

Are You Going to Answer That? Measuring User Responses to Anti- Robocall Application Indicators

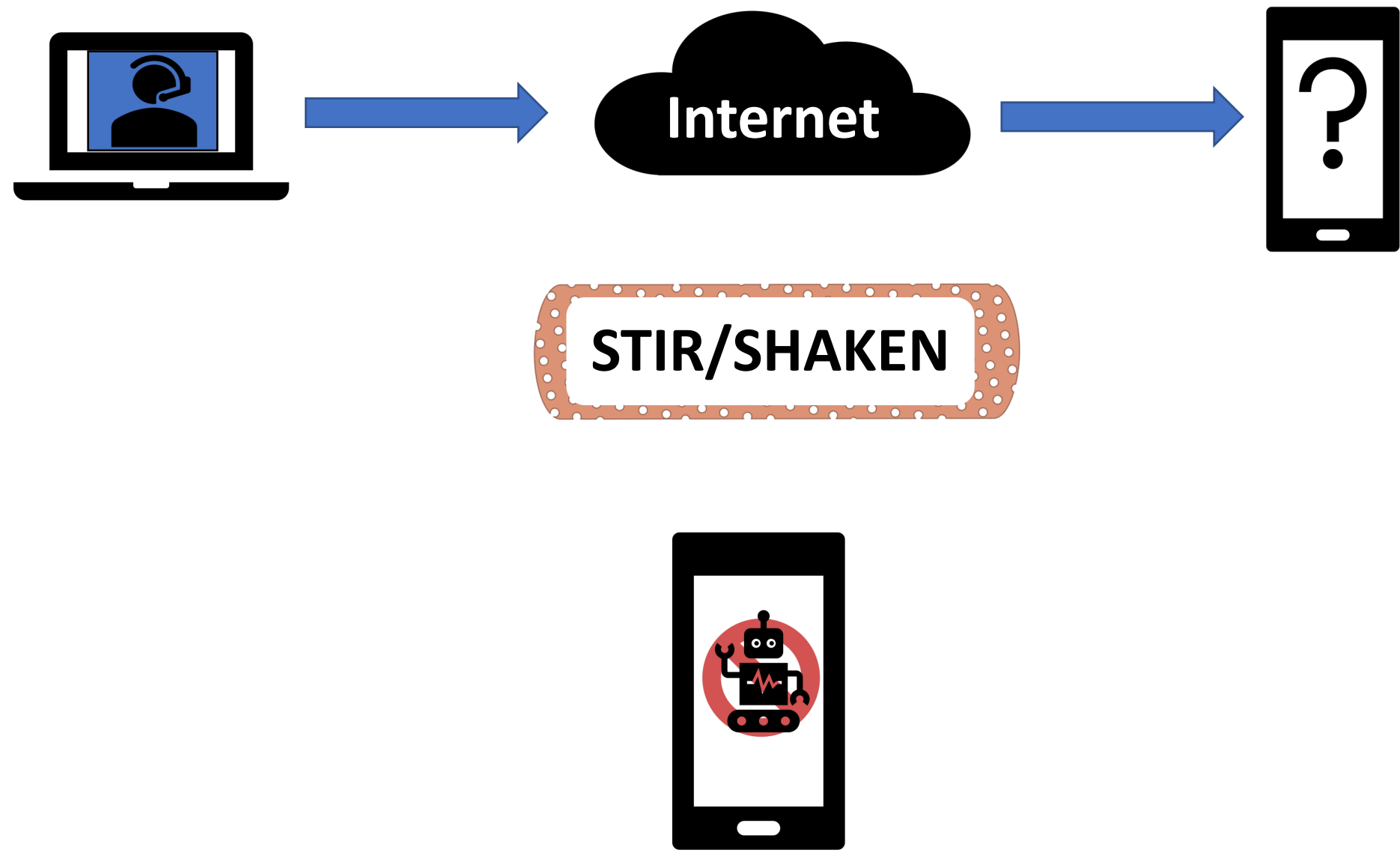
[Imani N. Sherman](#), Jasmine D. Bowers, Keith McNamara Jr., Juan Gilbert, Jaime Ruiz, Patrick Traynor



