Do Password Managers Nudge Secure (Random) Passwords?

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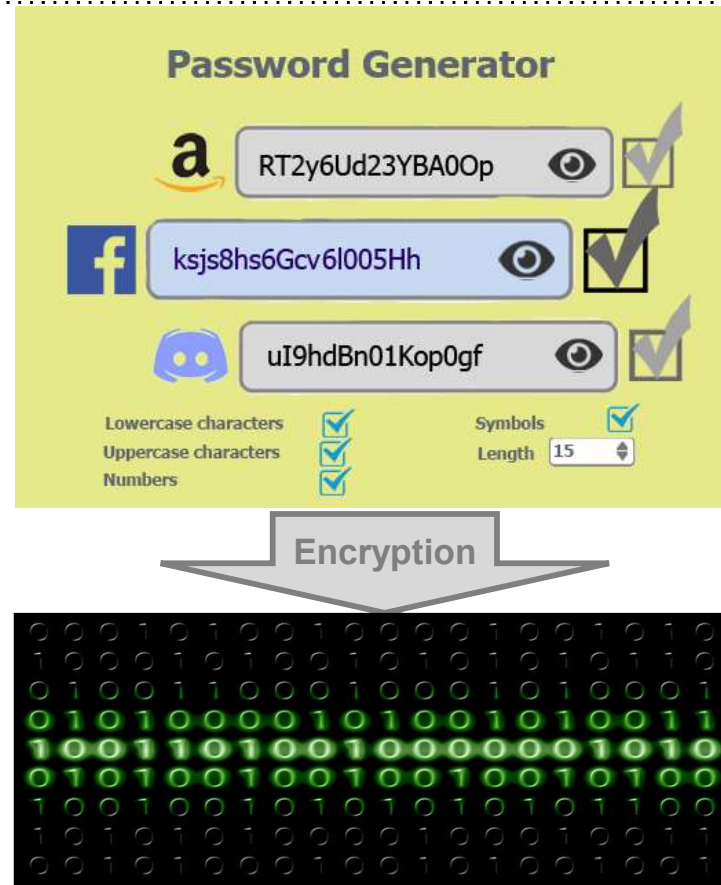Benjamin Mercier

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Motivation

- Avg. person: 26-100 accounts
- Password reuse
- Password manager (PM):
  - Password generator (PG)
  - Password storage
- How to encourage randomly generated password (RGP) adoption?

Nudging

Reusing password

Randomly generated password

Easy to remember password

Influence decisions without limiting people's choices

Browsers' PM Nudges

There is no data on how effective they are

Chrome Nudge

Firefox Nudge

Safari Nudge

How effective are browser-based PMs in nudging RGP adoption?

Chrome   VS.   Firefox   VS.   Safari

What factors contribute to the adoption rate for RGPs?

Noticing the nudge

Previous use of PM

Previous use of PG

Website's password policy

What are the rationales of users to (not) adopt a RGPs?

Feedback?

Trust

Convenience

Security

Avoid reusing password

Lack of knowledge

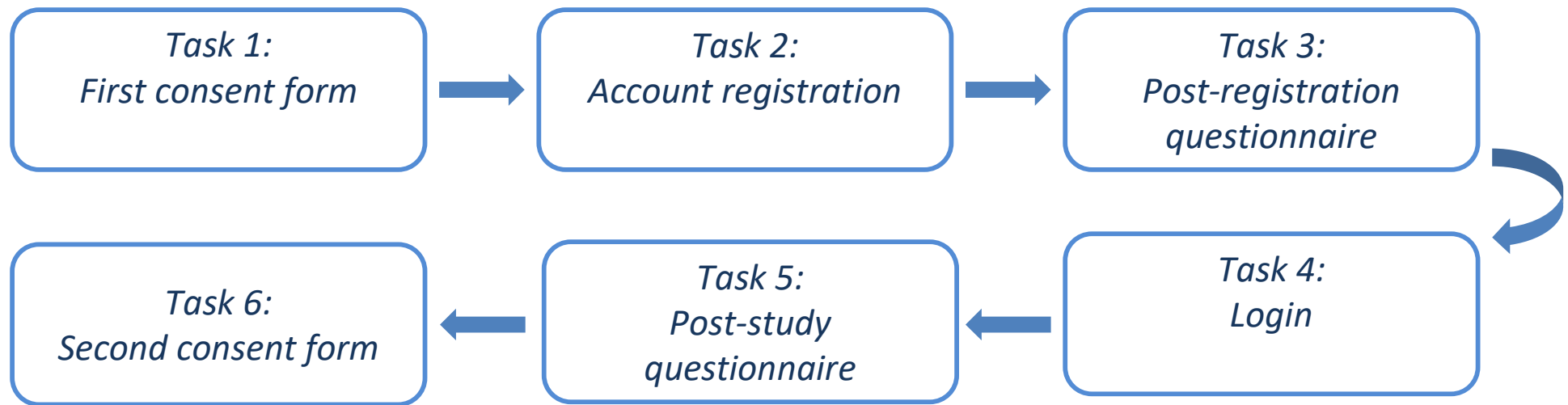# User Study (n=558)

