

1. Ethics Application for Institutional Review Board

The proposed research seeks to investigate the ease of use of two web browser plug-ins, PwdHash and Password Multiplier, which help users manage passwords. The goal is to evaluate their usability and effectiveness as security aids to prevent cyber criminals from gaining access to user accounts. This initial investigation is part of a class project for COMP5408, a graduate-level computer security class offered by Dr. van Oorschot of the School of Computer Science at Carleton University (Ottawa). Since the study will be conducted through the Human-Oriented Technology Lab (HOT Lab), ethics approval is required through the Carleton Ethics Committee for Psychological Research.

This proposal concerns the protocol regarding the usability tests. Formal usability tests will be conducted to assess the effectiveness and value of the password managing tools for computer users. Participants will be asked to complete a series of tasks representing typical actions undertaken by users of these programs. The usability test will also examine the perceptions and preferences of the users and will prompt the users for suggestions for improvements to the interfaces.

1.1. Method

The study consists of a usability test that requires the recruitment of participants. The procedure and materials are described in the following sections and included in the Appendices. Participants are asked to complete a one-hour session which will be used to test specific aspects of the password manager interfaces. Examples are provided to demonstrate what the typical task can be expected to resemble.

1.2. Usability Test

Participants. A potential user group has been identified as typical target users. This group consists of computer users who are familiar with navigating the web and using websites that require users to enter a username and password to access certain areas of the site. Participants will be primarily recruited from the University community. Up to 100 participants will be recruited to take part in the usability test. Participants will be paid a \$10 honorarium for their time. A notice of recruitment will be broadcast through email (see Appendix A for notice of recruitment). Some of the participants for this study will be recruited through the Psychology's Online Experiment Recruitment System. This same notice may be handed out to some personal contacts that would likely be willing to participate in the study.

Materials. The materials include: a computer with internet access and the PwdHash and Password Multiplier web browser plug-ins installed, a video camera and audio recording equipment, an informed consent form (See Appendix B), a video taping consent form (See Appendix C), a participant information form (See Appendix D), a set of instructions (See

Appendix E), ten usability tasks (See Appendix F for a sample), a Post-test questionnaire (See Appendix G), a debriefing form (See Appendix H) and a pencil or pen.

Procedure. Participants will be recruited via a notice broadcast through email, or through the Psychology Department's online recruiting system. Sessions will take place in the HOT Lab's Usability lab. After being escorted to the experiment room, participants will be given an informed consent form to read over and sign, if they wish to take part in the study. They will be told that we would like to video tape them completing the usability tasks and that in order to do so we require their consent, so they will be given an additional consent form to sign that is specific to the video/audio taping segment of the usability test. Each participant will be informed that the usability test is to test the software and not them. They will be reminded that they are not to feel bad if they cannot complete every task because the tasks are designed to test how easy the software is to use.

Although the software tested is intended to protect passwords, users will be given test accounts and will not be using their own accounts or passwords for any part of the study. Talk aloud protocol will be used, which required participants to verbalize what they are thinking when they are attempting to complete each task. They will be required to complete up to ten tasks, presented on cue cards, in random order. Participants will be asked to provide ratings after each task, offering a measure how easy or difficult it was for them to complete the task.

Time limits will not be imposed, but the tasks will be designed so that the session takes one hour at most. They will be told that they are free to give up when they feel they have spent enough time on the task and they will be informed that they are welcome to take rest breaks throughout the study.

Participants will be asked to complete a post-test questionnaire after the session. It will request their opinion of the password managers through Likert-scale questionnaires and through open-ended questions. Prior to being debriefed, participants will be asked to provide suggestions on what could be done to improve the software. Participants will be debriefed at the conclusion of the usability test.

1.3. Appendix A - Announcement for Recruitment - Usability Test

Participants will be recruited in three ways:

Approaching Prospective Participants

Prospective participants will be approached and asked if they would be willing to participate in the usability test.