Robocalls Can Be Annoying and Costly

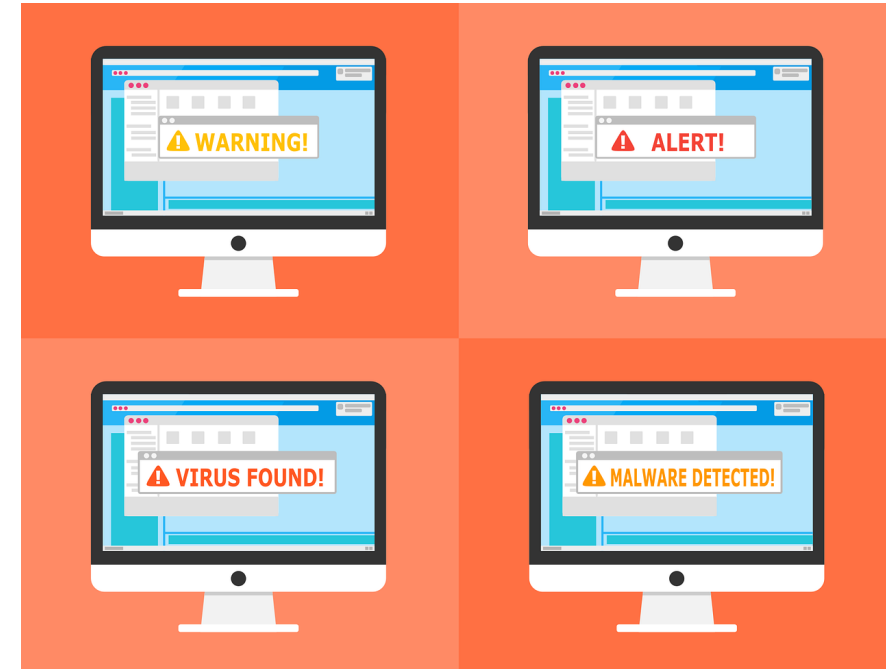
- 4.7 billion robocalls, Jan 2020
- Scams
 - Tech Support
 - Callback
 - Social Security





Why look at warning designs?

- Browsers
- Influence Decision Making
- User Independence



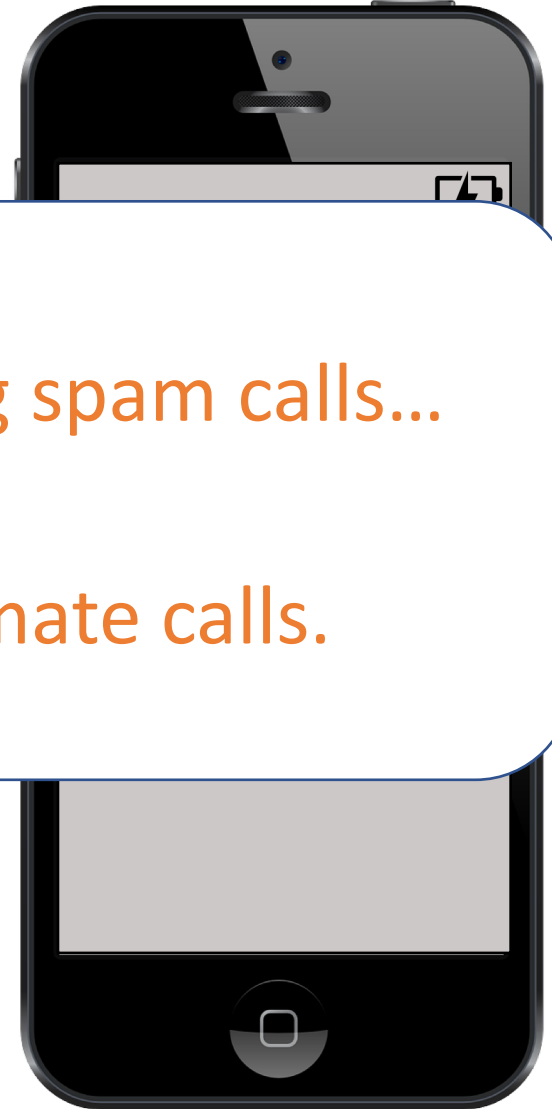
- Identify trends

- D

This work is NOT only about declining spam calls...

