Evaluating the Data Privacy of Mobile Applications Through Crowdsourcing

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Abstract. Consumers are largely unaware regarding the use being made to the data that they generate through smart devices, or their GDPR-compliance, since such information is typically hidden behind vague privacy policy documents, which are often lengthy, difficult to read (containing legal terms and definitions) and frequently changing. This paper describes the activities of the CAP-A project, whose aim is to apply crowdsourcing techniques to evaluate the privacy friendliness of apps, and to allow users to better understand the content of Privacy Policy documents and, consequently, the privacy implications of using any given mobile app. To achieve this, we developed a set of tools that aim at assisting users to express their own privacy concerns and expectations and assess the mobile apps’ privacy properties through collective intelligence.

Keywords. data privacy, mobile apps, GDPR, crowdsourcing, collective intelligence

1. Introduction

We experience a massive increase in personal information utilised by smartphone applications (apps), whose invasive nature for harvesting personal data has been demonstrated in many studies. This trend is continuing, despite the recently-established legislation for personal data protection, such as CCPA (California), LGPD (Brazil) and GDPR (Europe). In fact, studies have shown that the level of compliance of organizations and businesses to GDPR is low1. Although tracking and data access by apps is often legitimate, users are unaware of the related privacy risks, because apps describe their privacy behavior in a vague Privacy Policy (PrP) document, which is typically written using legal language and terminology [1], in long and frequently changing documents2, making it hard for users to read and understand the critical aspects related to their privacy. Thus,

2https://www.varonis.com/blog/gdpr-privacy-policy/
it comes as no surprise that the typical consumer is not investing time in studying such
documents before agreeing, thus unintentionally granting permission to apps to access,
use, and share a wealth of personal information, in a manner unknown to the user.

In this paper, we present the CAP-A H2020 project\(^3\), which aims to support users
in the daunting task of understanding the content of a PrP document and to be aware
of the privacy implications of using any given mobile app\(^4\).

Our position is that technical solutions and legal regulations are necessary but not
fully sufficient for accomplishing a paradigm shift; at the heart of our solution is the
hypothesis that data protection can also be powered by the society itself. By mobilising
consumers to become active players, we can harness our collective power, leading to a
more ubiquitous adoption of the technical and regulatory frameworks. To protect privacy
adequately, society needs awareness, but also consensus about privacy protecting mea-

sures and processes that generate norms, with which service providers will voluntarily
comply because it is profit maximising [2]. Exploring this knowledge is also of value
to social scientists to better understand the community dynamics involved, as well as to
policy makers to design more accurate and timely policies.

Along these lines, CAP-A deploys ICT tools that facilitate community interaction
and co-creation in various ways that improve users’ privacy awareness, and support a
more efficient interaction among developers and end users; the latter will lead to a new in-
novation model that will allow consumers to collectively express their concerns, and de-
velopers to adopt more privacy-friendly practices and to better respond to market needs.
CAP-A will also help in identifying and highlighting differences in opinions (i.e., norms),
in a way that will be beneficial for users, developers, social scientists and policy makers.

2. The CAP-A portal and mobile app

The CAP-A portal is a responsive web page, whereas the mobile app offers additional
functionalities adapted for small screens. They both rely on the same backend (which
uses data stored using semantic technologies) and are available for public use in: https://
www.cap-a.eu/tools. Due to space restrictions, we provide a brief description of
the most important functionalities of the CAP-A portal and mobile app below\(^5\).

**Expectations.** Through CAP-A, users can express expectations, i.e., whether they
consider (or not) reasonable a certain data request on behalf of the developer. Each ex-
pectation is related to a certain privacy-related process, such as “access to camera”, “min-
imisation of data collected” etc (called Privacy Policy Practice or PPP for short).

**PrP annotator.** CAP-A allows users to annotate PrP documents of apps, by marking
a block of text in the PrP document and stating the relevance of this block to a certain PPP.
Annotations are meant to highlight the important blocks of text in a PrP document and
how they are related to PPPs, thereby simplifying the task of understanding its content.

**Sharing evidences.** Users can share evidences related to an app, which may be
online articles, grounded claims by people who tested the app, or official documentation
regarding its privacy properties. The credibility of such evidences is assessed by users.

\(^3\)http://cap-a.eu/, funded by NGL Trust, and implemented by the authors

\(^4\)In the context of this paper, the term PrP refers to any type of Privacy Policy, Terms of Use, Consent Form
document prescribing legally binding obligation on behalf of a developer concerning a particular app.

\(^5\)Similar info, with screenshots, can be found in [14].
The mobile app. The CAP-A mobile app is a native Android app, which is not just a mobile-friendly version of the portal, but also allows users to conduct an “audit” of their installed apps, which allows targeted retrieval of information from Google Play.

Gamification and rewarding. Gamification features based on rewarding mechanisms are a well-known tool to support sustaining communities and for motivating contributors [10]. The CAP-A rewarding mechanism was developed using a general-purpose ontology [13], which captures various common features of diverse reward schemes. It encapsulates well-known gamification principles ([11]) and employs both intrinsic and extrinsic rewards ([12]).

App ratings. Each app in CAP-A is associated with two privacy-related ratings. These ratings are the Satisfaction of Community’s Expectations, which measures how close the privacy expectations regarding the app (as expressed by the users) are to what the app is requesting, and the Privacy Friendliness rating, whose computation takes into account privacy-related best practices, such as easy-to-understand PrP documents. The calculation of an app’s ratings is based on a set of weighted functions and parameters that aim to ensure an intuitive and fair behaviour.

Browsing apps. An easy-to-use search and browsing facility for apps is provided to allow users to access the app-related information (e.g., expectations, annotations, app ratings, evidences etc.). For legal reasons, only public information is shown. Moreover, not all apps found in Google Play have been downloaded; instead, the system automatically downloads data on the apps most relevant for its users.

The Privacy Dashboard. In the Privacy Dashboard, users can find visual representations of aggregated information about users and apps, as well as an aggregation of users’ behavior in the form of privacy norms. For example, we can determine whether certain age ranges tend to adopt a certain privacy stance towards specific categories of apps.

The role of developers. CAP-A is not only addressed to consumers, but also developers, who can claim the development of a certain app, giving them special privileges.

Mini-tours. An important feature is the concept of the mini-tours, which allow newcomers to get a grasp of the main CAP-A functionalities, through step-by-step tutorials.

3. Related Work

Various works aim to improve privacy awareness, but using different methods than CAP-A. In [3,4,5] various techniques (textual summarization, NLP, semantic text matching etc) are used to support users in understanding the content of PrP documents. Similarly, in [6], a remodelling of PrP documents is proposed, as well as an Annotator for visualizing them using semantic metadata. Tools for improving privacy awareness using visual techniques have appeared in [7,8], whereas [9] presents an app which enables users to behaviourally analyse the privacy aspects of other installed apps.

4. Conclusion and Future Work

We presented CAP-A, a socio-technical solution aiming to improve privacy awareness and users’ understanding of the privacy implications associated with the use of any given
mobile app. Our solution is based on crowdsourcing and collective intelligence measures. Despite the existence of a 1000-strong user base (partly through the sister initiative CAPrice⁶), only internal evaluation has been carried out for CAP-A so far; a large-scale evaluation through several pilots is currently planned. We also consider the incorporation of a debating/chatting tool (e.g., along the lines of our previous work, APOPSIS [15]), that will allow users, experts, and developers to express opinions on privacy-related aspects, share individual experiences, or justify viewpoints (e.g., on annotations).

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References


⁶https://www.caprice-community.net