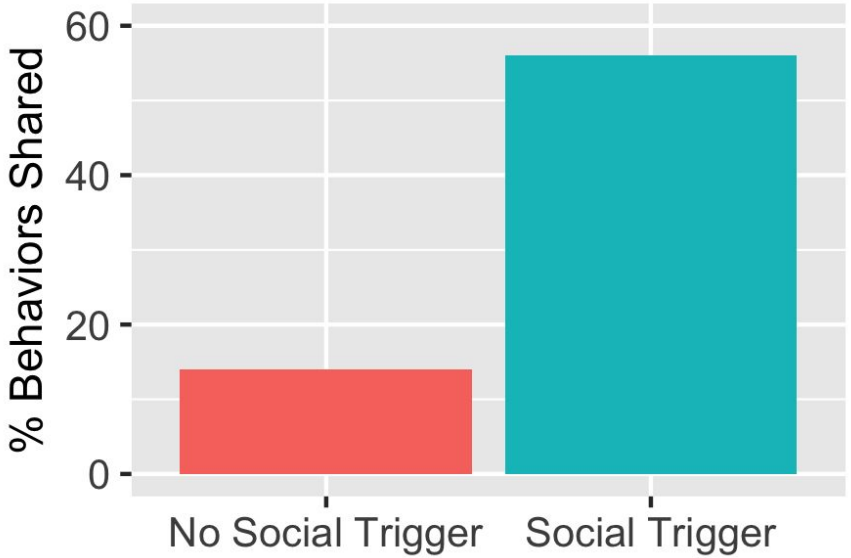
People with lower SBI were more likely to report more social triggers (sbi=0.12, p<0.05) and forced triggers (sbi=-0.25, p<0.001)

Gaussian additive model accounting for non-linearities in the data



RQ3: How often and why do people share their security and privacy behaviors with others?

Socially triggered behaviors were four times more likely to be shared with others



People were generally concerned for the security and privacy welfare of others

The most prevalent motivations for discussing a security change (aside from desire to socialize) were:

- Noticing people were being insecure
- Feeling obligated to protect them

	Mobile Auth	App Uninst.	Changed Pwd.	FB Priv.
I noticed they were being insecure	15%	14%	12%	33%
They learned about a new security tool	14%	9%	9%	N/A
I felt obligated to protect them	13%	17%	18%	N/A
They experienced a breach	12%	11%	11%	N/A
They had to set up a new device, account or tool	7%	4%	6%	N/A

Summary

Source: shutterstock

Social triggers were most frequent especially among those with low to medium security behavioral intention

People were **four times more likely to share socially triggered** security and privacy behaviors with others

Source: Icons8.com

People frequently shared security and privacy behaviors with others **out of concern for their welfare** (observing insecure behavior or a sense of obligation)

Design implications

Encourage social interaction - design for sharing

Explore the trigger design space

Sparks - motivating triggers (advertising, social proof notifications)

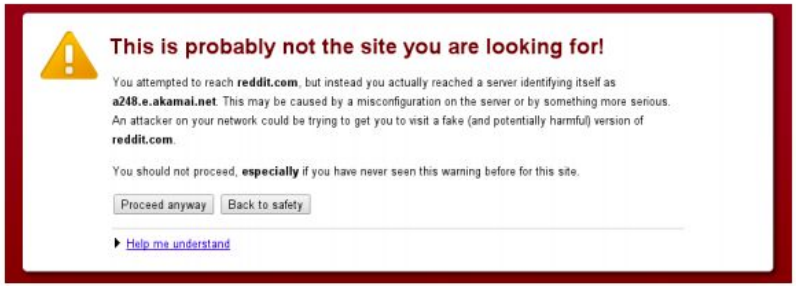
Facilitators - make the action easier (or seem easier)

Signals - reminders of something we can and want to do

Social Proof

Das et al., 2014

SSL warning



Akhawe & Porter Felt, 2013

Design implications

Encourage social interaction - design for sharing

Explore broader trigger design space

Personalize behavioral triggers

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Thank you!

@scyrusk, @dabbish, @jas0nh0ng

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CHIMPS Lab
Computer Human Interaction: Mobility Privacy Security

Key findings

1. Social triggers were most frequent especially among those with low to medium security behavioral intention
2. People were 4x more likely to share socially triggered security and privacy behaviors
3. People frequently shared security and privacy behaviors out of concern for others welfare