

Comics as a Medium for Privacy Notices

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ABSTRACT

Online privacy and security notices are rather ineffective: Very few people read them, and those who do find them difficult to understand and remember. How can we create privacy and security notices that are inviting, engaging, comprehensible, and memorable, even for users with dyslexia or a lower literacy level? In this paper, we propose to investigate the use of comics for privacy and security notices. We describe the ongoing development of comic notices for the “transparency and choice” part of Google’s privacy policy, as well as a research plan to test these notices against existing notices in various different settings.

1. INTRODUCTION

Although “transparency” is often cited as an important prerequisite for making accurate privacy and security decisions [12, 29], in reality, the privacy implications of using online services are hidden in lengthy “End-User License Agreements”. These agreements are often read by less than 1% of all users [4], and their linguistic complexity is often far beyond the capabilities of average users [20]. For example, the Google+ privacy policy has a Flesch-Kincaid Reading Ease score¹ of 51.61 (below the recommended 60-70), while Facebook’s privacy policy has a score of only 15.0. Similarly, Google’s “Safe Browsing diagnostic page”, a crucial tool in deciding whether to adhere to or ignore a malware warning in Google Chrome, has been found “confusing and unsatisfying” [2].

Several researchers have attempted to simplify privacy notices, e.g. using “nutrition labels” [15], standardized language [9], grids [26], textured agreements [14], and summary reports [10]. While some of these methods increase searchability and are more inviting for users to read, these improvements do not necessarily lead to better comprehension of the actual policy [14, 23]. Moreover, even the most prominent characteristics of agreements are usually forgotten within a few seconds after reading them [1]. According

¹See <http://read-able.com/>

to Nissenbaum [25], these problems are due to the “transparency paradox”: a privacy notice that is simple enough to understand usually oversimplifies the privacy situation it tries to explain; a notice that faithfully describes the situation, on the other hand, is usually too complex, too dull, and too lengthy for people to read.

For large consumer IT firms, these problems are even further exacerbated for three reasons: First of all, they offer not a single product but a suite of products—both software and hardware—that share a single user profile. The exact privacy policy thus depends on the combination of products that a user is using, and changes every time the user adopts a new product. Second, IT firms serve an ever-growing global market of users, and new entrants often have a lower level of literacy. In fact, about 40% of all Internet users are estimated to have “very low” to “low” levels of literacy [24]. Third, Internet usage is shifting towards mobile devices, which further reduce both the amount of attention paid to and the readability of large complex texts.

Given the widespread user ignorance towards privacy and security notices, the growing gap between their readability and users’ literacy level, and the low comprehension and retention of those who actually read the notices, it is clear that we need to radically rethink privacy and security notices, lest we fail on the “informed” part of “informed consent” [20]. How can we create privacy and security notices that are inviting, engaging, comprehensible, and memorable for anyone? In this paper, we propose to investigate the use of comics for privacy and security notices. We describe the ongoing development of comic notices for the “transparency and choice” part of Google’s privacy policy, as well as a research plan to test these notices against existing notices in various different settings. Specifically, we will conduct an interview study to decide on the comic format, a controlled experiment to test comprehension and retention, a field trial to test engagement and practical use, and an additional field trial to test the effectiveness of the comics for lower-literacy users. Following a brief introduction to the idea of using comics for privacy and security notices, we will describe the interview study and the controlled experiment in some detail, and then proceed to briefly discuss our future activities.

2. COMICS AS PRIVACY NOTICES

Comic books are among the most compelling forms of print media, a quality that has led language education scholars to suggest that they be used to increase literacy among beginning readers and second-language students [5, 8]. They are also used to provide health education and patient care

People have different privacy concerns. Our goal is to be clear about what information we collect, so that you can make meaningful choices about how it is used. For example, you can:

- [Review and update your Google activity controls](#) to decide what types of data, such as videos you’ve watched on YouTube or past searches, you would like saved with your account when you use Google services. You can also visit these [controls](#) to manage whether certain activity is stored in a cookie or similar technology on your device when you use our services while signed-out of your account.
- [Review and control](#) certain types of information tied to your Google Account by using Google Dashboard.
- [View and edit](#) your preferences about the Google ads shown to you on Google and across the web, such as which categories might interest you, using Ads Settings. You can also opt out of certain Google advertising services here.
- [Adjust](#) how the Profile associated with your Google Account appears to others.
- [Control](#) who you share information with through your Google Account.
- [Take information](#) associated with your Google Account out of many of our services.
- [Choose](#) whether your Profile name and Profile photo appear in shared endorsements that appear in ads.