- T

...but also about answering legitimate calls.



Survey Anti-Robocall Applications

Purpose: Collect current trends in robocall warning design

User Experience Collection

Purpose: Understand what users desire in robocall warnings

Warning Design User Study

Purpose: Show how users respond to currently used and user driven warning designs in best case scenario

Survey of Anti-Robocall Applications

Purpose - Collect current trends in robocall warning design

- 10 anti-robocall apps
 - Search term: “Spam call Blocker”
 - Free
 - 4-star rating
 - Not affiliated with a telephone carrier



Ten Selected Apps for Review

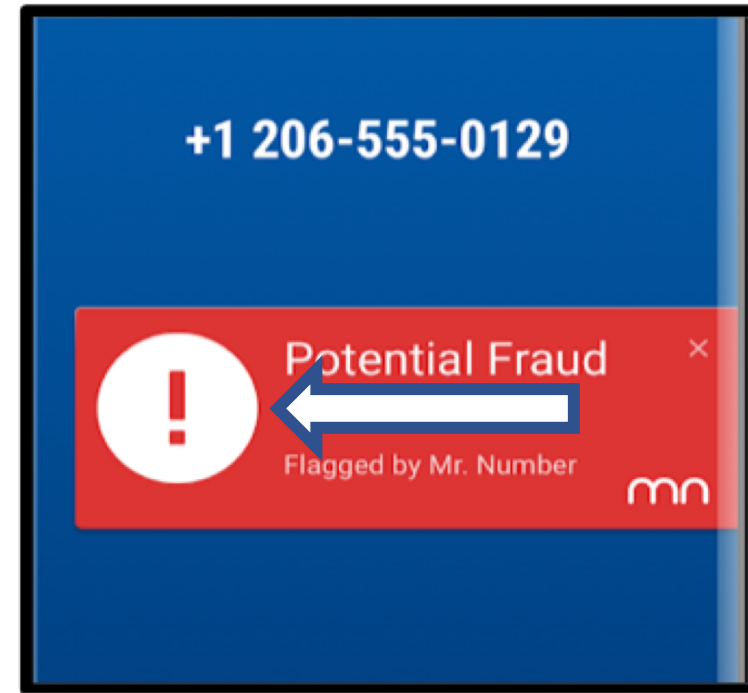


Name:	Call App (A1)	Call Blocker (A2)	Call Control (A3)	Caller ID & Call Blocker (A4)	Clever Dialer (A5)
Stars:	4.6	4.6	4.4	4.6	4.6
Installs:	100M+	10M+	5M+	5M+	1M+

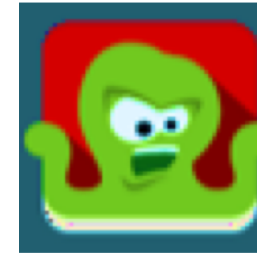


Name:	hiya (A6)	Mr.Number (A7)	Should I Answer? (A8)	Truecaller (A9)	Who's Calling (A10)
Stars:	4.5	4.2	4.7	4.5	4.4
Installs:	100M+	10M+	1M+	100M+	10M+

- Wording
- Layout & Placement
- Pictorial Symbols



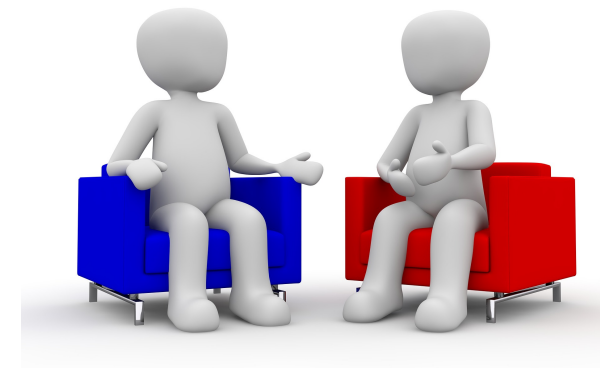
Mr. Number



User Experience Collection

Purpose: Understand what users desire in robocall warnings through focus groups

- Conducted 6, 60-minute focus groups and 3, 60-minute interviews
- 18 participants
- Participants discussed:
 - Robocall detection and response
 - Notification preferences
 - Desired Anti-robocall functionality



