Analyzing Developers' Perceptions, Attitudes and Challenges in Complying with Mobile App Store Privacy Requirements

Geetika Gopi
Carnegie Mellon University

Peter Meyers
Carnegie Mellon University

Thanyanun Charoensiritanasin
Carnegie Mellon University

Jayson Jin
Carnegie Mellon University

Lorrie Faith Cranor
Carnegie Mellon University

Ragashree Mysuru Chandrashekar
Carnegie Mellon University

Tianshi Li
Carnegie Mellon University

Abstract

Mobile app users rely on application developers and app stores to protect their data and privacy. As a result, platforms such as the Apple App Store and the Google Play Store have put significant efforts into establishing policies and processes to ensure that these apps meet their privacy requirements. However, complying with these policies poses challenges for developers. By conducting an online survey with 30 Android/iOS application developers, we identified several challenges that developers encounter when trying to comply with app store privacy requirements, including variability in app store privacy requirements across platforms, complex implementation details, and frequent privacy policy changes. Developers also expected more assistance from app stores, such as better documentation and tooling support.

1 Introduction

Mobile applications have become an integral part of people's lives. However, their ubiquitous nature also raises several privacy concerns. Users often turn to the application developers and app store platforms to protect their data and use it in a responsible manner. Hence, mobile app stores such as the Google Play Store and the Apple App Store have defined strict policies and established app review processes to ensure published apps conform to their privacy requirements [1, 2].

However, the app review processes have been found to be ineffective and inefficient for developers, who are oftentimes not privacy experts and face many other requirements that compete for their attention [3, 4]. Li et al. [3] showed developers face challenges with mobile App Store privacy compliance by analyzing the discussion on r/androiddev. The challenges they identified include lack of upfront explanation for privacy-enhancing changes, rigid restrictions on accessing user data, insufficient support from platforms like Google, and the broken compatibility issue when complying with new privacy requirements. Tahaei et al. [4] studied the challenges and confusions that developers face when discussing privacy related topics and found that developers rely on Stack Overflow for privacy-related support, with answers often lacking formal references.

In this work, we aim to gain further understanding in the challenges that mobile app developers are facing when publishing apps on the two main platforms regarding the compliance with the platform-specific privacy requirements. We conducted an online survey with 30 Android/iOS application developers. We found that developers face challenges in complying with varying requirements across platforms and developers seek more assistance from app stores, including clear documentation and tool support.

2 Methodology

We recruited 30 participants with iOS/Android app development experience to participate in our online survey. Some participants had experience publishing applications on the Apple App Store and/or the Google Play Store. The survey was hosted on Qualtrics. It consisted of multiple-choice and free-response questions to understand developers' experiences with app store privacy compliance. Recruitment was done through Reddit forums, university channels, and course announcement boards. People who were interested in our study needed to first complete a screening survey to assess their knowledge in mobile app development. A total of 644 responses were received through the screening survey, out of which 37 participants were invited to participate in the main survey and 30 participants completed the main survey. The screening survey took approximately 2 to 3 minutes to complete, while the main survey took approximately 15 to 20 minutes to complete. Participants received a $10 Amazon gift card as compensation for completing the main survey; Our study method was approved by Carnegie Mellon University IRB. All study materials can be found in the Appendix.

We analyzed the survey responses quantitatively and qualitatively. For the quantitative analysis, we mainly presented descriptive statistics due to the small sample size. Qualitative data from free-response questions were analyzed by two coders using an open coding approach to identify themes in developer responses related to our research question.

3 Results

We present findings on developers' roles, challenges, and required support from our quantitative and qualitative analyses.

3.1 Developers' Roles in Privacy Compliance

Out of 30 participants, 25 reported being responsible for ensuring their applications meet privacy requirements. Half worked independently, while others collaborated with the privacy compliance team. These findings highlight the significant role application developers play in privacy compliance, often with limited support or guidance.

