

an FTC Workshop

September 15, 2016

The future of disclosures?

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improving disclosure through **contextual** **integrity**

Serge Egelman, UC Berkeley / ICSI

Research funded by the National Science Foundation under grant CNS-1318680, and the Department of Homeland Security (contract FA8750-16-C-0140 administered by the Air Force Research Laboratory). No purchase necessary, void where prohibited, terms and conditions may apply.

how often are resources accessed *in practice*?

dynamic analysis

- modified Android OS and gave phones to 36 people
- hooked all API methods invoking permission checks
- logged contextual data surrounding permission requests

runtime requests?

213 requests per hour!

- location (10,960/day)
- reading SMS data (611/day)
- sending SMS (8/day)
- reading browser history (19/day)

asking each time is infeasible

...but 80% wanted to block at least one request
(on average, they wanted to block 35% of all requests)

what matters

expectations predicted blocking
($r=-0.39$, $p<0.018$)

...as did app visibility
($r=0.42$, $p<0.001$)

contextual **integrity**

privacy is **contextual**

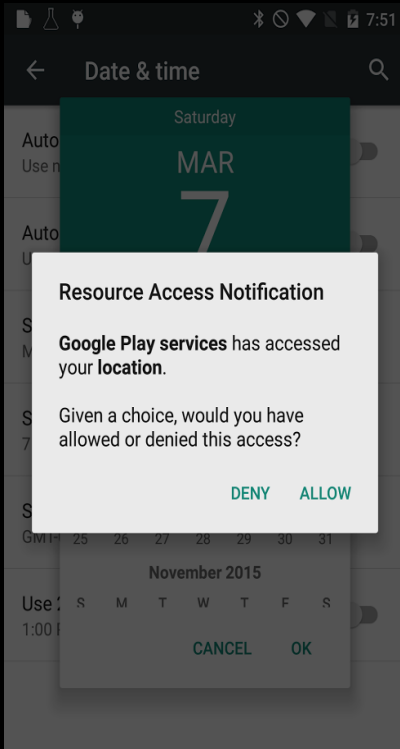
expectations drive privacy decisions

=> only prompt when access to data is likely to be ***unexpected***

or **better**...

- automatically **allow** access when a user is likely to expect it,
- automatically **deny** access when a user is likely to not expect it,
- **prompt** when system cannot infer user expectations (**and learn** from it)

can we predict privacy decisions?



field study to collect **behavioral data**

probabilistic prompts to measure
user expectations

the results

133 Android smartphone users

176 million events recorded

4,224 prompt responses

features

permission information

- permission
- visibility
- time of day

user behavior

- browsing habits
- audio preferences
- screen locking habits

past decisions

- under different visibility levels
- under different foreground applications

challenging the status quo

	Error Rate	Average Prompts/User
Ask-on-first-use	19.47%	12.34
ML Model (behavior-only)	18.82%	0.00*
ML Model	4.27%	25.60
ML Model (low-prompt)	12.67%	12.46

open questions

what is an **acceptable accuracy level**?

what are the **legal issues**?

how can this be applied in **other domains**?

Tamar Krishnamurti

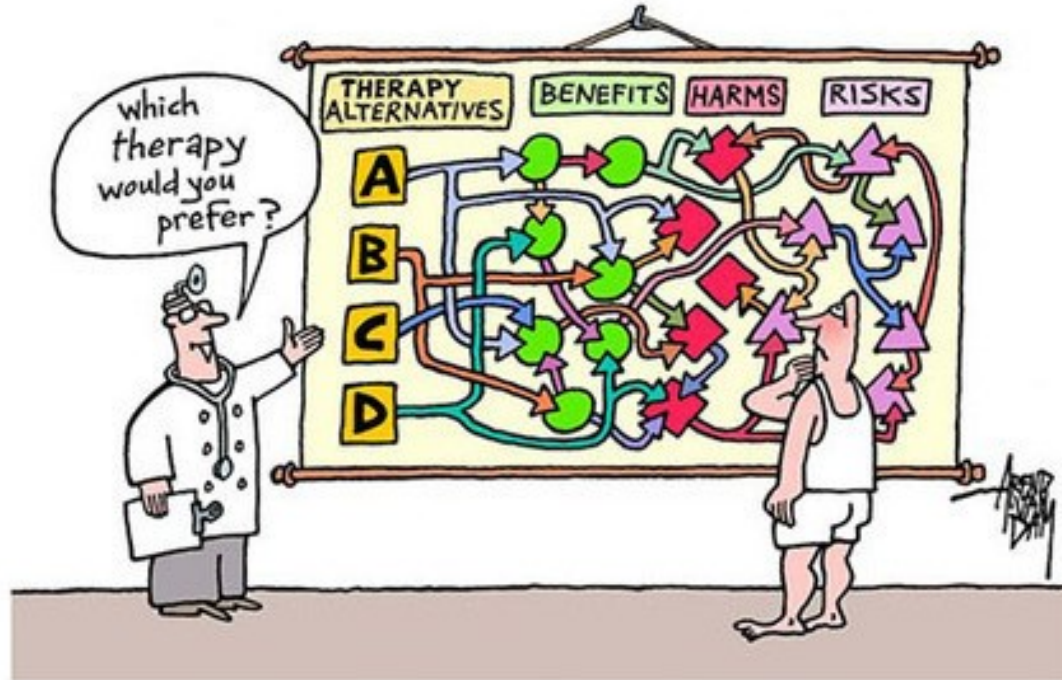
Dept. of Engineering & Public Policy
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A Patient-Centered Approach to Informed Consent

Tamar Krishnamurti, PhD ♦ Assistant Research Professor
Carnegie Mellon University

The research presented was funded by ICON plc and the Swedish Foundation for Humanities and Social Sciences (Riksbankens Jubileumsfond) Program on Science and Proven Experience.

What is “informed” consent?



informed consent

Krishnamurti, T. & Argo, N. A Patient-Centered Approach to Informed Consent: Results from a Survey and Randomized Trial. *Medical Decision Making* 2016 Aug;36(6):726-40.

Existing standards

- ICH Good Clinical Practice (GCP)
- Dept. of Health and Human Services federal regulations, e.g.
 - The purpose of the trial
 - The trial treatment(s) →
 - Random assignment
 - The reasonably expected benefits
 - Participation is voluntary etc. etc.



New technologies, new options



Research Questions

1. What consent information do patients care about ?
2. Can we generate a patient-centered consent form that meets normative guidelines?
3. Can these be delivered in different media?
4. Are patient-centered consent forms **at least as good** as traditional consent forms?