Notification Preference

- Background Color
- Icons
- Authenticated Caller ID

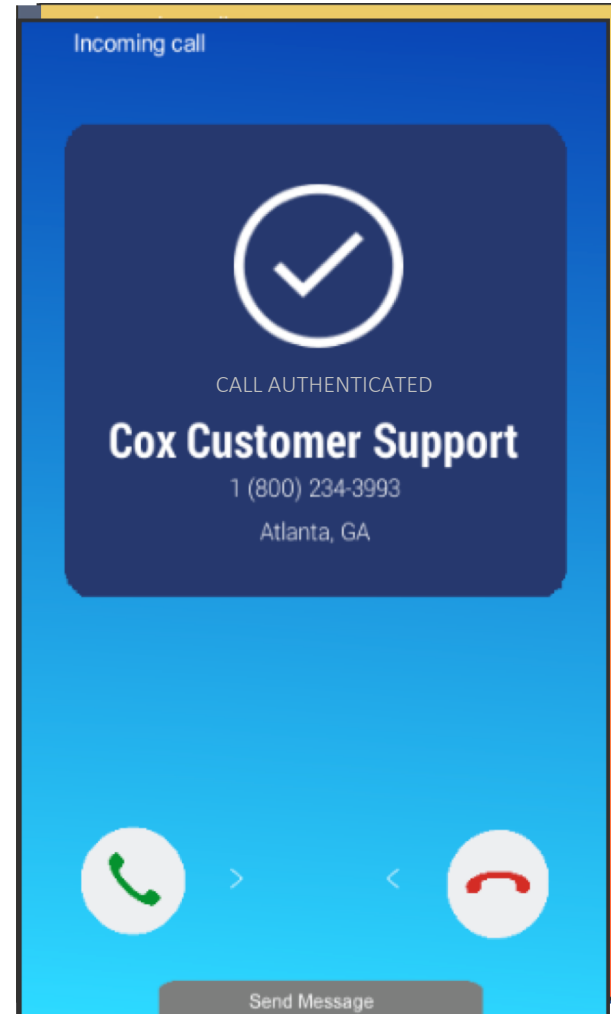


Warning Design User Study

Purpose: Show how users respond to currently used and user driven warning designs in best case scenario

- 34 participants
 - Age 20 to 32
 - None in the focus group
- Survey Contents
 - 5 warning designs
 - 6 phone numbers





Focus-AID

N1, N2: Two known numbers

N3: Unknown number, contact name was random city/state

N4: First 9 digits same as the participant's first 9 digits

N5: Same area code as the participant

N6: Out of state loan company



- Assessed how the following impacted participant Response:
 - Warning Design
 - Phone Number
 - Phone Number + Warning Design
- Response: the average number of times a participant answered a call.

Do robocall warnings affect users' response to incoming calls from unknown numbers?

Yes

% of Answered Calls

	Unknown #
Control	35%
Focus-Spam	5%
Avail-Spam	3%

	Unknown #
Control	35%
Focus-AID	42%
Avail-CID	34%

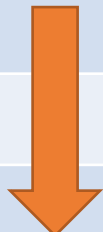
Do robocall warnings affect users' response to incoming calls from known numbers?

Yes

% of Answered Calls

	Known #
Control	100%
Focus-AID	100%
Avail-CID	95%

	Known #
Control	100%
Focus-Spam	65%
Avail-Spam	34%



Will the Available and Focus design have significantly different effects on user response?

Yes, for known numbers.

% of Answered Calls

	Known #	Unknown #
Focus-AID	100%	42%
Avail-CID	95%	34%

Focus-Spam	65%	5%
Avail-Spam	34%	3%

So what did we learn?

- Users were **more likely** to **answer** calls from **unknown** numbers accompanied with **Authenticated Caller ID**.
- Users were **less likely** to **answer** calls from **known** numbers accompanied by a **spam warning**.
- Warning designs work but are not perfect.





