Putting Disclosures to the Test

an FTC Workshop

September 15, 2016
The future of disclosures?

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  Research Director, Office of Tech. Research & Investigation, FTC

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  UC Berkeley / International Computer Science Institute

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  Carnegie Mellon University

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  School of Information  
  University of Michigan
improving disclosure through contextual integrity

Serge Egelman, UC Berkeley / ICS

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Error Rate</th>
<th>Average Prompts/User</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask-on-first-use</td>
<td>19.47%</td>
<td>12.34</td>
</tr>
<tr>
<td>ML Model (behavior-only)</td>
<td>18.82%</td>
<td>0.00*</td>
</tr>
<tr>
<td>ML Model</td>
<td>4.27%</td>
<td>25.60</td>
</tr>
<tr>
<td>ML Model (low-prompt)</td>
<td>12.67%</td>
<td>12.46</td>
</tr>
</tbody>
</table>
open questions

what is an acceptable accuracy level?

what are the legal issues?

how can this be applied in other domains?
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?

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
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

<table>
<thead>
<tr>
<th>Information that would NOT affect my decision</th>
<th>Information that would SOMEWHA T affect my decision</th>
<th>Information that would GREATLY affect my decision</th>
</tr>
</thead>
</table>

» 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.
## Automatic consent form generator

### % of people selecting a specific sentence

<table>
<thead>
<tr>
<th>Sentences</th>
<th>% Sec 1</th>
<th>Concept</th>
<th>Mean Score</th>
<th>Adjust F2 to filter by % selected</th>
<th>Adjust G2 and H2 to filter by % selected AND Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>38.2</td>
<td>CON</td>
<td>1.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study.</td>
<td>47.4</td>
<td>INFO</td>
<td>1.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You should take part in this study only if you want to do so.</td>
<td>26.3</td>
<td>CON</td>
<td>2.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please read this Information and Consent Form and ask as many questions as needed.</td>
<td>26.3</td>
<td>INFO</td>
<td>1.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>You should not sign this form if you have any questions that have not been answered to your liking.</td>
<td>47.4</td>
<td>CON</td>
<td>2.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only sign this form if you decide that you want to be part of this study.</td>
<td>38.2</td>
<td>CON</td>
<td>2.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This Information and Consent Form may contain words you do not understand.</td>
<td>13.2</td>
<td>INFO</td>
<td>2.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please ask the study doctor or the study staff to explain any words or procedures that you do not clearly understand.</td>
<td>5</td>
<td>INFO</td>
<td>1.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>42.4</td>
<td>INFO</td>
<td>2.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participating in a research study is not the same as receiving regular medical care.</td>
<td>53.9</td>
<td>GENMED</td>
<td>2.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The purpose of regular medical care is to improve your health.</td>
<td>16.4</td>
<td>GENMED</td>
<td>1.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### % of people selecting specific concepts

- **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.
- **INFO**: This form describes the purpose, procedures, benefits, risks, discomforts and safety measures of the research study.
- **GENMED**: Participating in a research study is not the same as receiving regular medical care.
Resulting patient-designed form
Did it meet normative criteria?

- The trial treatment(s) and random assignment
- The trial procedures to be followed
- The reasonably foreseeable
- The reasonably expected benefits
- 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?

- Completely engaged: P = .01, d = .72
- Not at all engaged: P = .06, d = .57
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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Contextualizing and Personalizing Privacy Notices and Controls

Florian Schaub

Putting Disclosures to the Test
Federal Trade Commission

Sept. 15, 2016

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privacy policies are too complex
privacy policies are too complex

how can we reduce information overload and enable informed privacy decision making?
simplifying disclosures based on expectations
simplifying disclosures based on expectations

privacy policy
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 heart rate throughout the day
* Exercise compared with Friends
* Information posted to your profile

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

Find further collection practices at 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

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

<table>
<thead>
<tr>
<th>Question</th>
<th>Definitely Collects</th>
<th>Probably Collects</th>
<th>Might Collect</th>
<th>Might not Collect</th>
<th>Probably Does not Collect</th>
<th>Definitely Does not Collect</th>
<th>I'm Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your perspiration rate</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>true</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>Your mood</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>true</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>Your altitude</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>true</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>Your shoe size</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>true</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>How many steps you've taken</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>How far you've walked</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>Information you've posted to your Fitbit profile</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>Your name</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
<td>true</td>
</tr>
<tr>
<td>A list of your Facebook friends</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>false</td>
<td>true</td>
<td>false</td>
<td>true</td>
</tr>
</tbody>
</table>

12. Imagine you are using a Fitbit Surge, which of the following types of information do you think Fitbit would collect about you? *
simplifying disclosures based on expectations
baseline expectations / awareness

Collection
- Data Retention Policy
- Selling Data Conditions
- Use Fitbit Without an Account
- Where to Find Privacy Policy
- Sharing with Government
- Sharing with Directed Organizations
- Sharing w Companies Providing Services
- Sharing with Fitbit Friends
- Collection of Location (Specific)
- Collection of Height
- Collection of Weight
- Collection of Exercise Comp. to Friend
- Collection of Sleep
- Collection of Name
- Collection of Stairs Climbed
- Collection of Heart Rate
- Collection of When Exercising
- Collection of Info Posted to Profile
- Collection of Distance
- Collection of Steps