Mturk sample

- 118 Asthma patients
- Age range 21-61 years ; 44% female
- Randomly assigned to 4.5 page excerpt from 17 page clinical trial informed consent document
- Embedded attention checks:
 - 82% successfully completed at least one of the two

Consent Priority Selection

INTRODUCTION

The purpose of an informed consent is to give you information about the research study and to help you decide if you want to participate in this study. This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study. You should take part in this study only if you want to do so. Please read this Information and Consent Form and ask as many questions as needed. You should not sign this form if you have any questions that have not been answered to your liking. Only sign this form if you decide that you want to be part of this study.

This Information and Consent Form may contain words you do not understand. Please ask the study doctor or the study staff to explain any words or procedures that you do not clearly understand. You may take home an unsigned copy of this consent form to think about the study or discuss it with family, friends, or anyone you choose before making your decision.

Participating in a research study is not the same as receiving regular medical care. The purpose of regular medical care is to improve your health. This sentence is not part of the consent form, but we need to know that you are paying attention; please click on it and select, "Information that would NOT affect my decision" on the following page. The purpose of a research study is to gather information about a drug. Being in this study does not replace your regular medical care.

The study doctor will be paid by the Sponsor, ABC, Inc., to conduct this research study.



Consent Priority Rating

	Information that would NOT affect my decision	Information that would SOMEWHAT affect my decision	Information that would GREATLY affect my decision
<p>» The purpose of an informed consent is to give you information about the research study and to help you decide if you want to participate in this study.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>» This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Automatic consent form generator

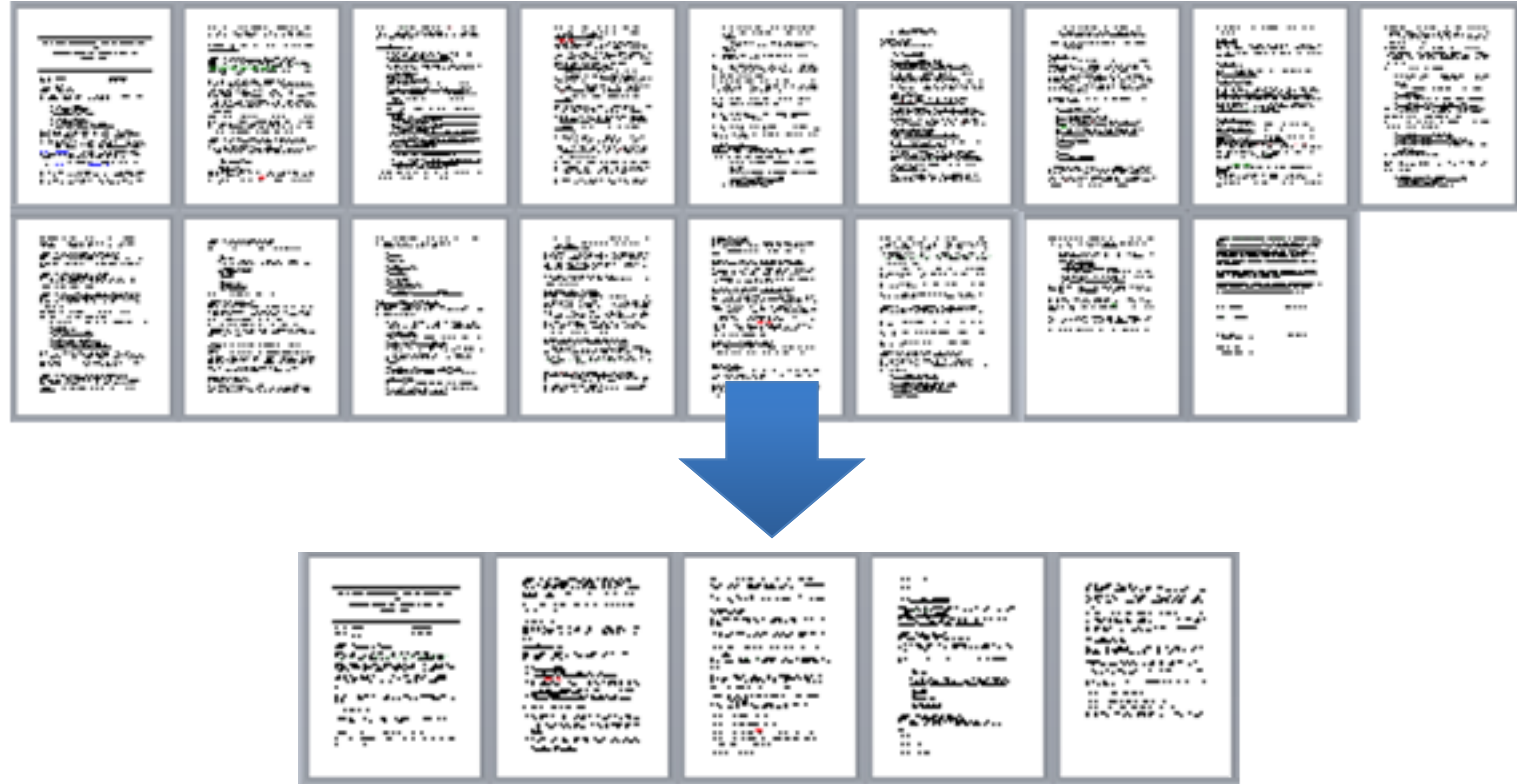
% of people selecting a
specific sentence

Sentences	% Sec 1	Concept	Mean Score	Adjust F2 to filter by % selected	Adjust G2 and H2 to filter by % selected AND Concept
The purpose of an informed consent is to give you information about the research study and to help you decide if you want to participate in this study.	38.2	CON	1.52	30 The purpose of an informed consent is to give you information about the research study and to help you decide if you want to participate in this study.	35 CON The purpose of an informed consent is to give you information about the research study and to help you decide if you want to participate in this study.
This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study.	47.4	CON	1.83	This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study.	
You should take part in this study only if you want to do so.	26.3	CON	2.10		
Please read this Information and Consent Form and ask as many questions as needed.	26.3	INFO	1.75		
You should not sign this form if you have any questions that have not been answered to your liking.	47.4	CON	2.14	You should not sign this form if you have any questions that have not been answered to your liking.	You should not sign this form if you have any questions that have not been answered to your liking.
Only sign this form if you decide that you want to be part of this study.	38.2	CON	2.07	Only sign this form if you decide that you want to be part of this study.	Only sign this form if you decide that you want to be part of this study.
» This Information and Consent Form may contain words you do not understand.	13.2	INFO	2.20		
» Please ask the study doctor or the study staff to explain any words or procedures that you do not clearly understand.	51.3	INFO	1.69	» Please ask the study doctor or the study staff to explain any words or procedures that you do not clearly understand.	
» You may take home an unsigned copy of this consent form to think about the study or discuss it with family, friends, or anyone you choose before making your decision.	43.4	INFO	2.15	» You may take home an unsigned copy of this consent form to think about the study or discuss it with family, friends, or anyone you choose before making your decision.	
» Participating in a research study is not the same as receiving regular medical care.	53.9	GENMED	2.15	» Participating in a research study is not the same as receiving regular medical care.	
» The purpose of regular medical care is to improve your health.	18.4	GENMED	1.79		