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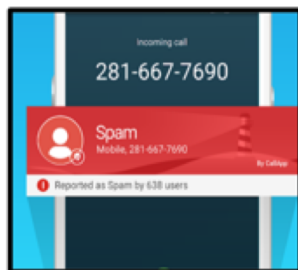
- Caller ID
- Black and Whitelisting
- Chatbots
- Audio Analysis
- Call Back Verification
- Provider based solutions: SHAKEN/STIR
- End-to-end solution: AuthentiCall
- Mobile Applications (Caller ID + Black and Whitelisting)

- 4.7 billion robocalls, Jan 2020
- “Tech Support”
- One-Ring Scam
- 50% of calls declined

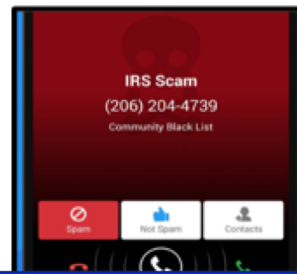


CBS News, WWMT, West Michigan

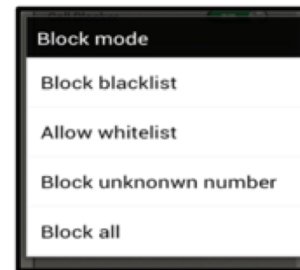
Ten Selected Apps for Review



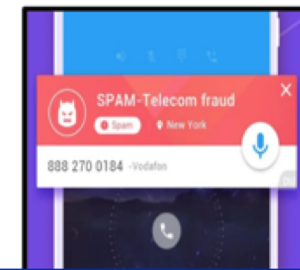
CallApp: Caller ID



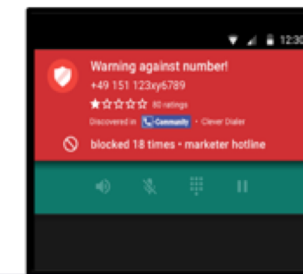
Call Control



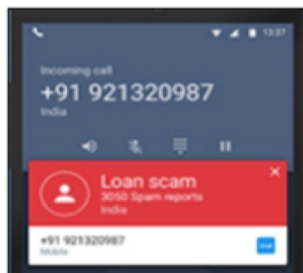
Call Blocker



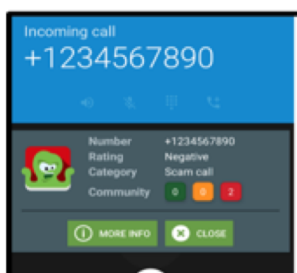
Du Caller



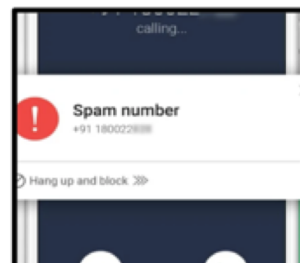
Clever Dialer



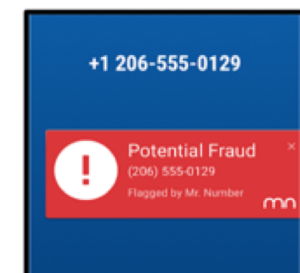
Mr. Number



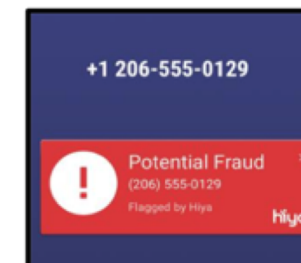