You may also set your browser to block all cookies, including cookies associated with our services, or to indicate when a cookie is being set by us. However, it’s important to remember that many of our services may not function properly if your cookies are disabled. For example, we may not remember your language preferences.

Figure 1: The “transparency and choice” section of Google’s privacy policy.

to young people, non-native speakers, and people with low literacy [11, 22]. Comics are inherently textured, i.e., they convey high-level information via their page layout and *mise en scène* elements on each panel, which allow readers to understand the general “storyline”, and be directed to the more detailed information that is encapsulated in each panel [6]. This quality is useful for license agreements, which have been shown to benefit from a textured layout [14]. Although previous work on privacy notices has used illustrations to support the text [7, 14], in comic books the text invariably supports the illustrations. This makes them particularly appropriate for people with lower literacy levels and/or a visual learning style [6, 27]. Finally, while the visual aspects of comics are captivating (which may increase the frequency and extent to which the notice is actually read), the static, serial presentation requires readers to actively engage with the content (which may increase comprehension and retention of the presented information) [6, 27]. This sets comics apart from regular text (which requires engagement but is not captivating) and video (which is captivating but does not require engagement).

Comic-based privacy and security notices have two additional advantages in the increasingly frequent scenario where an IT firm provides a “product suite” of multiple applications to the user, tied together with a single user profile. First of all, individual comics are often part of a series: they present a story within the context of an overarching narrative. This quality may make it easier to present the interrelated privacy consequences of using several products that share a single user profile. Second, comics have a variable length—they exist as single panels, multi-panel strips, page-length stories, or an entire book. This allows them to be used for notices with different levels of complexity, while still keeping a unified narrative style and presentation across notices. For example, within the Google ecosystem comics of dif-

ferent lengths could be used for the following purposes: a single panel or strip for simple notices (e.g. Android app permissions, cookie consent notices, safe browsing diagnostics), a page for moderately complex notices (e.g. privacy statements, license agreements), and a multi-page story for complex notices (e.g. the Google Safety Center).

3. PRELIMINARY COMICS

For our initial research, we consider the “transparency and choice” part of Google’s privacy policy². This section of Google’s privacy policy explains how users can gain insight into the information Google collects about them, and make choices about how this information is used. The section refers to seven pages that can be used for this purpose. Figure 1 shows the verbatim text.

The bullet point descriptions of the seven pages are rather short—this is understandable, because they are tailored to users’ limited attention span. A predicted advantage of our comics, however, is that they will captivate users’ attention long enough to allow expanding the length of these descriptions. Aside from these short descriptions, we therefore also develop a medium and long description for each page:

- The **short** descriptions are verbatim versions of the bullets in Google’s “transparency and choice” text. Figure 2 shows the comic version of the short description of the Activity Controls page (the first bullet point).
- The **medium** descriptions are slightly longer versions of the short descriptions. Specifically, we added one or two sentences describing *situation* in which a user would like to access the page. Moreover, we slightly paraphrased the descriptions to sound more like colloquial narratives than bullet point items. Figure 3

²<https://www.google.com/policies/privacy/#infochoices>

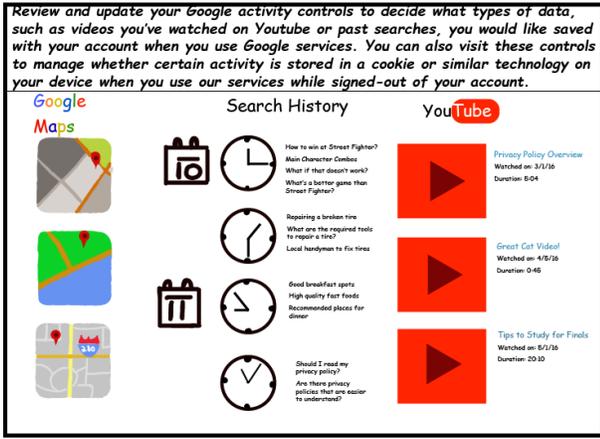


Figure 2: The short Activity Controls page description.

shows the comic version of the medium description of the Activity Controls page. The text version consists of a concatenation of the text at the top of each panel.

- The **long** descriptions expand upon the medium versions. Specifically, they describe in more detail the situation in which a user would like to access the page, linking it to higher-level user *goals* (i.e., mentioning *why* user may find themselves in need to access the page). Moreover, we expand the number of examples of the different aspects and features on the described page. Figure 4 shows the comic version of the long description of the Activity Controls page. The text version consists of a concatenation of the text at the top of each panel.