% of people
selecting specific
concepts

Conceptual category of
specific sentence

Resulting patient-designed form



Did it meet normative criteria?

- The trial t m assignment
 - The trial p ved
 - The reaso
 - The reaso its
 - Participation is voluntary etc., etc.,
- 

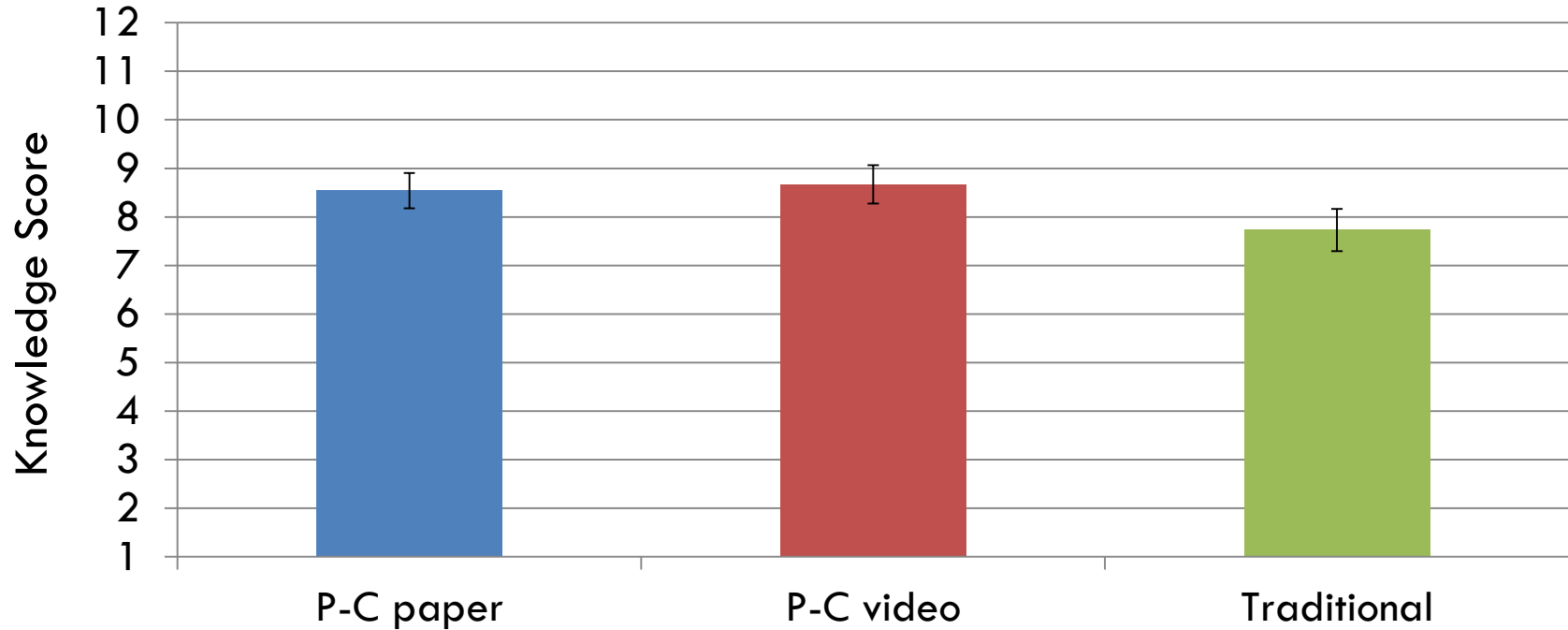
New technologies, new options



Lab-based Evaluation

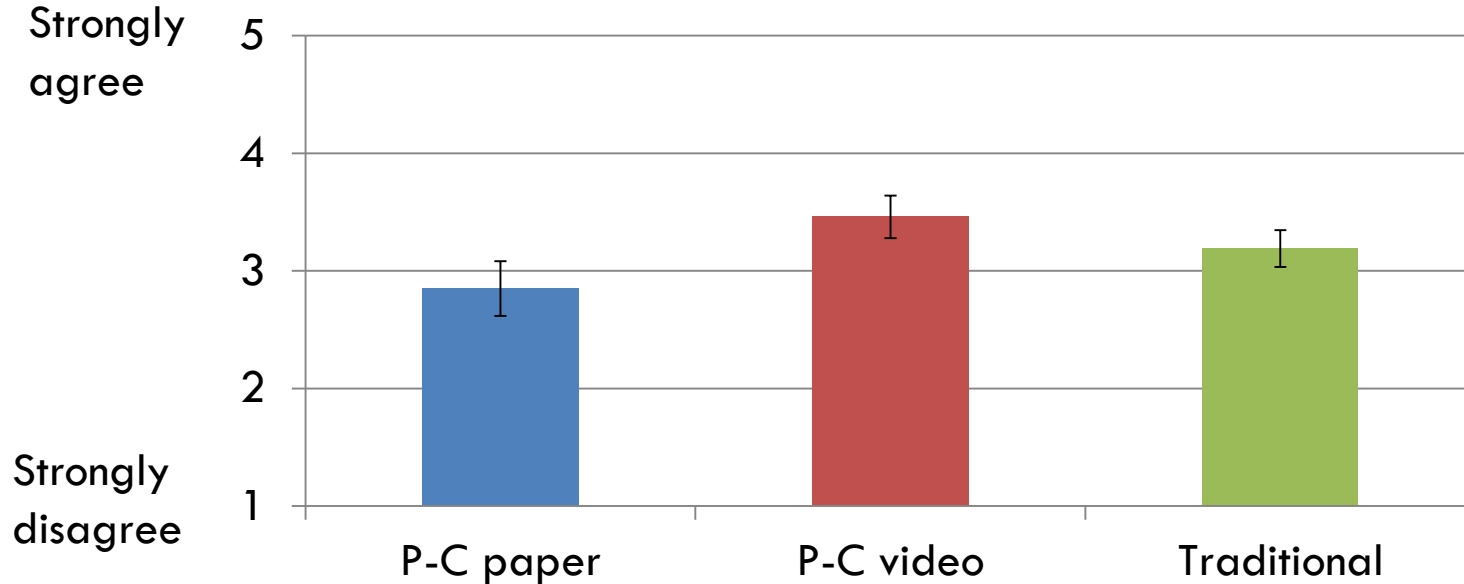
- 76 Asthma patients
- Age range 20-63 ; 54.3% female
- Randomly assigned to patient-centered (written or video) or traditional consents