3.2 Developers' Information Sources

Our findings revealed that developers commonly relied on online platform communities such as Stack Overflow and Reddit forums, as well as their coworkers or colleagues, to overcome challenges related to privacy compliance. Interestingly, only 5 iOS developers and 2 Android developers reported directly reaching out to Apple and Google, respectively, when facing privacy challenges. This observation is noteworthy because online community posts discussing privacy policies often lack links to official documentation [4]. Moreover, amongst cross-platform developers, 17 out 24 of them reported reaching out to a privacy expert when experiencing challenges with the Apple App Store, while no developers reported do so when facing issues with the Google Play Store. The reason for this difference could be an avenue for future research.

3.3 Developers' Use of Tools for Compliance

Among our survey participants, 15 out of 30 reported using privacy policy generators to quickly generate compliant policies. Additionally, Google's recently introduced Checks Audit Tool[1] is utilized by 10 out of 27 participants who developed apps for the Google Play Store. Notably, paid tier users found the tool effective for Google Play app reviews, highlighting its potential benefits for developers, particularly in the Premium or Enterprise tiers. The absence of a similar tool from Apple suggests a potential area for further investigation.

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[1] https://checks.google.com

3.4 Qualitative Analysis

Three themes emerged from our analysis of the freeform responses. We present each theme along with the related quotes from our participants (coded P1 to P30).

3.4.1 Cross Platform Challenges

Participants highlighted that understanding the unique privacy guidelines and requirements of app store platforms like Apple's App Store and Google Play is a major challenge, especially for developers new to the platform.

> *App store platforms such as Apple's App Store and Google Play have different privacy requirements, and understanding the nuances of these requirements can be challenging for developers, especially those who are new to the platform.* (P2)

3.4.2 Expected Assistance

Participants expect app stores to provide tools and resources to reduce their workload. Specifically, participants mentioned they expect app stores to notify developers with all the up-to-date requirements and offer education and training resources to help them comply with these requirements. " *App stores could provide support through education and training resources that help developers stay up-to-date with changes to privacy regulations and best practices.* " (P5)

3.4.3 Tension between Compliance and Other Priorities

Developers are facing extra challenges in the app implementation due to conflicts between the compliance requirements and other priorities. For example, P17 emphasized the need to balance app usability with privacy:

> *Another challenge that we faced was implementing privacy requirements into our app in a way that is both effective and user-friendly. For example, apps may need to obtain user consent for data collection and use, but we as developers needed to balance this with maintaining a positive user experience.*

4 Conclusion and Future Work

Our preliminary results provide valuable insights into mobile developers' experiences and expectations regarding complying with platform-level privacy requirements. They highlight the need to simplify app store privacy requirements by offering clear guidelines, support resources, and compliance tools. In future research, we aim to conduct further investigations for a more in-depth analysis. A mixed-methods approach with interviews and surveys can provide a comprehensive understanding of app store privacy requirements, helping develop solutions to support developers in compliance efforts.

References

[1] Prepare your app for review - Play Console Help. URL https://support.google.com/googleplay/android-developer/answer/9859455?hl=en&ref_topic=7072031.

[2] Apple Inc. Apple app store review guidelines. https://developer.apple.com/app-store/review/guidelines/, Accessed 2023. Accessed on May 18, 2023.

[3] Tianshi Li, Elizabeth Louie, Laura Dabbish, and Jason I. Hong. How developers talk about personal data and what it means for user privacy: A case study of a developer forum on reddit. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW3):1–28, jan 2021. doi: 10.1145/3432919. URL https://doi.org/10.1145/3432919.

[4] Mohammad Tahaei, Ruba Abu-Salma, and Awais Rashid. Stuck in the permissions with you: Developer & end-user perspectives on app permissions & their privacy ramifications. *arXiv preprint arXiv:2301.06534*, 2023.