For each type of description—short, medium, and long—we develop a **text version** (just the description) and a **comic version** (the description incorporated into a comic strip). The short descriptions are illustrated with short (mostly single panel) comics; the medium and long comics contain more panels (4-6 and 8-12, respectively).

4. RESEARCH PLAN

With our research we expect to gain insight into the effectiveness of comics as a medium for privacy and security notices. In our initial research plan, we therefore compare the comic-based notices against the text-based notices in various settings. These studies are described in this section. Once we have established the effectiveness of our comics, we will further optimize their parameters (e.g. drawing styles, use of color, type of content, presence of text, number of panels, narrative flow) to make them even more effective. We briefly discuss this effort in the future work section.

4.1 Interview Study

Our first planned study is an interview study to gain deeper insight into the feelings evoked by our comics. This study we will also give us qualitative feedback about the clarity and appeal of our comics. We will use this feedback to iterate on our comic designs.

We plan to recruit 30-50 local participants for the interview study. Participants will be asked to comment on a ran-

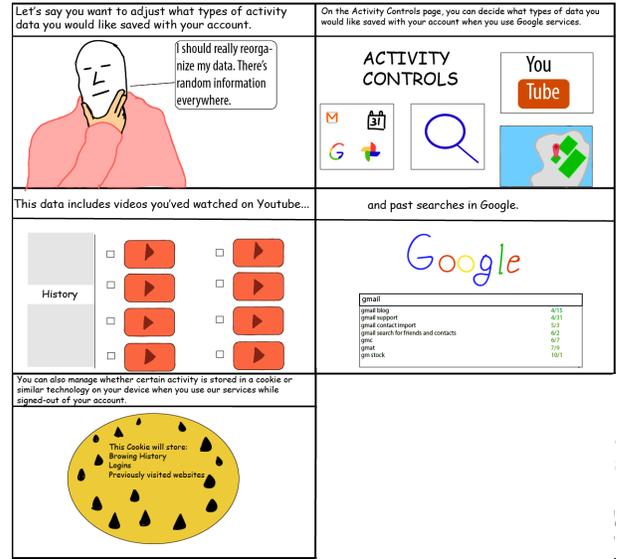


Figure 3: The medium Activity Controls page description.

domly chosen description for each page. We will ask them to rephrase the description in their own words (to test comprehension), their privacy expectations based on the description, and their evaluation of the quality of the description. We will subsequently show them the page associated with the description, and ask them if this page aligns with their expectations based on the description. Finally, we will show them an alternative description, and ask them to compare this version against the original description they were shown. All questions are listed in Appendix A.1.

Users' feedback will give us a preliminary understanding about whether the comic-based privacy notices are useful, and which description length is most ideal. Users' critique of the individual descriptions will be used to redesign them for future studies.

4.2 Controlled Experiment

The second planned study is an online controlled experiment, to be conducted via Amazon Mechanical Turk with at least 180 participants. The experiment is a 3x2 between-subjects experiment (3 description lengths: short, medium, long; 2 description types: text, comic). Participants will be told that they are participating in a usability study of Google's product settings. They will then be asked to read the description (matching their randomly assigned experimental condition) of the first page. Their reading time will be recorded to gauge their level of engagement with the description.

Participants will then move to a prototype of the page itself to set their settings as they would on their real Google account³. By observing their actions, we can measure to what extent the description motivated them to change the default settings (something users are not particularly prone to do [13, 19]).

³By not using their actual Google account, we avoid a potential participation selection bias, as well as the heterogeneity of their preexisting settings