No lost knowledge with patient-centered(P-C) formats



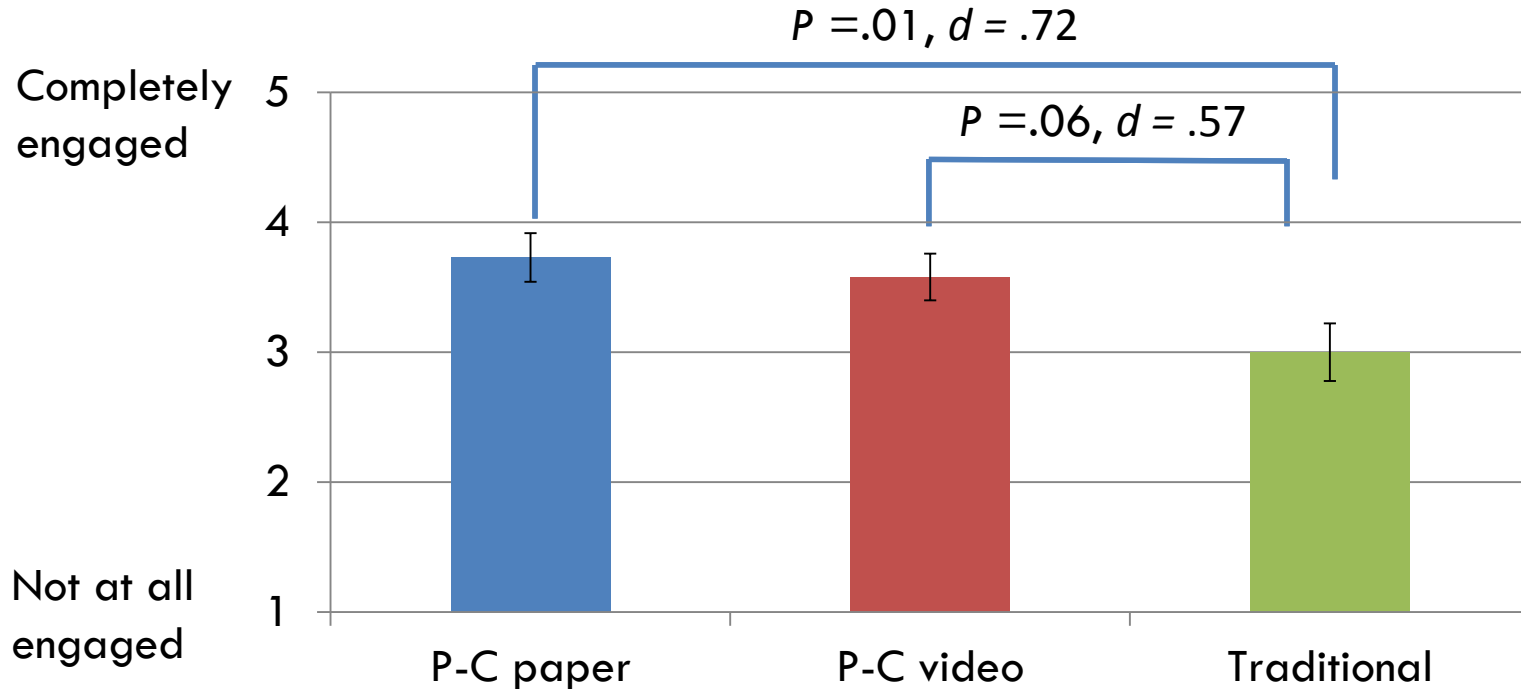
Note: bars show standard errors

No difference in perceived *risks or benefits*



How much do you agree with the following statement:
The benefits of this clinical trial outweigh the risks

Patient-derived formats are *more engaging*



How engaged were you in reading the consent form?

Take-aways and next steps

- **Greater engagement** in patient-centered consent with large effect sizes
- No differences found in critical decision factors
- Open questions include:
 - Mturk reliability
 - How does affect, type of risk, chronicity of disease etc. play a role

Thank you

Contact information

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Florian Schaub

School of Information
University of Michigan

Contextualizing and Personalizing Privacy Notices and Controls

Florian Schaub



Putting Disclosures to the Test
Federal Trade Commission



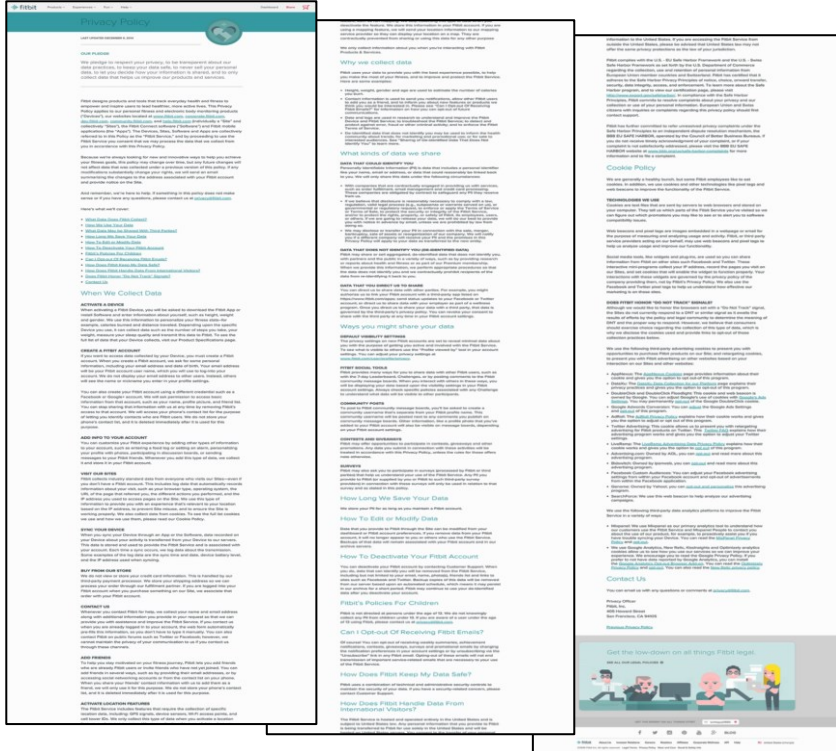
Sept. 15, 2016

privacy policies are too complex



simplifying disclosures based on expectations

simplifying disclosures based on expectations



privacy policy
[www.fitbit.com/
legal/privacy-policy](http://www.fitbit.com/legal/privacy-policy)
3,500 words