A Appendix

A.1 Recruitment Materials

A.1.1 Reddit Post - r/androiddev

Title: Participate in a Carnegie Mellon University research study [STUDY2023 00000084]
Description
Hello, we are researchers at Carnegie Mellon University, looking to recruit US based developers with apps deployed in the Google Play Store for an online survey. You will be asked to take a short screening survey. If you are eligible, you will then complete the remainder of the 20-minute online survey. At the completion of this survey, you will be compensated with a $10 Amazon gift card via email. If you are interested, please find our survey at www.linktosurvey.com

A.1.2 Reddit Post - r/iosdev

Title: Participate in a Carnegie Mellon University research study [STUDY2023 00000084]
Description:
Hello, we are researchers at Carnegie Mellon University, looking to recruit US based developers with apps deployed in the Apple App Store for an online survey. You will be asked to take a short screening survey. If you are eligible, you will then complete the remainder of the 20-minute online survey. At the completion of this survey, you will be compensated with a $10 Amazon gift card via email. If you are interested, please find our survey at www.linktosurvey.com

A.1.3 Reddit Post - r/appdev

Title: Participate in a Carnegie Mellon University research study [STUDY2023 00000084]
Description:
Hello, we are researchers at Carnegie Mellon University, looking to recruit US based developers with apps deployed in the Google Play Store or Apple App Store for an online survey. You will be asked to take a short screening survey. If you are eligible, you will then complete the remainder of the 20-minute online survey. At the completion of this survey, you will be compensated with a $10 Amazon gift card via email. If you are interested, please find our survey at www.linktosurvey.com

A.2 Informed Consent Form- Survey

RESEARCH CONSENT FORM

Title of Study: Developers' Challenges in Complying with App Store Privacy Requirements
This survey is part of a research study conducted by Geetika Gopi at Carnegie Mellon University
Summary:
The survey will focus on questions related to developers' challenges to comply with app store guidelines and assistance developers need to ease such challenges. It will take approximately 15 to 20 minutes to complete.
Purpose of the Study:
The goal of the project is to understand developers' challenges to comply with app store guidelines, support developers, and provide assistance to ease such challenges. To meet the goal, it requires some in-depth findings from developers to understand the real issues, instead of reaching out to a wide range for general challenges. We will conduct an online survey (Qualtrics) for this particular project to understand developers' challenges and attempts to overcome such challenges.
Procedures:
If you choose to participate, participants will be asked to answer survey questions, which should take about 15-20 minutes, related to your app development experience. There will be 30 participants who will be participating in this survey.
Participant Requirements:
Participation in this study is limited to individuals age 18 and older, living in the US while completing the survey and who have previously submitted apps to App Store(s).
Risks:
The risks and discomfort associated with participation in this study are no greater than those ordinarily encountered in daily life or during other online activities. Participating in this study may involve a risk of breach of confidentiality, including the possibility that participants may be identified through the demographics data submitted as part of the study.

While the researchers have taken every reasonable step to protect your confidentiality, there is always the possibility of interception or hacking of the data by third parties that is not under the control of the research team. There may be other risks to participation in this research that are not known at this time. If additional risks are identified during your participation in the research, you will be informed so that you may decide whether or not to continue your participation.

Benefits:

There may be no personal benefit from your participation in the study. However, there may be an indirect benefit, such as refreshing your knowledge regarding App Store's privacy compliance requirements. The information from this study can help app store platforms such as the Google Play Store and the Apple App Store improve their privacy compliance process.

Compensation and Costs:

Participants will be compensated with a $10 Amazon gift card for completing the online survey, provided they meet the requirements of the screening survey. The gift card code will be sent to the email address submitted by the participant through the qualtrics.

There will be no cost to you if you participate in this study.

Future Use of Information:

In the future, once we have removed all identifiable information from your data we may use the data for our future research studies, or we may distribute the data to other researchers for their research studies. We would do this without getting additional informed consent from you (or your legally authorized representative). Sharing of data with other researchers will only be done in such a manner that you will not be identified.

Confidentiality:

By participating in this research, you understand and agree that Carnegie Mellon may be required to disclose your consent form, data and other personally identifiable information as required by law, regulation, subpoena or court order. Otherwise, your confidentiality will be maintained in the following manner:

Your data and consent form will be kept separate. Your consent form will be stored in a secure location on Carnegie Mellon property and will not be disclosed to third parties. By participating, you understand and agree that the data and information gathered during this study may be used by Carnegie Mellon and published and/or disclosed by Carnegie Mellon to others outside of Carnegie Mellon. However, your name and other direct personal identifiers will not be mentioned in any such publication or dissemination of the research data and/or results by Carnegie Mellon. Note that per regulation all research data must be kept for a minimum of 3 years.