simplifying disclosures based on expectations
baseline expectations / awareness

<table>
<thead>
<tr>
<th>Share Misc.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Retention Policy</td>
<td></td>
</tr>
<tr>
<td>Selling Data Conditions</td>
<td></td>
</tr>
<tr>
<td>Use Fitbit Without an Account</td>
<td></td>
</tr>
<tr>
<td>Where to Find Privacy Policy</td>
<td></td>
</tr>
<tr>
<td>Sharing with Government</td>
<td></td>
</tr>
<tr>
<td>Sharing with Directed Organizations</td>
<td></td>
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<tr>
<td>Sharing with Companies Providing Services</td>
<td></td>
</tr>
<tr>
<td>Sharing with Fitbit Friends</td>
<td></td>
</tr>
<tr>
<td>Collection of Location (Specific)</td>
<td></td>
</tr>
<tr>
<td>Collection of Height</td>
<td></td>
</tr>
<tr>
<td>Collection of Weight</td>
<td></td>
</tr>
<tr>
<td>Collection of Exercise Comp. to Friend</td>
<td></td>
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<tr>
<td>Collection of Sleep</td>
<td></td>
</tr>
<tr>
<td>Collection of Name</td>
<td></td>
</tr>
<tr>
<td>Collection of Stairs Climbed</td>
<td></td>
</tr>
<tr>
<td>Collection of Heart rate</td>
<td></td>
</tr>
<tr>
<td>Collection of When Exercising</td>
<td></td>
</tr>
<tr>
<td>Collection of Info Posted to Profile</td>
<td></td>
</tr>
<tr>
<td>Collection of Distance</td>
<td></td>
</tr>
<tr>
<td>Collection of Steps</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Collection</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Retention Policy</td>
<td>70%</td>
</tr>
<tr>
<td>Selling Data Conditions</td>
<td></td>
</tr>
<tr>
<td>Use Fitbit Without an Account</td>
<td></td>
</tr>
<tr>
<td>Where to Find Privacy Policy</td>
<td></td>
</tr>
<tr>
<td>Sharing with Government</td>
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<td>Sharing w Companies Providing Services</td>
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<td>Sharing with Fitbit Friends</td>
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<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Collection of Distance</td>
<td></td>
</tr>
<tr>
<td>Collection of Steps</td>
<td></td>
</tr>
</tbody>
</table>

**Figure:** Bar chart showing the percentage of users who would accept different privacy policies. The highest acceptability is for the data retention policy (70%).
simplifying disclosures based on expectations

compact disclosures

With an account, Fitbit will collect:
- Your location, when location features, such as steps, are active.
- Your name, height, and weight.
- Your steps, distance and stairs climbed.
- When and how long you sleep.
- When and how long you are active.
- Your heart rate throughout the day.
- Exercise compared with Friends.
- Information posted to your profile.

You can track your heart rate, distance and sleep count with your Fitbit, without needing an account.

Find further collection practices at 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 on your public dashboard with friends in your profile settings.
- Fitbit may share or sell aggregated information that does not identify you.

Selling your aggregated data identified data allows Fitbit to provide fitbit services at lower cost, with no service changes.

Find further sharing practices at 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.

If you ever have a problem with Fitbit’s data practices, simply delete your account and your personal data will no longer be stored.

Find further privacy practices at fitbit.com/privacy.

simplifying disclosures based on expectations

compact disclosures

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 calories climbed
- When and how long you exercise
- Where and how long you sleep
- Your heart rate throughout the day
- Exercise compared with Friends
- Information posted to your profile

You can track your heart rate, distance and step count with your Fitbit without needing an account.
Find further collection practices at 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., DropBox)
- Fitbit friends, you’re listed as friends in your profile settings
- Fitbit may share or sell aggregated data that does not identify you.

Selling your aggregated de-identified data allows Fitbit to provide Fitbit devices at lower cost, with no service charges.
Find further sharing practices at fitbit.com/privacy

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

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

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

DID YOU KNOW?

Your Location Data has been accessed 1222 times over the past week by:

- Snapchat (266 times)
- Facebook (144 times)
- Yelp (50 times)

...and 13 more apps.

Some of these apps use your location for:

- Targeted Advertising
- Consumer Tracking & Profiling

GO TO MY SETTINGS

KEEP CURRENT SETTINGS

REMINDE ME IN AN HOUR

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:

- Maps
- GasBuddy
- San Francisco
- Yelp
- GroobHub
- Waze

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

- YES
- NO

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

- Deny 1 app(s) access to Calendar
- Deny 9 app(s) access to Location
- Facebook (50 times)
- News & Weather (0 times)
- Contacts+ (28 times)
- Messenger (16 times)
- Snapchat (84 times)
- "Why deny?" This Social app accesses your Location for App Functionality and Consumer Tracking & Profiling.
- QR Code Reader (0 times)
- Skype (0 times)

Do you want to make these changes?

- YES, DENY THE 8 APP(S) SELECTED
- NO, DO NOT MAKE ANY CHANGES

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

www.privacyassistant.org
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
- machine-readable privacy disclosures and controls needed

www.privacyassistant.org
summary

• emphasize unexpected / surprising practices in disclosures
• adapt disclosures to specific contexts
• personalize disclosures and controls
• need for machine-readable disclosures and controls
summary

- emphasize unexpected / surprising practices in disclosures
- adapt disclosures to specific contexts
- personalize disclosures and controls
- need for machine-readable disclosures and controls

- online studies effective for eliciting expectations and testing disclosure variants
- additionally lab and field studies under real conditions
summary

• emphasize unexpected / surprising practices in disclosures
• adapt disclosures to specific contexts
• personalize disclosures and controls
• need for machine-readable disclosures and controls

• online studies effective for eliciting expectations and testing disclosure variants
• additionally lab and field studies under real conditions

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The future of disclosures?

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