layered notice
www.fitbit.com/privacy
1,300 words



simplifying disclosures based on expectations

our compact disclosure format

With an account, Fitbit will collect:

- * Your **location**, when location features, such as maps, are active
- * Your **name, height, and weight**
- * Your **steps, distance and stairs climbed**
- * When and how long you **exercise**
- * When and how long you **sleep**
- * Your **heartrate** throughout the day
- * Exercise **compared with Friends**
- * **Information posted** to your profile

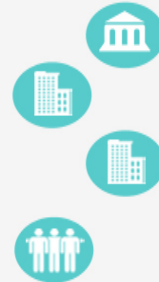


You can track your heartrate, distance and step count with your Fitbit, without needing an account.

Find further collection practices at [Fitbit.com/privacy](https://www.fitbit.com/privacy)

With whom do we share data?

- * **Government Entities**
- * **Companies** providing services to Fitbit
- * **Organizations** you specifically direct Fitbit to share data with (e.g. Facebook)
- * **Fitbit friends** you've listed (opt-out of sharing with friends in your profile settings)



Fitbit may share or sell aggregated information that does not identify you.

It is sometimes possible to identify an individual from de-identified data.

Find further sharing practices at [Fitbit.com/privacy](https://www.fitbit.com/privacy)

How long do we keep your data?

- * Personal Information, such as your address, is removed **when you delete your fitbit account.**
- * Sensor Information that cannot identify you, such as fitness data, is **kept indefinitely**



Until you delete your Fitbit account, anything you've ever posted will be kept by Fitbit, regardless of deleting your profile.

Full Fitbit Privacy Policy:
www.fitbit.com/privacy

simplifying disclosures based on expectations

determine privacy expectations / awareness of data practices

- online survey with amazon mechanical turk ($n=70$)
- participants asked to look at a specific fitness wearable
- **rate likelihood** of certain data collection and sharing practices
- actual practices mixed in with fictitious practices



simplifying disclosures based on expectations

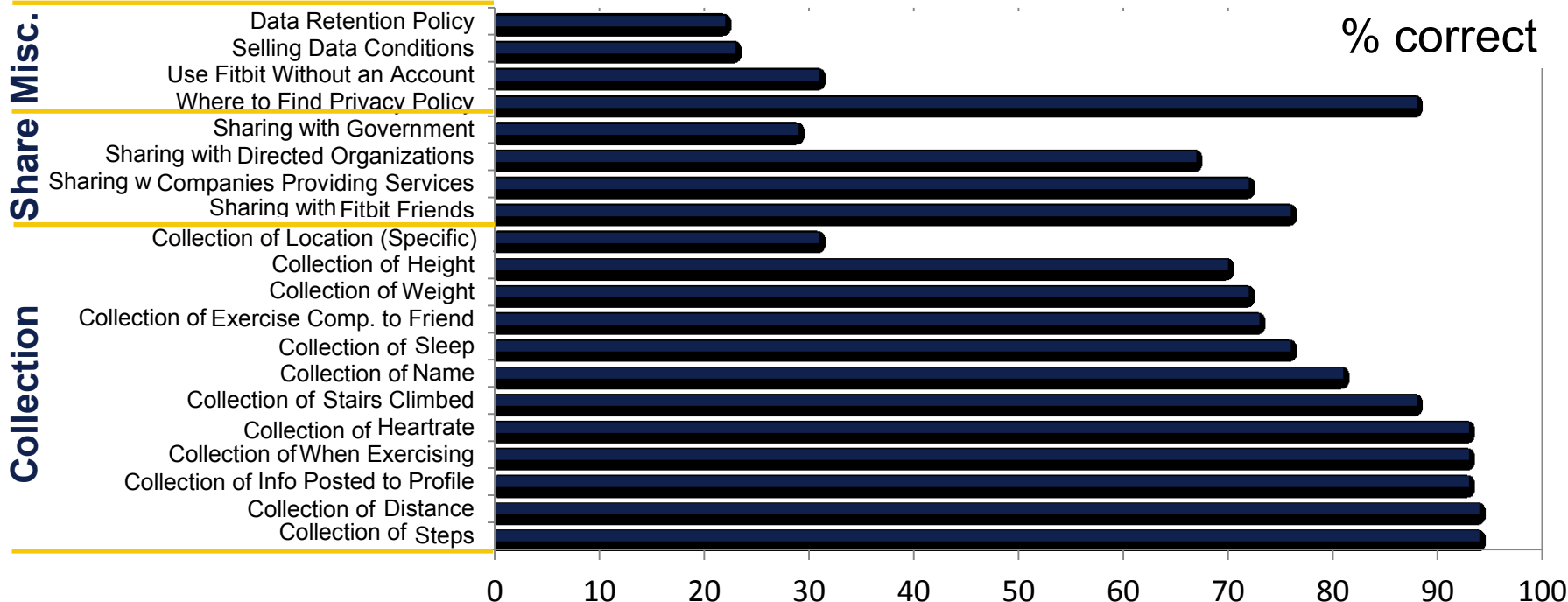
determine privacy expectations / awareness of data practices

12. Imagine you are using a Fitbit Surge, which of the following types of information do you think Fitbit would collect about you? *

	Definitely Collects	Probably Collects	Might Collect	Might not Collect	Probably Does not Collect	Definitely Does not Collect	I'm Unsure
false Your perspiration rate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
false Your mood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
false Your altitude	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
false Your shoe size	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
true How many steps you've taken	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
true How far you've walked	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
true Information you've posted to your Fitbit profile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
true Your name	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
false A list of your Facebook friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