The study will collect your research data through your use of Qualtrics. This company is not owned by CMU. The company will have access to the research data that you produce and any identifiable information that you share with them while using their product. Please note that Carnegie Mellon does not control the Terms and Conditions of the company or how they will use or protect any information that they collect.

Right to Ask Questions and Contact Information:

If you have any questions about this study, you should feel free to ask them by contacting the Principal Investigator now at, Geetika Gopi. Department: Software and Societal Systems, School of Computer Science, Carnegie Mellon University. Address: 4825 Centre Avenue, Pittsburgh, PA 15213. Email: ggopi@andrew.cmu.edu. Phone: +1-412-980-1578. If you have questions later, desire additional information, or wish to withdraw your participation please contact the Principal Investigator by mail, phone or e-mail in accordance with the contact information listed above.

If you have questions pertaining to your rights as a research participant; or to report concerns to this study, you should contact the Office of Research integrity and Compliance at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu . Phone: 412-268-4721.

Voluntary Participation:

Your participation in this research is voluntary. You may discontinue participation at any time during the research activity. You may print a copy of this consent form for your records. Refusal to participate, withdrawal of your consent, or discontinued participation in the study will not result in any penalty or loss of benefits or rights to which you might otherwise be entitled.

I am 18 or older.

○ Yes

○ No

I have read and understood the information above.

○ Yes

○ No

I want to participate in this research and continue with the online survey.

○ Yes

○ No

I have reviewed the eligibility requirements listed in the Participant Requirements section of the consent form and certify that I am eligible to participate in this research, to the best of my knowledge.

○ Yes

○ No

A.3 Screening Survey

1. **Are you 18 or older?**

   ○ Yes
   ○ No

2. **Approximately how many years have you been coding mobile apps?**

   ○ I don't have mobile app development experience
   ○ less than a year
   ○ 1-2 years
   ○ 2-3 years
   ○ 3-4 years
   ○ 4-5 years
   ○ more than 5 years
   ○ Prefer not to answer

3. **When was the last time you participated in developing an app published in the Google Play Store/Apple App Store?**

   ○ I don't have apps published in the Google Play Store/Apple App Store
   ○ Within a month
   ○ Within 6 months
   ○ Within a year
   ○ within 2 years
   ○ More than 2 years ago
   ○ Prefer not to answer

4. **Please submit Google Play Store/Apple App Store links for the app(s) you worked on most recently. (At most 10 links separated by a comma or a new line)**

5. **Please check all types of data that you have collected via apps. (Select all that apply)**

   ☐ Financial Information
   ☐ User content
   ☐ Usage data
   ☐ Diagnostics
   ☐ Sensitive Information
   ☐ Contacts
   ☐ Browsing History
   ☐ Search History
   ☐ Purchases/Purchase History
   ☐ Health & Fitness
   ☐ Location
   ☐ Identifiers
   ☐ Other (please specify)
   ☐ None of the above

Please answer the following questions based on the provided code. (If you're a Java programmer, please look at the first screenshot; If you're a Kotlin programmer, please look at the second screenshot; If you're a Swift programmer, please look at the third screenshot.)

Java:

```java
public class CodeWizard {

  public int magical(int num1, int num2) {
    return num1 + num2;
  }

  public int mystical(int num1, int num2) {
    return num1 - num2;
  }

  public int enchanted(int num1, int num2) {
    return num1 * num2;
  }

  public double divine(double num1, double num2) {
    if(num2 == 0) {
      throw new IllegalArgumentException("Cannot divide by zero!");
    }
    return num1 / num2;
  }
}
```