Should I Answer



Hiya

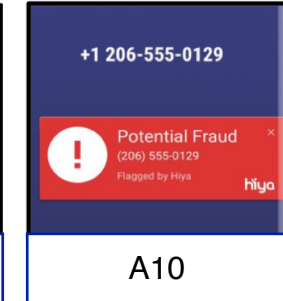
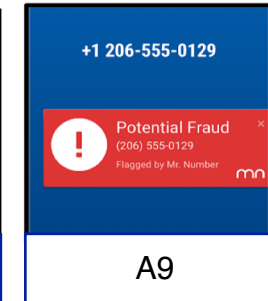
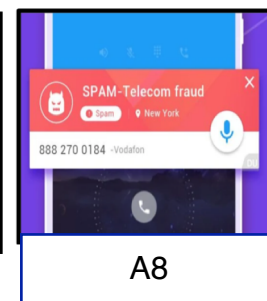
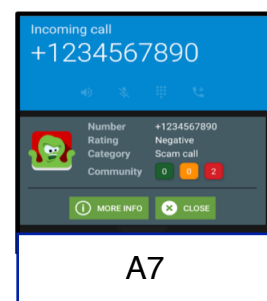
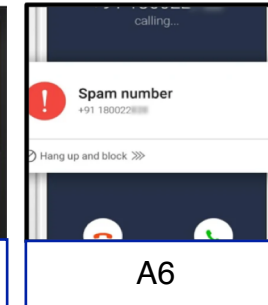
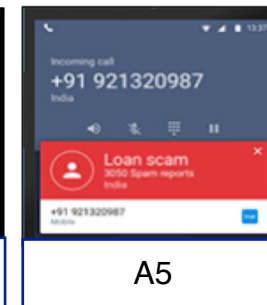
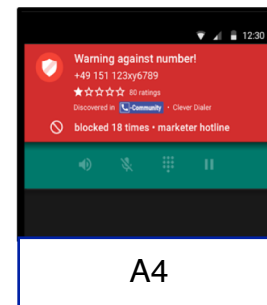
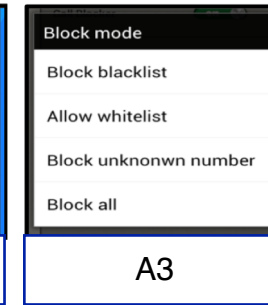
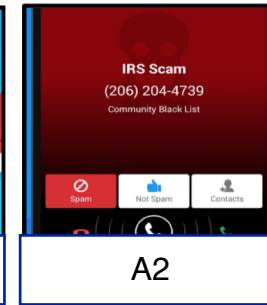
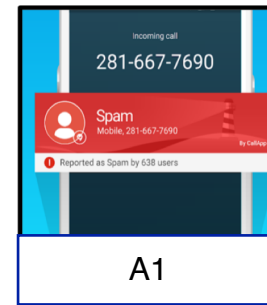


Truecaller



Who's calling

- All apps use blacklist
- A3 uses its community and FCC, FTC and IRS complaint data
- A4 and A9 add customer contacts to whitelist



Wogalter, Michael S., Vincent C. Conzola, and Tonya L. Smith-Jackson. "Research based guidelines for warning design and evaluation." *Applied ergonomics* 33.3 (2002): 219-230.

- Wording
- Layout & Placement
- Pictorial Symbols
- Auditory Warning
- Salience (Noticeability)
- Personal Factors (Demographics)