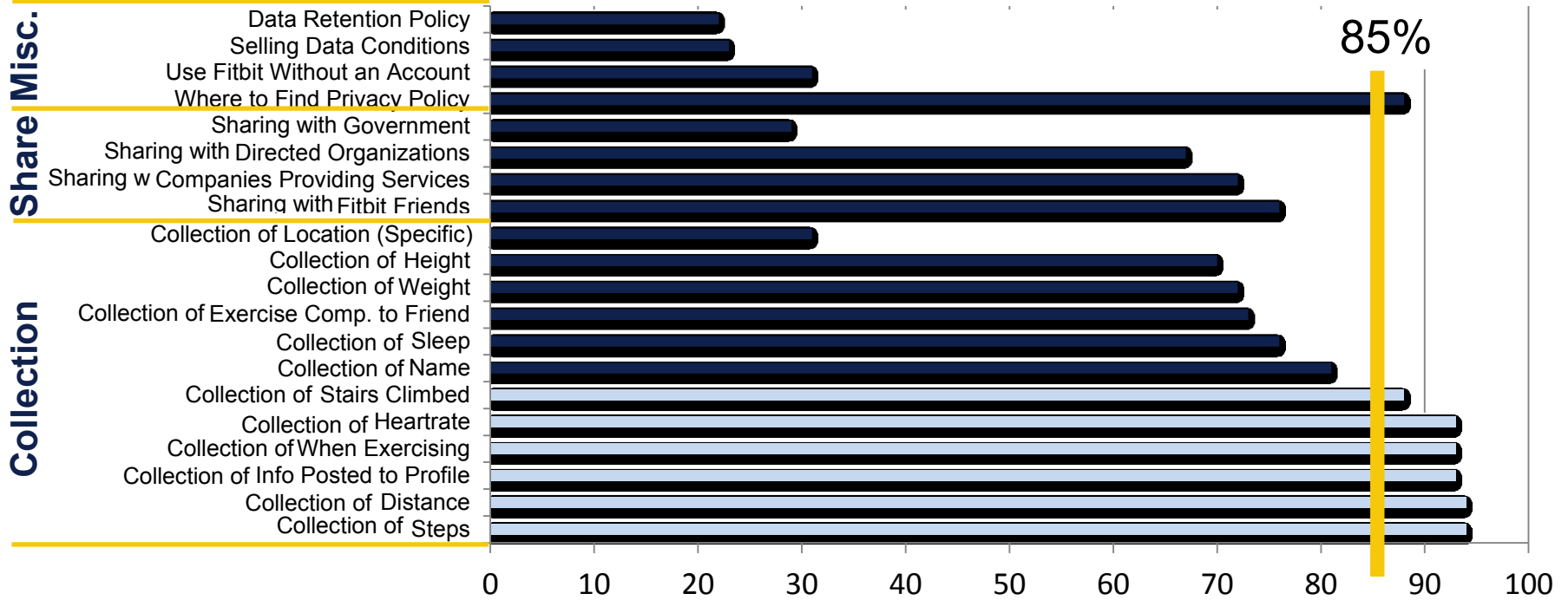
simplifying disclosures based on expectations

baseline expectations / awareness



simplifying disclosures based on expectations

baseline expectations / awareness



J. Gluck, F. Schaub, A. Friedman, H. Habib, N. Sadeh, L.F. Cranor, Y. Agarwal. How Short is Too Short? Implications of Length and Framing on the Effectiveness of Privacy Notices. Symposium on Usable Privacy and Security 2016.

simplifying disclosures based on expectations exclude most expected practices (85%)

With an account, Fitbit will collect:

- * Your location, when location features, such as maps, are active
- * Your name, height, and weight
- * Your steps, distance and stairs climbed
- * When and how long you exercise
- * When and how long you sleep
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Full Fitbit Privacy Policy: www.fitbit.com/privacy



full

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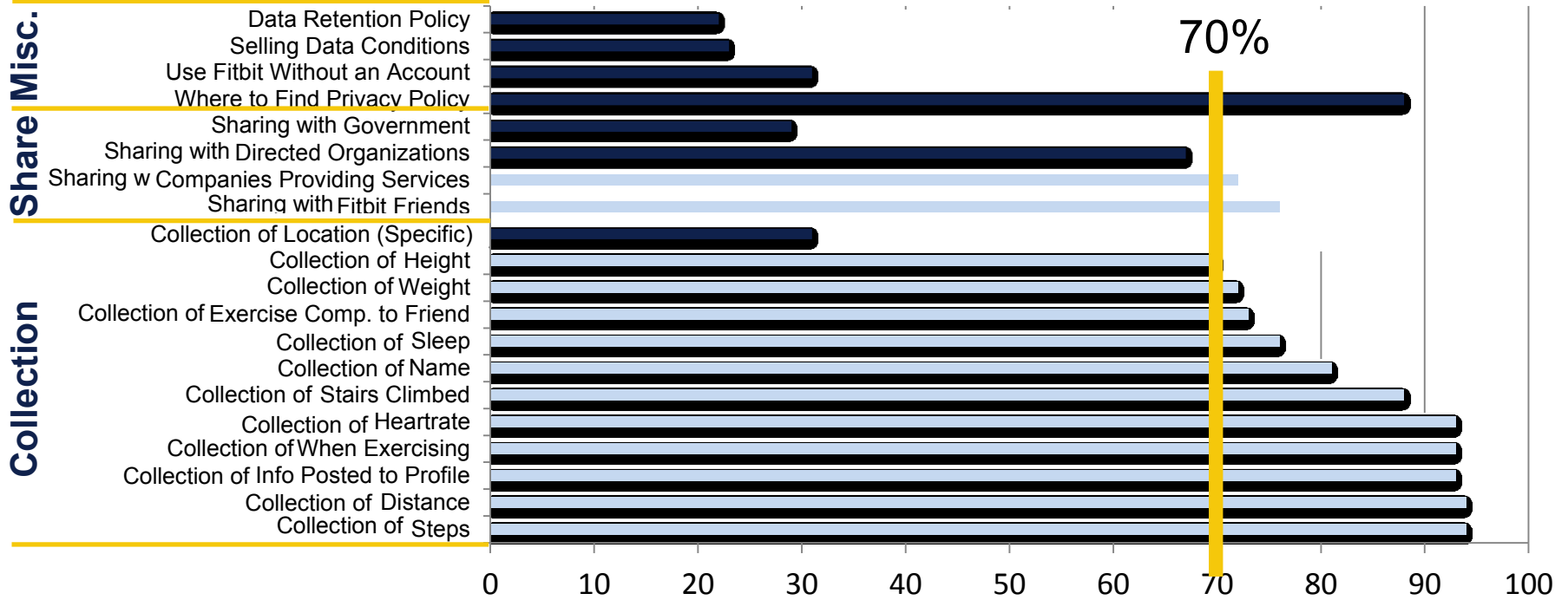
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medium (85%)