Participants recruited through Amazon's Mechanical Turk

Three groups: (1) Chrome, (2) Firefox, (3) Safari

Users signed up for one of the groups

Password policies: 1C8, 3C12

Study Structure

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┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│ Task 1:             │ ───▶ │ Task 2:             │ ───▶ │ Task 3:             │
│ First consent form  │      │ Account registration│      │ Post-registration   │
│                     │      │                     │      │ questionnaire       │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
                                                                      │
                                                                      ▼
┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│ Task 6:             │ ◀─── │ Task 5:             │ ◀─── │ Task 4:             │
│ Second consent form │      │ Post-study          │      │ Login               │
│                     │      │ questionnaire       │      │                     │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
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RGP Adoption Rate

$(\chi 2 = 32.972, p < 0.001)$
Moderate effect size

RGPs (1C8 + 3C12)

| | 35.2% | 41% | 61.5% |

Noticing the Nudge

| Noticed the nudge | 70.2% | 71.8% | 88.8% |
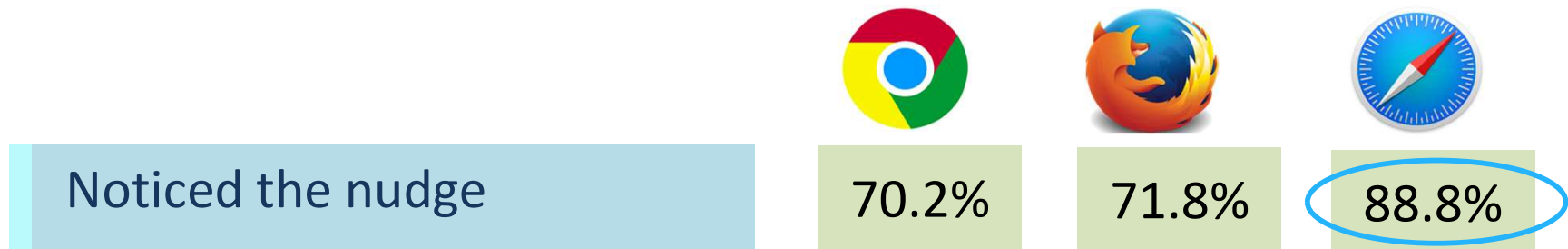
"Did you notice the recommendation to use a random password while registering on our website?"

Noticing the Nudge – RGP Adoption

Noticed the nudge?	Used RGP	Didn't use RGP
Yes	51.6%	48.4%
No	19.7%	80.3%

(χ2 = 39.265, p < 0.001)
Moderate effect size

Noticing the Nudge – Save Password

Noticed the nudge?	Saved password	Didn't save password
Yes	64.5%	35.5%
No	35.2%	64.8%

$(\chi 2 = 33.321, p < 0.001)$
Moderate effect size

Past Experience Influence - PG

Used PG before?	Used RGP	Didn't use RGP
Yes	58%	42%
No	29.6%	70.4%

($\chi 2$ = 43.842, p < 0.001)
Moderate effect size

Past Experience Influence - PM

Used PM before?	Used RGP	Didn't use RGP
Yes	48.1%	51.9%
No	37.6%	62.4%

$(\chi 2 = 5.154, p = 0.023)$

No!
I haven't
used a PM before

Uses this browser regularly

$(\chi2 = 0.81, p = 0.366)$

	Used RGP	Didn't use RGP
Daily	43.5%	56.5%
Weekly	44%	56%
Monthly	40.7%	59.3%
A few time per year	51%	49%
Never used	55%	45%

Password Policy

Password policies	Used RGP	Didn't use RGP
1C8 ********	40.6%	59.4%
3C12 **************	48.9%	51.1%

(χ2 = 3.921, *p* =0.047)

Qualitative Analysis

"Can you describe the reason why you used/did not use the random password generator?"

- Emergent coding approach

- Cohen's Kappa test: K=0.98; near-perfect agreement

Users' Rationale

Self-Chosen Password

Memorability issue	23.66%
User's preference	11.47%
Didn't notice the nudge	4.30%

Randomly Generated Password

Convenience	19.89%
Security	12.19%
Remember password	5.56%

Concluding Remarks

Valuable data on the efficacy of RGP nudges in 3 browsers

Supports that some factors might contribute to the adoption of RGPs

Findings useful for future PM nudge designs and interventions to encourage PM use

Future Work

Which design elements are most impactful in Safari's nudge?

How to improve password manager nudges further?

- Other nudging techniques?
- Personalizing nudges?

Questions?

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