Kotlin:

```kotlin
class CodeWizard {

  fun magical(num1: Int, num2: Int): Int {
    return num1 + num2
  }

  fun mystical(num1: Int, num2: Int): Int {
    return num1 - num2
  }

  fun enchanted(num1: Int, num2: Int): Int {
    return num1 * num2
  }

  fun divine(num1: Double, num2: Double): Double {
    if(num2 == 0.0) {
      throw IllegalArgumentException("Cannot divide by zero!")
    }
    return num1 / num2
  }
}
```

Swift:

```swift
class CodeWizard {

  func magical(num1: Int, num2: Int) -> Int {
    return num1 + num2
  }

  func mystical(num1: Int, num2: Int) -> Int {
    return num1 - num2
  }

  func enchanted(num1: Int, num2: Int) -> Int {
    return num1 * num2
  }

  func divine(num1: Double, num2: Double) -> Double {
    if num2 == 0 {
      fatalError("Cannot divide by zero!")
    }
    return num1 / num2
  }
}
```

6. **How many functions does the code contain?**

    ○ 2
    ○ 3
    ○ 4
    ○ 5

7. **What are the parameters of the "mystical"?**

    ○ num1 and num2
    ○ int and int
    ○ double and double
    ○ None of the above

8. **What will "magical" return?**

    ○ The sum of num1 and num2.
    ○ The difference between num1 and num2.
    ○ The product of num1 and num2.
    ○ The quotient of num1 and num2.

9. **What is the data type of the parameter in "enchanted"?**

    ○ Strings
    ○ Integers
    ○ Booleans
    ○ Doubles

10. **What is the class name in this code?**

    ○ CodeWizard
    ○ magical
    ○ mystical

○ enchanted

○ divine

11. **Which of the following programming languages can be used for developing mobile applications on both IOS and android platforms? (Choose all that apply)**

    ☐ Java
    ☐ Swift
    ☐ Python
    ☐ C

12. **What is your Email Address?**

A.4   Survey

Section 1: Understanding developer background

1. **Approximately how many applications have you or your team submitted to the Apple App Store? (Choose one)**

    ○ I don't have apps published in the Apple App Store
    ○ 1-2
    ○ 3-4
    ○ 5 or more
    ○ Prefer not to answer

2. **Approximately how many applications have you or your team submitted to the Google Play Store? (Choose one)**

    ○ I don't have apps published in the Google Play Store
    ○ 1-2
    ○ 3-4
    ○ 5 or more
    ○ Prefer not to answer

3. **Do you create applications as part of your professional work or as personal projects? (Choose one)**

    ○ Professional projects
    ○ Personal projects
    ○ Both Professional and Personal projects
    ○ Neither Professional and Personal projects
    ○ Prefer not to answer

4. **What kind of applications have you developed? (Select all that apply)**

    ☐ Lifestyle (Fitness, Dating, Food, Music, Travel)

- ☐ Social Media (Facebook, Instagram, Pinterest, Snapchat)
- ☐ Utility (Reminder, Calculator, Flashlight, Weather)
- ☐ Game/ Entertainment (Angry Birds, PubG, Clash of Clans)
- ☐ Productivity (Docs, Sheets, Wallet, Evernote, Wunderlist)
- ☐ News/ Information (Google News, Reddit, Buzzfeed)
- ☐ Other _____
- ☐ Prefer not to answer

5. **What is your role in the app development process? (Select all that apply)**
   - ☐ Frontend Developer
   - ☐ Backend Developer
   - ☐ Full Stack Developer
   - ☐ iOS/ Android Developer
   - ☐ Business Analyst
   - ☐ UX/UI Designer
   - ☐ Quality Assurance (QA) Engineer
   - ☐ Project Manager
   - ☐ Other _____
   - ☐ Prefer not to answer

6. **Have you or your team been required to ensure compliance with the privacy requirements of the Apple App Store or Google Play Store?**
   - ◯ Yes
   - ◯ No
   - ◯ I don't know/ I don't remember
   - ◯ Prefer not to answer

