Evaluating Usability and Security with Users of All Ages

Barry Po

Cogneto Development Inc.

330-1085 Homer St.

Vancouver, B.C., Canada

V6B 1J4

bpo@cogneto.com

Engilla Loo

Cogneto Development Inc.

330-1085 Homer St.

Vancouver, B.C., Canada

V6B 1J4

eloo@cogneto.com

Martin Renaud

Cogneto Development Inc.

330-1085 Homer St.

Vancouver, B.C., Canada

V6B 1J4

mrenaud@cogneto.com

Patrick Audley

Cogneto Development Inc.

330-1085 Homer St.

Vancouver, B.C., Canada

V6B 1J4

paudley@cogneto.com

Abstract

Although studying the users of security technologies already presents unique challenges for HCI, testing these technologies with users of all ages (including children and the elderly) introduces many other issues that must be addressed. Among these, understanding special ethical and legal considerations, addressing protocol compliance, and managing testing outcome expectations need additional attention. Based on our experiences in testing with users of all ages, we suggest some strategies for dealing with these kinds of issues.

Keywords

Security, user studies, children, elderly, best practices.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Continuous evaluation and user testing are important components of developing systems that are both usable and secure. As is true about evaluation in HCI in general, formal and controlled user studies remain an important way for researchers and practitioners to understand the usability issues and effectiveness of

proposed security methods and technologies. Many research studies rely on users that fall into a reliable range of ages (i.e. participants in studies are often university students as in a recent phishing study by Dhamija, Tygar, and Hearst [2], and an evaluation of security toolbars by Wu, Miller, and Garfinkle [6]).

However, many users who deal with security on a regular basis fall outside this range of ages. Younger users (including those who are under the age of eighteen) are familiar with authentication in the form of username and passwords for instant messaging (IM) or Web site sign-on. Elderly users (including those who are well past retirement age) also deal with security regularly as many access their bank accounts online or may be required to verify their identity for access to medical services. AOL reports that nearly thirty percent of teenagers under the age of eighteen say they cannot imagine their lives without instant messaging [1]. A Pew Center study by Fox and Beier suggests that at least twenty-seven percent of "silver surfers" over the age of sixty-five use the Internet regularly for banking activities, a number that is expected to grow in years to come [3].

It is becoming increasingly evident that users of all ages must be taken into account when evaluating new security methods or technologies. In this position paper, we outline some critical issues that need to be addressed and suggest some "best practices" when conducting user evaluations including users of all ages. These are based on our own personal experiences running user trials that evaluate new online security technologies under controlled conditions.

Issues with Studies Including Users of All Ages

Our experiences with running user studies involving very young participants (as young as ten years old) and very old participants (as old as seventy-seven years) suggest there are at least three aspects of running a user study that must be even more carefully considered than usual. Many of these issues are reflective of issues touched upon by others who have run user studies with the young and elderly, including Hanna, Risden, and Alexander [4] who suggest guidelines for tailoring traditional software usability testing to allow children to participate, and Nielsen [5] who followed the Web usage patterns of seniors over the age of sixty-five.

Providing informed consent with participants young and old. When running a user study involving participants below legal age or those beyond retirement age, we have found that establishing "informed consent" is challenging. Informed consent is especially important in security user studies for these participant groups because many "relevant" user tasks may introduce many non-trivial privacy concerns. Children below legal age typically must have the consent of a parent or guardian, many of whom may not have any prior experience participating in a user study or controlled trial of any kind. Elderly participants often proceed with informed consent very carefully, requiring more time on the part of facilitators or researchers and the participant.

Addressing protocol compliance. Unlike user studies involving participants in the 18-50 age range, we found that research involving younger and older users was further complicated by the fact that such

participants had more difficulty in adhering to study procedure, especially when asked to perform tasks over an extended period of time. We found that younger participants had shorter attention spans and it could be difficult to keep them focused on completing tasks as instructed. We found that older participants got tired quickly, making it difficult to evaluate them in tasks that would be considered "easy" for someone younger. Where security user studies are concerned, having participants who are unable to successfully complete assigned tasks substantially reduces the amount of data available for subsequent analysis – almost fatal in security applications, where it can already be difficult to collect minimally acceptable quantities of data for statistical analysis.

