The Privacy and Security Behaviors of Smartphone App Developers

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Presentation by:
Mylon Blueford & Amy Shick
Outline

- Introduction
- Related Work
- Interview Method and Results
- Survey Method and Results
- Further Discussion and Conclusion
Introduction

- Space for innovation is huge
- No training process
- No certification necessary
- Pressure to develop quickly
- Two-step research process
Related Work

- User concerns about privacy and security
- Public policy and tools
User Concerns about Privacy Policy

- Users are concerned with:
  - What permissions are requested by apps
  - Frequency of data collection
  - The recipients of the data

- Users are concerned but they are neither empowered or informed.
  - Privacy policies offer the illusion of notice.
    - Required time, reading level, and vague language pose significant barriers.
Public Policy and Tools

• Reviewed 5 privacy guidelines for app developers.
  • 5 recommendations made by all of the guidelines
    • Someone must be appointed and responsible for privacy
    • The app should have a clear and easy to find privacy policy
    • The app should encrypt data in transmission
    • The app should encrypt data it stores
    • The app should limit data collection to what is needed

• Tools have been developed to help developers practice privacy and security behaviors.
  • Open-source databases
  • Privacy policy generators
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In-depth Interview

- Semi-structured interviews with 13 smartphone app developers in August and September of 2013

- Research Goals:
  - Understand what decisions app developers make that they consider privacy and security related
  - Better understand what resources they were aware of to help them make those decisions

- Demographics
<table>
<thead>
<tr>
<th>Participant ID</th>
<th>Company Size</th>
<th>Revenue Model</th>
<th>Service</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>10-30</td>
<td>Advertising, Free trial, Subscription</td>
<td>Digital, Physical, Service, Contents</td>
<td>CA</td>
</tr>
<tr>
<td>P2</td>
<td>2-9</td>
<td>Advertising, Free trial, Other</td>
<td>Digital, Service, Contents, Advertisement, Personalized information, Other</td>
<td>CA</td>
</tr>
<tr>
<td>P3</td>
<td>2-9</td>
<td>Free trial, Other</td>
<td>Digital, Service</td>
<td>PA</td>
</tr>
<tr>
<td>P4</td>
<td>2-9</td>
<td>Pay-per-user</td>
<td>Physical, Service</td>
<td>WA</td>
</tr>
<tr>
<td>P5</td>
<td>2-9</td>
<td>Free trial</td>
<td>Digital</td>
<td>WA</td>
</tr>
<tr>
<td>P6</td>
<td>100+</td>
<td>Subscription</td>
<td>Other</td>
<td>PA</td>
</tr>
<tr>
<td>P7</td>
<td>1</td>
<td>None</td>
<td>Contents</td>
<td>TX</td>
</tr>
<tr>
<td>P8</td>
<td>10-30</td>
<td>Subscription</td>
<td>Digital, Service</td>
<td>CA</td>
</tr>
<tr>
<td>P9</td>
<td>2-9</td>
<td>Other</td>
<td>Service</td>
<td>CA</td>
</tr>
<tr>
<td>P10</td>
<td>1</td>
<td>None</td>
<td>Contents</td>
<td>PA</td>
</tr>
<tr>
<td>P11</td>
<td>2-9</td>
<td>Advertising, None</td>
<td>Physical, Personalized information, Other</td>
<td>IL</td>
</tr>
<tr>
<td>P12</td>
<td>2-9</td>
<td>None</td>
<td>Personalized information</td>
<td>PA</td>
</tr>
<tr>
<td>P13</td>
<td>100+</td>
<td>None</td>
<td>Physical</td>
<td>MI</td>
</tr>
</tbody>
</table>

**TABLE I.** INTERVIEW PARTICIPANT MOBILE APP AND COMPANY DEMOGRAPHICS.

<table>
<thead>
<tr>
<th>Service</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital</td>
<td>games, MP3, Ebooks</td>
</tr>
<tr>
<td>Physical</td>
<td>selling books</td>
</tr>
<tr>
<td>Service</td>
<td>e-mail, banking, ticketing</td>
</tr>
<tr>
<td>Stock Information</td>
<td>stock prices</td>
</tr>
<tr>
<td>Contents</td>
<td>news, weather, entertainment</td>
</tr>
<tr>
<td>Personalized information</td>
<td>location information</td>
</tr>
</tbody>
</table>
Interview Results

- Emerging Themes
  - Education and Advice
  - Third party data collection tools
  - Perception of privacy policies
  - Trade-offs due to lack of resources
Education and Advice

- Lack of formal training
  - Corporate training or certification
  - Exceptions - eCommerce
- Lack of knowledge about new guidelines
  - Government suggestions
  - Exceptions – Health Information
- Resources
  - Online research
  - Consulting friends
  - Legal or specialist advice
Security Tools vs. Privacy Tools

- Third-party tools
  - Additional privacy concerns
  - Analytics
- Security Tools
  - Encryption built into database
  - SSL code built into platform
  - Authentication methods – Facebook
- Privacy Tools
  - Little knowledge

We take your privacy seriously

- We don't post anything to Facebook
- Other users will never know if you've liked them unless they like you back
- Other users cannot contact you unless you've already been matched
- Your location is not shown to other users
Perceptions about Privacy Policies

- Low priority
- Little value
- Lower user retention
- Small company, not get sued
- Website vs. within app
Trade-offs Between Privacy, Security, and Resources

- Need to monetize app
- Limited resources
- Personal desire to respect privacy
- Policies for deleting old data
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Survey Methods

- Hypothesis Testing
- Participant demographics
- App company characteristics

<table>
<thead>
<tr>
<th>Behavior</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use SSL</td>
<td>83.8%</td>
</tr>
<tr>
<td>Encrypt data on phone</td>
<td>59.6%</td>
</tr>
<tr>
<td>Encrypt data in database</td>
<td>53.1%</td>
</tr>
<tr>
<td>Encrypt everything (all data collected)</td>
<td>57.0%</td>
</tr>
<tr>
<td>Revenue from advertising</td>
<td>48.2%</td>
</tr>
<tr>
<td>Have CPO or equivalent</td>
<td>78.1%</td>
</tr>
<tr>
<td>Privacy Policy on website</td>
<td>57.9%</td>
</tr>
</tbody>
</table>

**TABLE III.** Percentage of respondents who reported various privacy and security-related behaviors. Participants could select multiple options.
Hypothesis Testing and Results

- Relationships between security, privacy and
  - Company size
  - Revenue model
Company Size

- Hypothesis 1: Smaller companies less likely to engage in privacy and security behaviors.
  - Company size correlates to having a CPO
  - Company size correlates to having a privacy policy
  - Company size correlates with encrypting everything
  - Company size correlates with using SSL
Revenue Model

- Hypothesis 2: Certain revenue models were less likely to show privacy and security behaviors

- Revenue model is correlated to having a CPO

- Revenue model is correlated to having a privacy policy
  - Advertising revenue model indicates low adoption of privacy policy

- Revenue model is correlated with encrypting everything

- Revenue model is correlated with using SSL
  - In-app purchase has the lowest adoption of SSL

- There is not much of a correlation between revenue and privacy and security behaviors
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Discussion and Conclusion

- Third-party tools should be more transparent about data collection

- Support from security and privacy advocates

- Legalese hinders reading and writing of privacy policies

- Smaller companies need privacy and security tools
QUESTIONS?