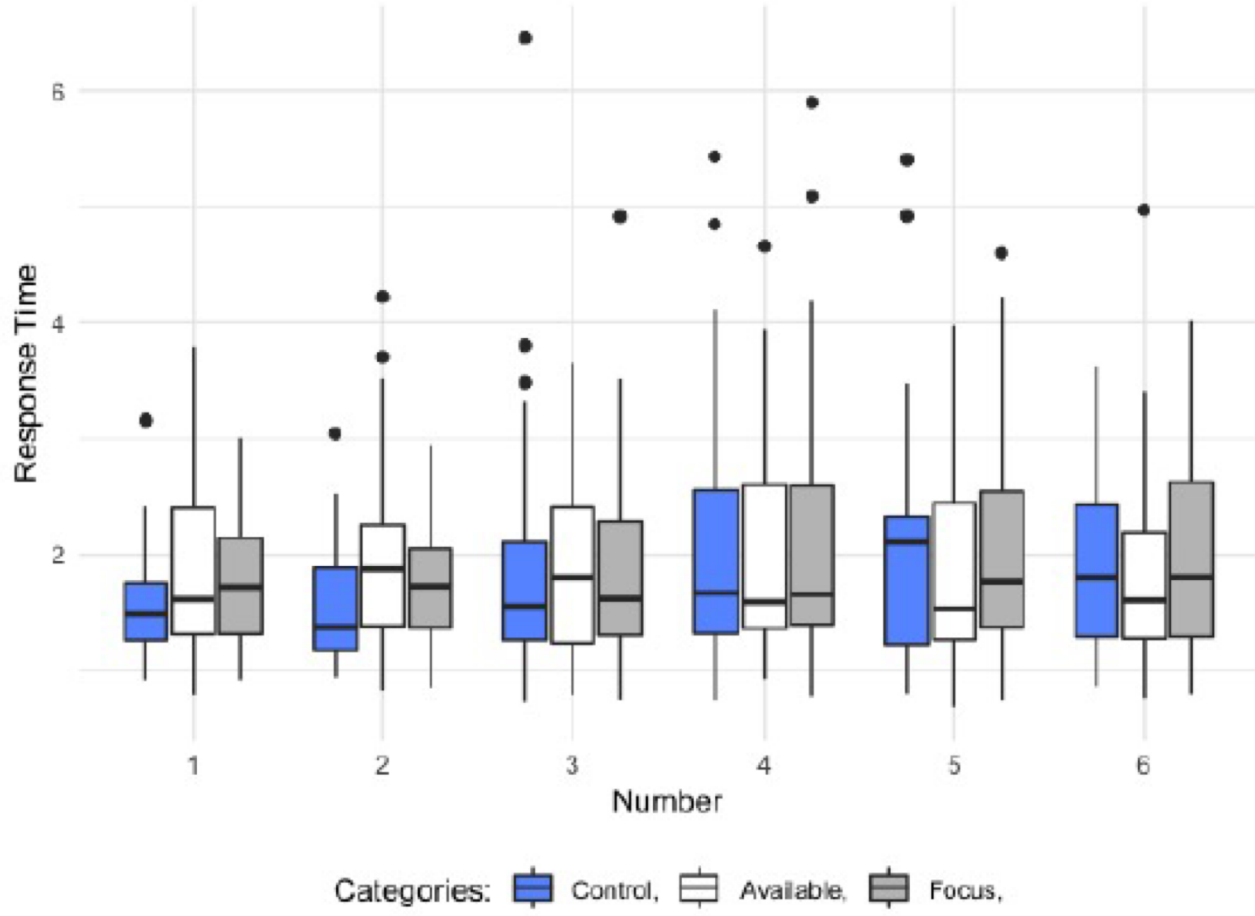
- Background Color
 - Differ from normal call
 - Orange, Yellow
 - Red –mixed feelings
- Icons
 - Lock is confusing
 - Emojis unprofessional
 - X-mark and Check-mark
- Authenticated Caller ID



- 34 participants between the age 20 and 32
- Survey: 5 warnings, 6 phone numbers, 30 combinations shown 6 times to each participant randomly
- RM ANOVA for reaction time
- ANOVA for Response
- No significant difference over rounds for time or response