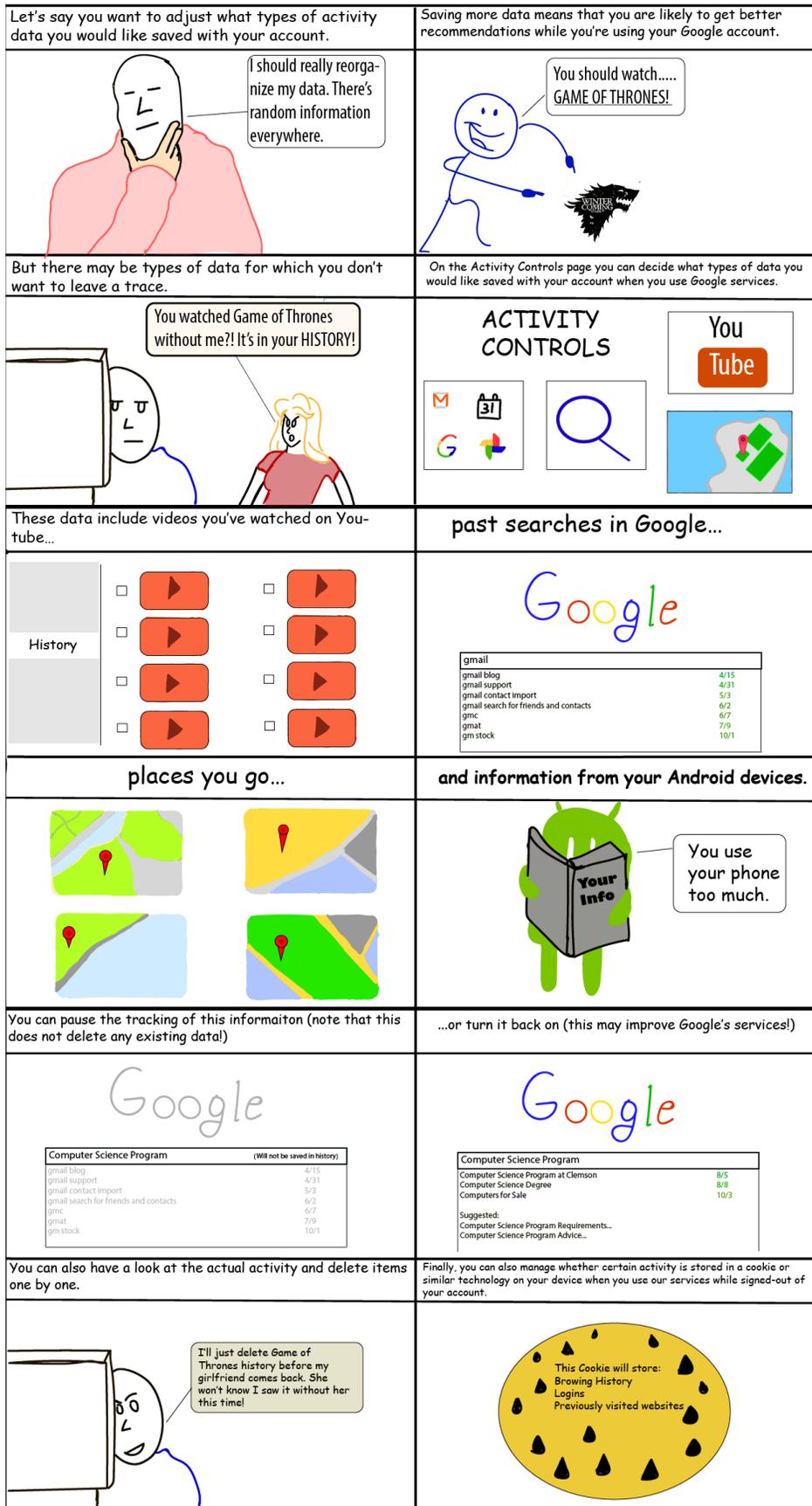


Figure 4: The long Activity Controls page description.

Next, participants are given a short multiple choice test that tests users' comprehension of the page they just saw. Example questions for the Activity Controls page are listed in Appendix A.2. It is our hypothesis that if the explanation was successful, participants are more effective at exploring the page, and thus also better at answering these questions. This sequence (description, page, test) will repeat itself for all seven pages.

Once all seven pages have been covered, the participants will receive a final multiple choice test that will test their understanding of the purpose of each of the seven pages. The questions in this "Overview Test" are listed in Appendix A.3. Finally, participants will be asked to evaluate the quality of the descriptions, the settings interface, users' privacy threat, and their general privacy and collection concerns. These questionnaires are listed in Appendix A.4.

Two to four weeks after the experiment, the participants will be invited to participate again. This time, they will first complete the Overview Test, and then each of the seven pages followed by their Comprehension Test.

The purpose of this study is to test the combined effect of description length (short, medium, long) and type (text, comic) on participants' comprehension, engagement, and decision behavior. The follow-up study will test their retention of the material. Based on the results of the study, we can find the strengths and weaknesses of having a comic-based description over a standard description of various lengths. Our hypothesis is that longer descriptions will be more informative and thus effective, but only when presented in comic format, because that is the only way to engage users for a sufficient amount of time to read the entire description.

4.3 Field Trial

Our third planned study is a field trial of the comic descriptions. This trial will run in a classroom setting, where students will use Google services as part of the course activities. In this trial, the comic description of the most optimal length (as observed in the controlled experiment) is again tested against its text-only counterpart. Participants will receive the descriptions in weekly emails, and the descriptions will link to the actual Google settings pages. During the trial, we will instrument participants' browsers with a tool that tracks the changes users make to their settings.