simplifying disclosures based on expectations

baseline expectations / awareness



simplifying disclosures based on expectations

compact disclosures

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short (70%)

simplifying disclosures based on expectations

compact disclosures

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short (70%)

simplifying disclosures based on expectations

testing the compact disclosures

- online survey with amazon mechanical turk ($n=400$)
- similar design as baseline survey
- but after looking at specific fitness wearable, participants **see one of the compact disclosures**
- plus **control condition** without disclosure (same as baseline)

simplifying disclosures based on expectations

testing the compact disclosures

findings

- participants who saw disclosure had significantly higher awareness of practices (% correct)

simplifying disclosures based on expectations

testing the compact disclosures

findings

- participants who saw disclosure had significantly higher awareness of practices (% correct)
- **similar awareness with medium and full disclosures** (no sign. diff.), but **significant drop in awareness with short disclosure**

simplifying disclosures based on expectations

testing the compact disclosures

findings

- participants who saw disclosure had significantly higher awareness of practices (% correct)
- **similar awareness with medium and full disclosures** (no sign. diff.), but **significant drop in awareness with short disclosure**
- no difference in time spent on disclosure – regardless of length

simplifying privacy notices and controls

1. emphasize likely **unexpected or surprising information**

simplifying privacy notices and controls

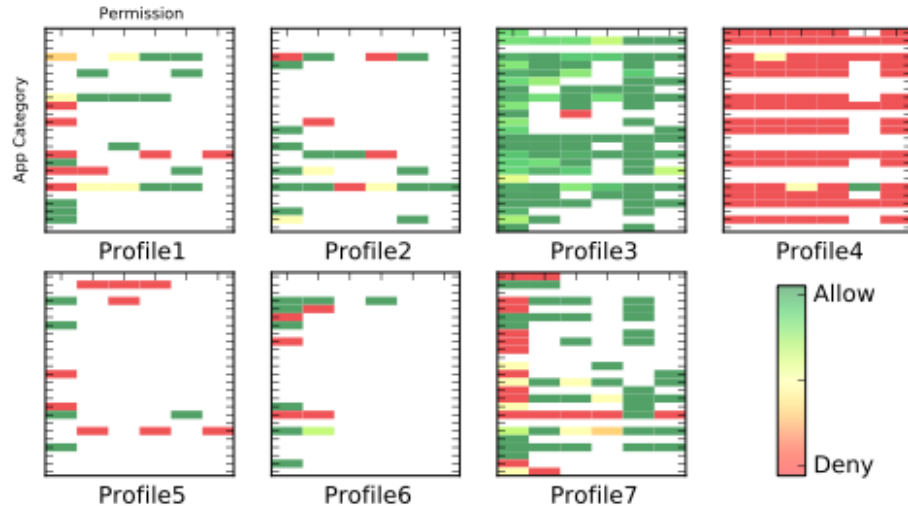
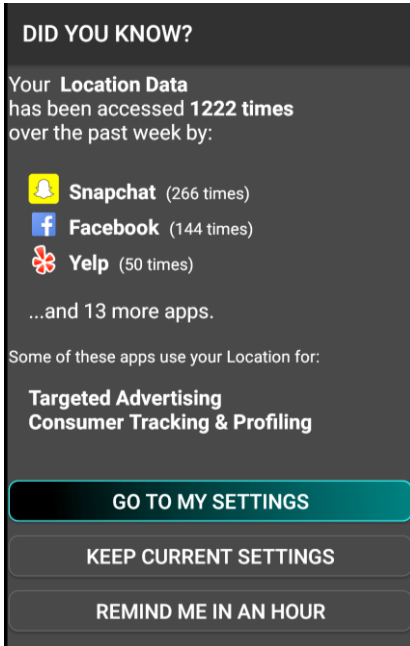
1. emphasize likely **unexpected or surprising information**
2. **contextualize information** based on type of service, user activity and user goals

simplifying privacy notices and controls

1. emphasize likely **unexpected or surprising information**
2. **contextualize information** based on type of service, user activity and user goals
3. **personalize information** based on user characteristics and individual information needs

personalized privacy assistants

learning privacy profiles from users' privacy settings

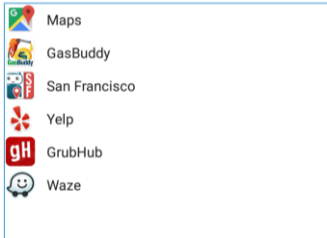


84 Android users (rooted phones)
2 week field study (1 nudge per day)

personalized privacy assistants

providing personalized privacy settings recommendations

These **TRAVEL & LOCAL** apps accessed your **LOCATION** **102 TIMES** over the past 2 days:



In general, are you OK with **TRAVEL & LOCAL** apps accessing your **LOCATION**?

YES

NO

profile
assignment



Thank you! Based on your answers, we recommend restricting the following 11 app(s):

Click category to view/change recommendations

- Deny 1 app(s) access to Calendar
- Deny 9 app(s) access to Location
 - Facebook (50 times) Allow
 - News & Weather (0 times) Deny
 - Contacts+ (28 times) Deny
 - Messenger (16 times) Allow
 - Snapchat (84 times) Deny
 - QR Code Reader (0 times) Deny
 - Skype (0 times) Deny

Why deny? This Social app accesses your Location for App Functionality and Consumer Tracking & Profiling.