7. **(if yes to Q6) During which phase of the software development life cycle have you or your team had to ensure compliance with the privacy requirements of these platforms (either the Apple App Store or Google Play Store)? (Select all that apply)**
   - ☐ During design and planning phase
   - ☐ During development phase
   - ☐ During testing phase
   - ☐ After initial deployment phase
   - ☐ Prefer not to answer

8. **(if during design and planning/ development/ testing or after initial deployment phase to Q7) Did you/your team work independently or together with a dedicated compliance expert or team? (Choose one)**

- ◯ Work independently
- ◯ Work together with a compliance expert or team
- ◯ Both
- ◯ Prefer not to answer

9. **(if Work together with a compliance expert or team or Both on Q8) What specific roles made up the compliance team that you/your team worked with? (Select all that apply)**
   - ☐ Software Developers
   - ☐ Privacy Engineers
   - ☐ Privacy Lawyers
   - ☐ Project Managers
   - ☐ Other _____
   - ☐ Prefer not to answer

Section 2: Understanding developers' familiarity, perceptions, approaches, experiences, and challenges faced regarding app store privacy requirements and tools.

10. **Have you heard of any privacy policy generator tools?**
    - ◯ Yes
    - ◯ No

11. **Have you used any privacy policy generator tools?**
    - ◯ Yes
    - ◯ No

12. **(if yes to Q11) Which privacy policy generator tools do you use?**

13. **Have you ever heard about privacy requirements of any app store platforms (either the Apple App Store or Google Play Store)?**
    - ◯ Yes
    - ◯ No

14. **(if yes to Q13) How familiar are you with the privacy requirements of any app store platforms (either the Apple App Store or Google Play Store)? (Choose one)**
    - ◯ Very familiar
    - ◯ Somewhat familiar
    - ◯ Not familiar
    - ◯ Prefer not to answer

15. **(if 1-2/ 3-4/ 5 or more to Q1) What resources do you regularly consult when you are facing challenges regarding Apple App Store privacy compliance? (Select all that apply)**

☐ Online Communities (StackOverflow, Reddit, and etc.)

☐ Apple (message or call directly)

☐ Friends

☐ Colleagues/ Coworkers

☐ Privacy expert/team

☐ Compliance expert/team

☐ Other _____

☐ I don't know/ I don't remember

16. **(if 1-2/3-4/5 or more to Q2) What resources do you regularly consult when you are facing challenges regarding Google Play Store privacy compliance? (Select all that apply)**

☐ Online Communities (StackOverflow, Reddit, and etc.)

☐ Google (message or call directly)

☐ Friends

☐ Colleagues/Coworkers

☐ Privacy expert/team

☐ Compliance expert/team

☐ Other _____

☐ I don't know/ I don't remember

17. **How do you keep up to date with changes to the privacy policies and guidelines of the app store platforms? (Select all that apply)**

☐ Join online communities or forums (Stack Overflow, Reddit, and etc.) where developers and industry professionals share information and insights about app store platforms and their privacy policies and guidelines.

☐ Regularly check the app store platforms' websites for updates on their privacy policies and guidelines.

☐ Subscribe to the app store platforms' newsletters or follow their social media accounts for updates on privacy policies and guidelines.

☐ Attend industry events or conferences or webinars that discuss changes to privacy policies and guidelines for app store platforms.

☐ Consult with legal or compliance experts who specialize in app store privacy policies and guidelines.

☐ Discuss updates to privacy policies and guidelines with colleagues and coworkers

☐ Other _____

☐ I don't know/ I don't remember

18. **(Optional) Have you faced any challenges when trying to comply with the privacy requirements of the app store platforms? Please describe.**

19. **To your knowledge, have any of your applications undergone a privacy audit from either the Apple App Store or Google Play Store?**

○ Yes

○ No

○ I don't know/ I don't remember

20. **(if yes to Q19) Which app store audited your application? (Select all that apply)**

☐ Apple App Store

☐ Google Play Store

☐ Other _____

21. **(if yes to Q19) Did you receive advance notice of the privacy audit?**

○ Yes, I was aware of the privacy audit process

○ No, I was not aware of the privacy audit process

22. **(if yes to 19) How were you notified of the results of the audit? (Select all that apply)**