Besides the main manipulation of description type (text versus comic), the trial also tests the effects of "progressive disclosure": half of the participants will receive all seven descriptions in their email every week, while the other half will receive them one by one. Our hypothesis is that participants may be overwhelmed by the descriptions unless they are disclosed one by one; the latter condition will thus result in a higher level of engagement with the settings pages. Again, we expect that the comic-based descriptions will also lead to higher levels of engagement than the text-based descriptions. At the end of the field trial, participants will do the Overview Test (A.3), and fill out the questionnaires listed in Appendix A.4.

4.4 Trial with Low Literacy Users

Our final planned study is another field trial, but with low literacy users. This trial will be similar to the regular field trial. However, the overview test and the evaluation of the

experience will be conducted in person, so as to avoid issues with understanding the questions due to participants' limited literacy levels. The in-person evaluation will also allow us to ask qualitative questions about users' experience with the descriptions and the settings pages, which will again provide valuable insights to further improve the descriptions specifically for low literacy users.

5. FUTURE WORK

The results of the controlled experiment described in this paper will tell us whether comics are an effective medium for privacy and security notices of various lengths. After confirming these results in realistic field trials with high literate and low literate users, we will turn to the task of optimizing the parameters of the comics to further improve their effectiveness and appeal. Specifically, we will investigate the following aspects:

- **Drawing style:** Comic drawing styles range from simple line art to hyper-realistic. The choice of drawing style arguably involves a tradeoff between understandability and appeal, and the optimal drawing style may be user-dependent.
- **Use of color:** While color comics may be more attractive, we would like to test whether high-contrast black-and-white comics are equally effective and appealing in an attempt to improve legibility on low-contrast screens and for color-blind users.
- **Type of content:** Our current comics display a mixture of people performing actions, stylized screenshots, and highlights. We would like to test the relative effectiveness and appeal of each of these types of content.
- **Text banners and speech bubbles:** Comic artists use text banners and speech bubbles can be used to blend regular text with graphical elements. Which of these methods is most appealing and effective? Is it possible to represent privacy and security notices using "mute" comics without using any text? The latter would arguably be an improvement for low literacy users, and it would also avoid the need to translate the notice into many different languages.
- **number and size of panels:** A comic may consist of few or many panels, irrespective of the length of the notice itself. Some comics also break up single panels into smaller components to provide additional structure to the reader. We would like to test the optimal number and size of panels for notices of various lengths.
- **narrative flow:** Traditional comics have a left-to-right, panel-by-panel narrative flow, but some comics break this structure using sub-panels and/or alternative layouts. We would like to test whether such alternative layouts are suitable for privacy and security notices.

Aside from testing the characteristics of the comics, we are also interested in testing a more holistic use of comics to explain a multitude of services (not just their privacy implications) from a single provider. We hypothesize that the

comic design language can be used to create a narrative thread that allows users to gain an integrated understanding of the provided services, both in terms of their individual characteristics (e.g. “use Hangouts to communicate”, “use Google Docs to write documents together”) as well as their complementary qualities (e.g. “use Hangouts within Google Docs to discuss the document you are writing”). Branching comics (cf. [3]) could be used to personalize such comics to the specific set of services that the user is using.

6. CONCLUSION

In this paper we propose the use of comics as a medium for privacy and security notices. We hypothesize that comics can make such notices inviting, engaging, comprehensible, and memorable for anyone—even people with dyslexia or lower levels of literacy. We propose a series of planned studies that we will use to test these hypotheses, as well as a number of future studies that we will employ to further improve the effectiveness of these comic-based notices. We believe that the increased accessibility of such notices addresses the needs of an increasing number of low literacy Internet users, and we may even be able to make learning about privacy a *fun and engaging activity*... oh, what a wonderful world that would be!