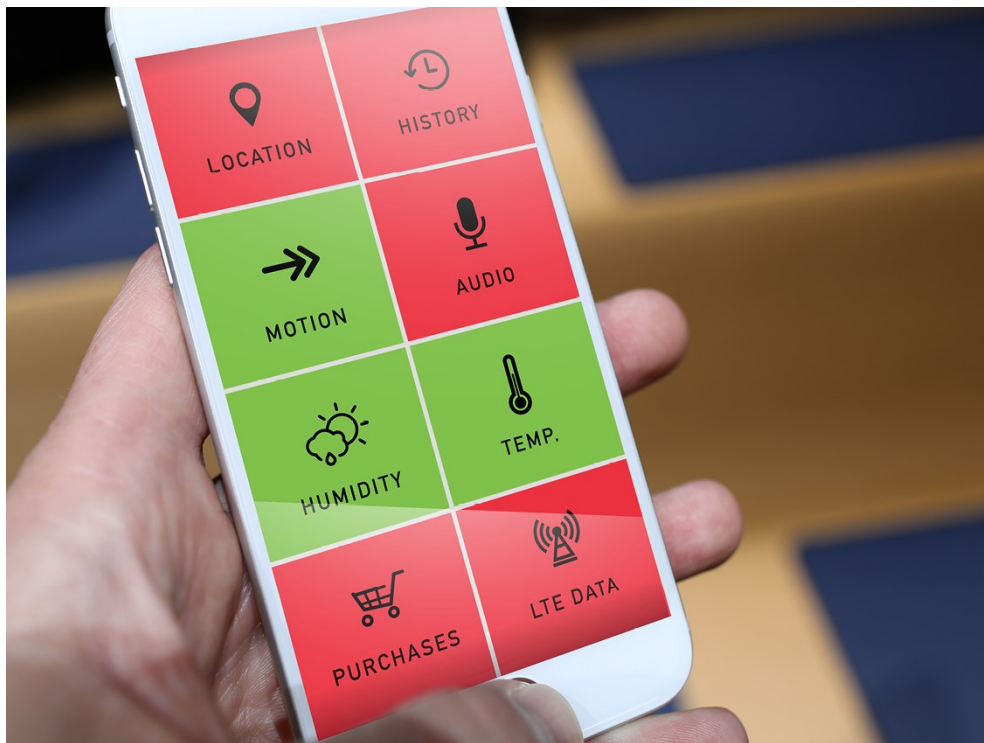
Do you want to make these changes?

YES, DENY THE 8 APP(S) SELECTED

NO, DO NOT MAKE ANY CHANGES

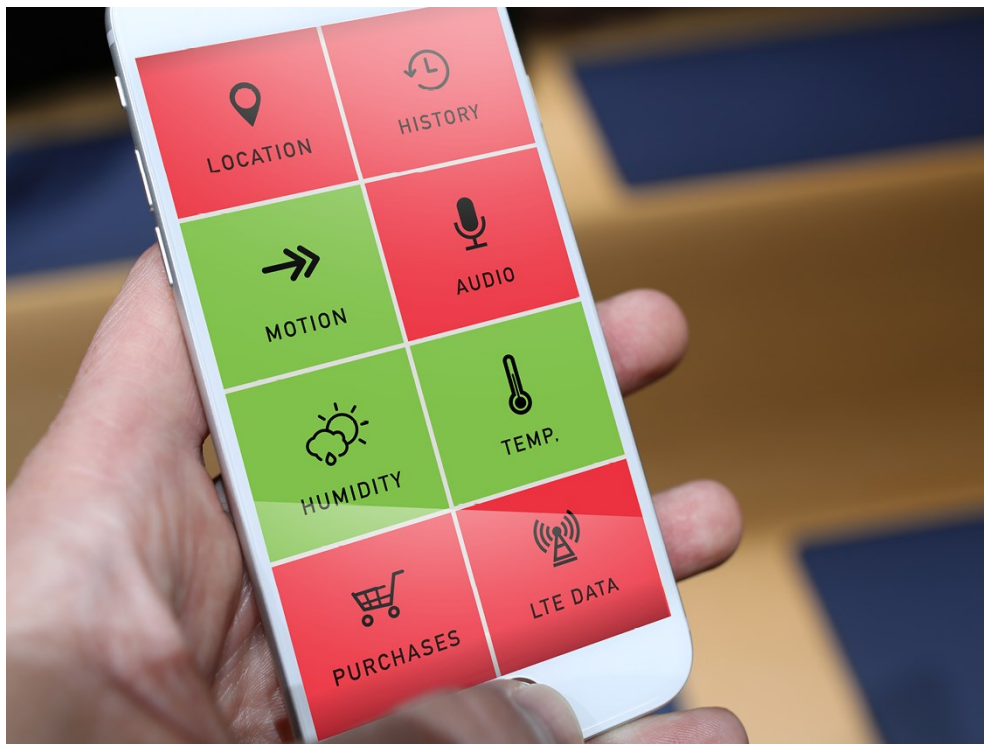
permission
recommendations

personalized privacy assistants for internet of things



- aggregate disclosures and controls across IoT systems
- context-aware privacy decision support and configuration
- personalized recommendations and adaptation

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summary

- emphasize unexpected / surprising practices in disclosures
- adapt disclosures to specific contexts
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The future of disclosures?

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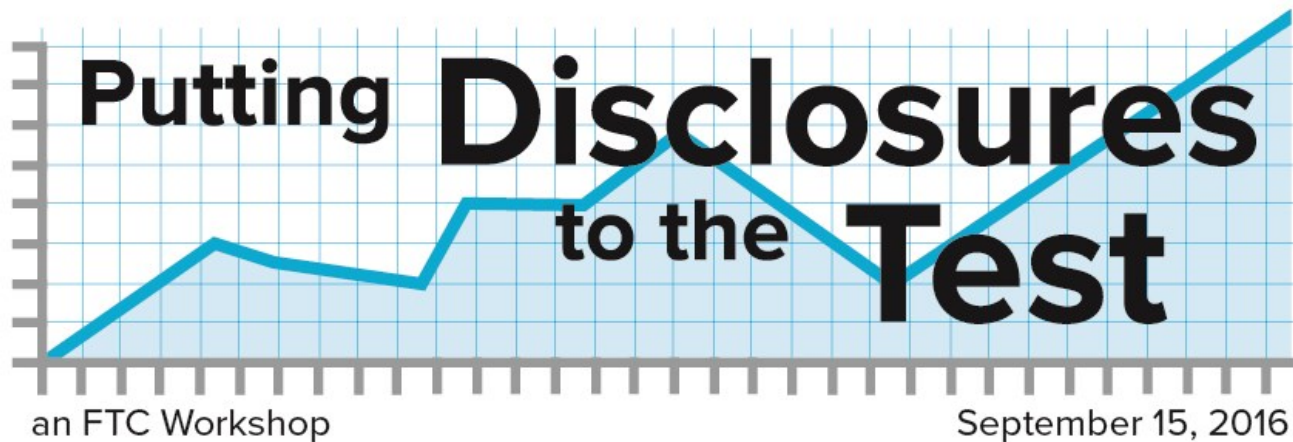
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