TABLE III. REPEATED MEASURES ANOVA RESULTS

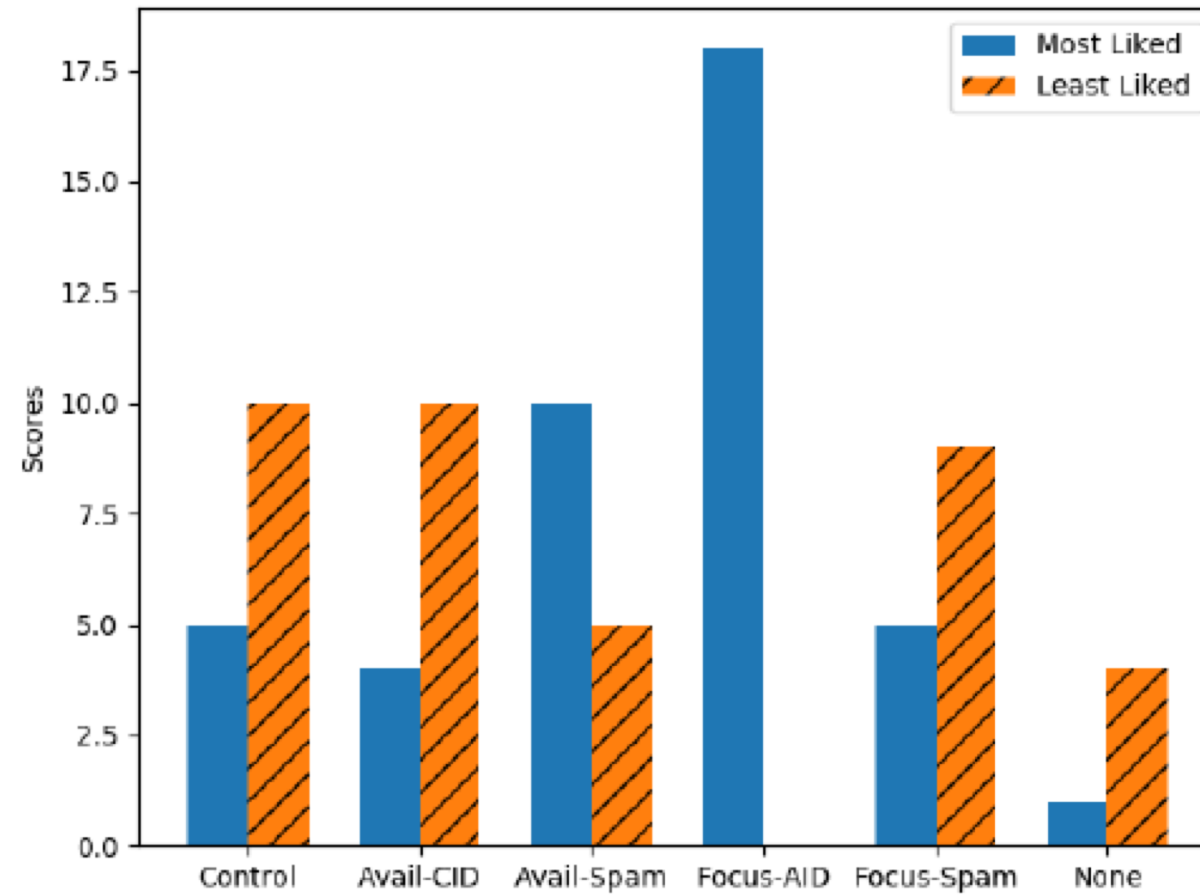
Independent Variable	Df	Response		Reaction Time	
		F-value	<i>p</i>	F-value	<i>p</i>
Warning Design	4,132	62.085	< .001	5.013	< .001
Number	5,165	51.49	< .001	1.055	.192
Warning Design: Number	20,660	22.361	< .001	7.962	< .001
Round	2,66	–	–	177.262	< .001
Warning Design: Round	8,264	–	–	5.202	< .001
Number: Round	10,330	–	–	1.8232	.017
Warning Design: Number: Round	40,1320	–	–	2.887	< .001



F.

	All	Known #	Unknown #
Control	56.40%	100%	35%
Focus-AID	61%	100%	42%
Focus-Spam	25%	65%	5%
Avail-CID	55%	95%	34%
Avail-Spam	13%	34%	3%

		<hr/>					
<i>%</i>		N1	N2	N3	N4	N5	N6
Control		100%	99%	29%	42%	44%	25%
Focus-AID		100%	99%	38%	50%	54%	27%
Focus-Spam		65%	66%	3%	11%	5%	2%
Avail-CID		94%	97%	29%	42%	43%	24%
Avail-Spam		35%	34%	2%	2%	2%	3%
		<hr/>					
<i>p-value</i>		<hr/>					
Focus-AID vs.	Control	ns	ns	ns	ns	ns	ns
	Focus-Spam	.002	.023	< .001	< .001	< .001	ns
	Avail-CID	ns	ns	ns	ns	ns	ns
	Avail-Spam	< .001	< .001	< .001	< .001	< .001	ns
Focus-Spam vs.	Control	< .001	.014	< .001	ns	< .001	ns
	Avail-CID	ns	.034	.ns	.033	< .001	ns
	Avail-Spam	ns	.01	ns	ns	ns	ns
Avail-CID vs.	Control	ns	ns	ns	ns	ns	ns
	Avail-Spam	< .001	< .001	ns	< .001	< .001	ns
Avail-Spam vs.	Control	< .001	< .001	< .001	< .001	< .001	ns



- Participant Number
- Lab Study
- Lack of consequences

1. How do robocall management applications warn users of robocalls now?
2. How do users handle robocalls?
3. What warning would they like to see?
4. How do users react to current warnings compared to the warnings they want to see?