7. REFERENCES

- [1] Adjerid, I., Acquisti, A., Brandimarte, L., and Loewenstein, G. Sleights of Privacy: Framing, Disclosures, and the Limits of Transparency. In *Proceedings of the Ninth Symposium on Usable Privacy and Security* (Newcastle, UK, 2013), 9:1–9:11.
- [2] Almuhimedi, H., Felt, A. P., Reeder, R. W., and Consolvo, S. Your Reputation Precedes You: History, Reputation, and the Chrome Malware Warning. In *Proceedings of the Tenth Symposium On Usable Privacy and Security* (Menlo Park, CA, 2014), 113–128.
- [3] Andrews, D., and Baber, C. Visualizing interactive narratives: employing a branching comic to tell a story and show its readings. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Toronto, Canada, 2014), 1895–1904.
- [4] Bakos, Y., Marotta-Wurgler, F., and Trossen, D. R. Does Anyone Read the Fine Print? Testing a Law and Economics Approach to Standard Form Contracts. Manuscript: <http://archive.nyu.edu/handle/2451/29503>, 2009.
- [5] Bucher, K. T., and Manning, M. L. Bringing Graphic Novels into a School’s Curriculum. *The Clearing House* 78, 2 (Nov. 2004), 67–72.
- [6] Duncan, R., Smith, M. J., and Levitz, P. *The Power of Comics: History, Form and Culture*. Bloomsbury Academic, New York, July 2009.
- [7] Eargle, D., Galletta, D., Kirwan, B., and Vance, T. Integrating Facial Threat Signals into Security Messages: An Extension of Media Naturalness Theory to an Information Security Context. In *Proceedings of the IFIP Dewald Roode Information Security Workshop* (Newark, DE, 2015).
- [8] Frey, N., and Fisher, D. B. *Teaching Visual Literacy: Using Comic Books, Graphic Novels, Anime, Cartoons, and More to Develop Comprehension and Thinking Skills*. Corwin, Thousand Oaks, CA, Jan. 2008.
- [9] Gideon, J., Cranor, L., Egelman, S., and Acquisti, A. Power Strips, Prophylactics, and Privacy, Oh My! In *Proceedings of the Second Symposium on Usable Privacy and Security* (Pittsburgh, PA, 2006), 133–144.
- [10] Good, N., Dhamija, R., Grossklags, J., Thaw, D., Aronowitz, S., Mulligan, D., and Konstan, J. Stopping Spyware at the Gate: A User Study of Privacy, Notice and Spyware. In *Proceedings of the First Symposium on Usable Privacy and Security* (Pittsburgh, PA, 2005), 43–52.
- [11] Green, M. J., and Myers, K. R. Graphic medicine: use of comics in medical education and patient care. *BMJ* 340 (Feb. 2010), c863.
- [12] Hui, K.-L., Teo, H. H., and Lee, S.-Y. T. The Value of Privacy Assurance: An Exploratory Field Experiment. *MIS Quarterly* 31, 1 (Mar. 2007), 19–33.
- [13] Johnson, E. J., Bellman, S., and Lohse, G. L. Defaults, Framing and Privacy: Why Opting In \neq Opting Out. *Marketing Letters* 13, 1 (2002), 5–15.
- [14] Kay, M., and Terry, M. Textured Agreements: Re-envisioning Electronic Consent. In *Proceedings of the Sixth Symposium on Usable Privacy and Security* (Redmond, WA, 2010), 13:1–13:13.
- [15] Kelley, P. G., Bresee, J., Cranor, L. F., and Reeder, R. W. A “nutrition label” for privacy. In *Proceedings of the 5th Symposium on Usable Privacy and Security* (Mountain View, CA, 2009), 1.
- [16] Knijnenburg, B. P., and Bulgurcu, B. Form Auto-completion Tools Designed for Elaboration: Overcoming the Deleterious Effects of Decisional Heuristics on Users’ Privacy. Submitted for journal publication, 2016.
- [17] Knijnenburg, B. P., and Kobsa, A. Making Decisions about Privacy: Information Disclosure in Context-Aware Recommender Systems. *ACM Transactions on Interactive Intelligent Systems* 3, 3 (2013), 20:1–20:23.
- [18] Knijnenburg, B. P., and Kobsa, A. Increasing Sharing Tendency Without Reducing Satisfaction: Finding the Best Privacy-Settings User Interface for Social Networks. In *ICIS 2014 Proceedings* (Auckland, New Zealand, 2014).
- [19] Lai, Y.-L., and Hui, K.-L. Internet Opt-In and Opt-Out: Investigating the Roles of Frames, Defaults and Privacy Concerns. In *Proceedings of the 2006 ACM SIGMIS Conference on Computer Personnel Research* (Claremont, CA, 2006), 253–263.
- [20] Luger, E., Moran, S., and Rodden, T. Consent for All: Revealing the Hidden Complexity of Terms and Conditions. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Paris, France, 2013), 2687–2696.
- [21] Malhotra, N. K., Kim, S. S., and Agarwal, J. Internet Users’ Information Privacy Concerns (IUIPC): The Construct, the Scale, and a Nomological Framework. *Information Systems Research* 15, 4 (2004), 336–355.
- [22] McAllister, M. P. Comic Books and AIDS. *The Journal of Popular Culture* 26, 2 (Sept. 1992), 1–24.
- [23] McDonald, A., Reeder, R., Kelley, P., and Cranor, L. A Comparative Study of Online Privacy Policies and Formats. In *Privacy Enhancing Technologies*, vol. 5672

of *Lecture Notes in Computer Science*. Springer Berlin / Heidelberg, 2009, 37–55.