Managing testing outcomes and expectations.
Consistent with the two issues described above, we found that it was also important to establish reasonable expectations for the quality of usability data collected during studies with younger and older users. Because of difficulties in obtaining informed consent and having participants adhere to study protocol, usability data collected from these participant groups was often found to be incomplete or unreliable. As such, we found that it was also important to devise strategies for coping with the relatively sparse quality of the data from these studies. In the context of security user studies, this can be important because there are many "industry standard" metrics that are important to measure (false acceptance and false rejection, for example) but are difficult to assess with these groups using existing tools and techniques.

Best Practices
Based on our experiences in user testing with users of all ages, we suggest the following "best practices" as strategies for mitigating the previously outlined issues. We generally found that older participants were more likely to call for help during studies while younger participants were more likely to internalize their problems, attempting to solve their participation issues without involving researchers or facilitators.

Customize informed consent for each age group participating in a user study. We found that potential participants were able to better understand their legal and ethical obligations when informed consent was presented using language familiar to them. For young children and their parents or guardians, it was often helpful to explain the same concepts in multiple ways. For elderly participants, it was helpful to provide a step-by-step breakdown to what it was they were consenting. Offering simpler language explanations were helpful for both groups.

Use analogies wherever possible to encourage understanding during a study. We found that using analogies to daily life experiences were helpful both for getting children and young teenagers to understand what it was they were being asked to do during a study and also for offering peace of mind to their parents or guardians. Analogies helped us convey peace of mind because it allowed us to show both parent and participant that what they were being asked to do was no different than what they might do in front of their computer at home. They were also useful among elderly participants because many of them were not technically sophisticated and were unfamiliar with many "technical" terms and phrases.

Treat studies with younger and older participants more like case studies rather than complete controlled studies. In user studies involving participants with special needs or accessibility issues, it is generally understood that it is not possible to assess study results in the same way as studies involving "healthy" participants. We found that we were able to obtain more value from studies involving younger and older participants by relying more heavily on qualitative rather than quantitative analysis, and spending more time with each individual participant to get a sense for the kinds of usability issues they experienced.

Discussion at the Workshop

At the workshop, we would be interested in pursuing a discussion on how security user studies can better address the needs of younger and older participants, both for practical evaluation and theoretical research (i.e. what methods or techniques are most appropriate under these conditions and why). We acknowledge that the list of issues and best practices listed above are not exhaustive and we would like to encourage deeper discussions about how the ethical conditions under which user studies are conducted change when children or the elderly are involved. Time permitting, it would also be interesting to discuss how the lessons learned with users of all ages might be applied to users with disabilities or special needs.

Conclusion

We presented a number of issues and "best practices" for managing the experience of younger and older participants in security user studies. These suggest that a deeper discussion of study issues is important when dealing with users of all ages because there is as yet a limited understanding for how such users are best treated in the context of evaluating new security methods and technologies.

References

[1]   AOL. New AP-AOL Instant Messaging Trends Survey Finds Majority of Teens Send More Instant Messages than Emails. (2006). Available: http://press.aol.com/article_display.cfm?article_id=1138 (January 10, 2007).

[2]   Dhamija, R., Tygar, J. D., and Hearst, M. Why phishing works. In *Proc CHI 2006*, ACM Press, pp. 581-590.

[3]   Fox, S. and Beier, J. Online Banking 2006: Surfing to the Bank. (2006). Available: http://www.pewinternet.org/pdfs/PIP_Online_Banking_2006.pdf (January 10, 2007).

[4]   Hanna, L., Risden, K., and Alexander, K. Guidelines for usability testing with children. In *Interactions 4(5)*. (1997). ACM Press, pp. 9-14.

[5]   Nielsen, J. Usability for Senior Citizens. (2002). Available: http://www.useit.com/alertbox/20020428.html (January 10, 2007).

[6]   Wu, M., Miller, R. C., and Garfinkle, S. L. Do security toolbars actually prevent phishing attacks? In *Proc CHI 2006*, ACM Press, pp. 601-610.