☐ Email

☐ Portal notifications

☐ Through my organization's compliance team

☐ Other _____

☐ I don't know/ I don't remember

23. **(if yes to Q19) In your opinion, were the correction requests from app store platforms (either the Apple App Store or Google Play Store) easy to comprehend and implement?**

○ Yes

○ No

24. **(if yes to Q23) Why do you think it was easy to comprehend and implement? Please describe.**

25. **(if no to Q23) Why do you think it was not easy to comprehend and implement? Please describe.**

Section 3: Understanding developers' approaches, experiences, and challenges faced with privacy compliance tools.

26. **(if 1-2/ 3-4/ 5 or more to Q2) Have you ever used Google Checks Audit Tool?**

○ Yes

○ No

27. **((if yes to Q26) Which tier of the Checks tool have you or your team utilized? (Select all that apply)**

☐ Free
☐ Premium
☐ Enterprise
☐ I don't know/ I don't remember

28. **(if yes to Q26) Did any application for which you used the Checks Audit Tool subsequently fail a privacy audit? (Choose one)**

○ Yes
○ No
○ I don't know/ I don't remember

29. **(if yes to Q26) Was the Checks Audit Tool effective enough to prepare for Google Playstore's privacy audit? (Choose one)**

○ Yes
○ No

30. **(if yes to Q29) Why do you think it was effective? Please describe.**

31. **(if no to Q29) Why do you think it was ineffective? Please describe.**

32. **Did you or your team use any other tools (apart from Checks Audit Tool) to help achieve compliance with the privacy requirements of Google Play Store or the Apple App Store? (Choose one)**

○ Yes _____
○ No
○ I don't know/ I don't remember

Section 4: Understanding developer expectations

33. **If you were to deal with the app store privacy compliance process at some point in your app development career, what kind of support do you expect from Google Play Store and/or Apple App Store? Please describe.**

Section 5: Demographics

34. **What is your age? (Choose one)**

○ 18 – 24
○ 25 – 34

○ 35 – 44
○ 45 – 54
○ 55 – 64
○ Above 65
○ Prefer not to answer

35. **What is your gender? (Choose one)**

○ Woman
○ Man
○ Non-binary
○ Prefer to self describe _____
○ Prefer not to answer

36. **What is your highest level of educational attainment? (Choose one)**

○ Some high school
○ High school
○ Associates degree
○ Bachelor's degree
○ Master's degree
○ Ph.D. or higher
○ Trade school
○ Other _____
○ Prefer not to answer

37. **What is your Email Address?**
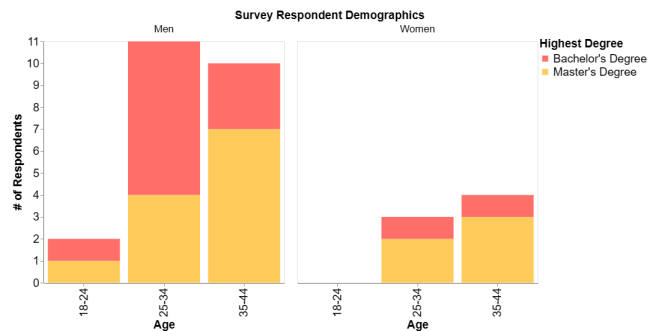
A.5 Demographics

Figure 1: Demographic information for survey participants. In general, participants skewed towards younger, more educated personnel.

	N	Sample (%)
Gender		
Male	23	76.7
Female	7	23.3
Age		
18-24	2	6.7
25-34	15	50.0
35-44	13	43.3
Education		
Bachelor's Degree	13	43.3
Master's Degree	17	56.7
Role (Multiple Possible)		
Frontend Developer	7	23.3
Backend Developer	8	26.7
Full Stack Developer	6	20.0
iOS/Android Developer	20	66.7
Business Analyst	0	0.0
UX/UI Designer	5	16.7
Quality Assurance (QA) Engineer	3	10.0
Project Manager	3	10.0

Table 1: Demographic statistics of our survey (*N = 30*).