- [24] Nielsen, J. *Lower-Literacy Users: Writing for a Broad Consumer Audience*, Mar. 2005.
<https://www.nngroup.com/articles/writing-for-lower-literacy-users/>.
- [25] Nissenbaum, H. A Contextual Approach to Privacy Online. *Daedalus* 140, 4 (Oct. 2011), 32–48.
- [26] Reeder, R. W., Kelley, P. G., McDonald, A. M., and Cranor, L. F. A User Study of the Expandable Grid Applied to P3p Privacy Policy Visualization. In *Proceedings of the 7th ACM Workshop on Privacy in the Electronic Society* (Alexandria, VA, 2008), 45–54.
- [27] Reid, J. M. *Learning Styles in the ESL/EFL Classroom*, 1st edition ed. Heinle & Heinle Publishers, New York, Mar. 1995.
- [28] Smith, H. J., Milberg, S. J., and Burke, S. J. Information Privacy: Measuring Individuals’ Concerns about Organizational Practices. *MIS Quarterly* 20, 2 (1996), 167–196.
- [29] Tsai, J. Y., Egelman, S., Cranor, L. F., and Acquisti, A. The Effect of Online Privacy Information on Purchasing Behavior: An Experimental Study. *Information Systems Research* 21, 1 (2010), 1–18.

APPENDIX

A. QUESTIONNAIRES AND TESTS

Listed below are the various questionnaires and tests used in our proposed studies, experiments, and trials.

A.1 Feedback Questions

These are the feedback questions asked in the interview study (see Section 4.1).

1. Please read this text/comic carefully. Once you are done, please describe what it says in your own words.
2. Based on this text/comic, what expectations do you have regarding your privacy? (skip if already answered in 1)
3. What would you change about this text/comic version? How can we improve future versions?
4. If you click on the link in this text/comic, what kind of “settings” page do you expect to encounter? What will you be able to do on that page? (skip if already answered in 1 or 2)
5. Please click on the link and inspect the settings page. Was this what you expected to see here?
6. Can you explain each of these settings in your own words?
7. Here is a comic/text version of the same explanation. Do you think this explanation is better or worse than the one you just read? Why?
8. What would you change about this text/comic version? How can we improve future versions?
9. Which version do you prefer for this explanation? Why?
10. How satisfied are you with this privacy setting? If anything, what would you change about it?

A.2 Comprehension Test

In the controlled experiment, comprehension questions for each page are asked right after the user has interacted with the page (see Section ??). Below are the test items for the Activity Controls page. Correct answers are printed in bold.

1. By pausing Web and Application activity...
 - You can stop Google from collecting information on your searches in the future while also removing your previously stored information.
 - **You halt Google from collecting information on your searches resulting in less personalized content being displayed.**
 - You stop Google’s ability to give you personalized content based on the information they collect.
 - You prevent Google from displaying advertisements based on your activity.
2. When you turn on Device Information...
 - Google sends you reminders when your operating system needs updating.
 - **Google helps you keep track of events and other things that are relevant to you throughout the day.**
 - Google tracks the information on your current device only.
 - Your contacts, calendars, alarms, apps, music, movies, books, and other content are stored publicly (anyone can access them).
3. If you pause your YouTube watch history...
 - All watch history will be removed from your YouTube account.
 - You no longer get any recommendations for new videos.
 - Your future searchers will not appear in your search history.
 - **Previous watch activity is maintained, but new watch activity will no longer be stored.**
4. When you turn on Voice & Audio Activity...
 - You enable audio dictation on your smartphone.
 - Google will continuously record and save all audio from your signed-in devices to your account.
 - **A recording of the speech/audio following “Ok Google” or a press on the microphone icon, plus a few seconds before, will be stored.**
 - You enable the “Ok Google” feature; this feature does not work without turning on Voice & Audio Activity.

A.3 Overview Test

At the end of the controlled experiment, participants will be tested once more to test their understanding of the purpose of each page. The questions below each have seven answer options, one for each page. The correct answer is displayed in parentheses. These questions are asked in a random order.

- Where can you decide on what types of data you would like saved with your account when you use Google services? (Activity Controls)
- Where can you view types of information tied to your Google Account? (Google Dashboard)

- Where can you edit your categorical interests that affect advertisements? (Advertisement Page)
- Where can you adjust how your Google+ Profile appears to others? (Google+ Profile Page)
- Where can I go about learning about troubleshooting and Connections? (Google+ Help Center Page)
- Where can you download your data containing information about your Google Account? (Accounts Help Page)
- Where can you decide if your profile and photo are displayed in advertisements? (Shared Endorsements Page)

A.4 Subjective Evaluation Questionnaires

The following measurement scales will be used to evaluate the quality of the descriptions, the settings interface, users' privacy threat, and their general privacy and collection concerns. All items are asked on a 7-point scale from *completely disagree* to *completely agree*.

A.4.1 Perceived ease of use of the settings pages

Taken from [18].

1. Setting my Google settings is convenient.
2. I was able to quickly set my Google settings.
3. Setting my Google settings was unnecessarily complex.
4. I felt lost using the Google settings pages.
5. Setting my Google privacy was a harrowing experience.

A.4.2 Perceived effectiveness of the settings pages

Newly developed scale.

1. I was able to decide what settings to make.
2. I understood the purpose of each privacy setting.
3. I was able to set the settings that I really wanted.
4. In setting my Google settings, I was able to make a balanced tradeoff between privacy and usefulness.
5. I understood how to set my settings in a way that is right for me.

A.4.3 Perceived value of the descriptions

Based on [17].

1. The page descriptions helped me to decide what settings to make.
2. The page descriptions explained the purpose of each privacy setting.
3. The page descriptions helped me to make a tradeoff between privacy and usefulness.
4. The page descriptions left me clueless about how to set my privacy settings.

A.4.4 Comprehension of the descriptions

Newly developed scale.

1. After reading the page descriptions, I have a very solid understanding of how my privacy works on this website.
2. I feel that the page descriptions were explained in a clear manner.

3. I felt confident answering questions about the contents of the described page.
4. From reading the page descriptions, I understand the value of using the settings pages.
5. The page descriptions were difficult to understand.
6. The page descriptions did not tell me why I should set my settings.

A.4.5 Motivation to read the descriptions

Newly developed scale.

1. I felt that reading the page descriptions was tedious and boring.
2. I find that the page descriptions were an interesting read.
3. Reading the page descriptions was enjoyable.
4. I had a hard time reading the page descriptions.
5. I completely read the all of the page descriptions.
6. I skimmed through some of the page descriptions.
7. I enjoyed reading the page descriptions.
8. The page descriptions did not appeal to me.

A.4.6 Motivation to set one's privacy settings

Based on [16].

1. The page descriptions made me feel that it is worthwhile to put in the effort to carefully set my Google settings.
2. The page descriptions made me think that it is important to contemplate how to set my Google settings.
3. The page descriptions motivated me to carefully consider what settings are appropriate to my personal situation.
4. The page descriptions made me want to put considerable effort into setting my Google settings.
5. The page descriptions motivated me to set my Google settings in a way that is right for me.

A.4.7 Self-efficacy to set one's privacy settings

Based on [16].

1. The page descriptions provided me with the skills to set my Google settings the way I really wanted.
2. The page descriptions enabled me to carefully deliberate how to set each setting.
3. The page descriptions gave me the competency to decide on my Google settings.
4. The page descriptions helped me control my Google settings.
5. The page descriptions helped me to set my Google settings in a way that is right for me.

A.4.8 Perceived over-disclosure threat

Taken from [18].

1. I am afraid that due to my Google settings, I am sharing my information too freely.

2. I am comfortable with the amount of sharing I chose in my Google settings.
3. Due to my Google settings, people may know too much about me.
4. In setting my Google settings, I made sure that nobody gets to see more information about me than I am comfortable with.
5. I fear that I have been too liberal in selecting my Google settings.
6. My Google settings are spot on; I am not disclosing too much to anyone.

A.4.9 General Privacy Concerns (GIPC)

Taken from [28].

1. All things considered, the Internet would cause serious privacy problems.
2. Compared to others, I am more sensitive about the way online companies handle my personal information.
3. To me, it is the most important thing to keep my privacy intact from online companies.

4. I believe other people are too much concerned with on-line privacy issues.
5. Compared with other subjects on my mind, personal privacy is very important.
6. I am concerned about threats to my personal privacy today.

A.4.10 Collection Concerns

Based on [21], extended by [17].

1. It usually bothers me when online companies ask me for personal information.
2. When online companies ask me for personal information, I sometimes think twice before providing it.
3. It bothers me to give personal information to websites.
4. Websites may collect any information about me because I have nothing to hide.
5. I'm concerned that websites are collecting too much personal information about me.
6. I'm not bothered by data collection because my personal information is publicly available anyway.