Posting a Notice of Recruitment

Notices of recruitment, requesting participation in the usability test, will be posted on bulletin boards at Carleton University. A email requesting participants will also be sent to ***** requesting that she forward it to the Departmental email list. Personal contacts who may be interested in participating will also be contacted through email.

Notices sent to electronic mailing lists will be in the following format:

Hi,

My name is ***** and I am a PhD student in the HOT Lab. I am conducting a study on the usability of password managers for web browsers. The goal is to gain some insight on the practicality of recently proposed solutions for helping people secure their web accounts from cyber attacks.

I am recruiting volunteers to take part in the usability test. Participants should have experience browsing the web and using websites that require a username and password to gain access. You will not be required to use your own accounts or passwords for the study. A \$10 honorarium will be given.

If you are interested in participating in this project, please contact me at:

Kind Regards

Posting a Notice on the Psychology Department's Online Recruitment System

A notice of recruitment will be posted through the Psychology Department's Online Recruitment System.

Posted notice of recruitment will contain the following information:

- We are conducting a study on the usability of password managers
- We are recruiting volunteers to take part in a usability test
- Participants will receive a \$10 honorarium
- For more information, send email to: *****.ca or call the HOT Lab at *****

1.4. Appendix B - Consent Form - Usability Test

Research Personnel

***** Principle Investigator Carleton University (613) ***** Email: *****	Dr. ***** Faculty Sponsor Carleton University (613) ***** Email: *****
---	--

Purpose

The purpose of this usability test is to evaluate the practicality of password managers. We are trying to determine how easy it is for people to use this software to help protect their web account passwords.

Task Requirements

We will ask you to complete a series of ten tasks and ask you to think out loud while you work on them. At the conclusion of each task you will be asked to give a rating as to how easy or difficult you found the task and how satisfied you were with it. We will then ask that you fill out a short questionnaire and at the conclusion of the testing session you will be asked to provide us with any suggestions you might have to improve the software.

Duration and Locale

Each session should take approximately 1 hour. You will be paid a \$10 honorarium for your time. The testing will primarily take place at the HOT Lab located in room *****.

Potential Risk/Discomfort

There will be no psychological or physical risk.

Anonymity/Confidentiality

All data that is collected will be held completely confidential. Data will be coded for identification purposes. Sessions may be audio and video taped. If the session is to be recorded, you will be asked to sign a separate consent form indicating your agreement.

Right to Withdraw

You have the right to withdraw at any time, without any explanation as to the reason for withdrawing from the testing. You will receive the \$10 honorarium even if you choose to withdraw from the study.

If you have concerns about the ethics of this research, please contact Dr. *****. For other questions about the research, please contact Dr. *****:

Dr. ***** Chair, Department of Psychology Carleton University (613) ***** Email: *****	Dr. ***** Chair, Carleton University Ethics Committee for Psychological Research Carleton University (613) ***** Email: *****
--	--

Signatures

I have read and understand the above terms of testing and I understand the conditions of my participation. My signature indicates that I agree to participate in this experiment.

Participant's Name: _____

Participant's Signature: _____

Researcher's Name: _____

Researcher's Signature: _____

1.5. Appendix C - Audio and Video Taping Consent Form

We would like to record information about how you work with the system for the purposes of evaluating the software and showing the results of our testing. This audio and video taping consent form requests your permission for us to audiotape your statements and videotape the monitor while you are performing the tasks.

Video and audio will be recorded in digital format and stored on DVDs in a secure location. The data will be kept for a maximum of 2 years and then the DVDs will be destroyed.

By signing this form you give you consent to use the information you give us, your voice, verbal statements, and videotape pictures, but not your name, only for the purpose of evaluating the software and showing the results of our testing.

Participant's Name: _____

Participant's Signature: _____

Date: _____

1.6. Appendix D - Participant Information – Usability Test - Student

This information will be held completely confidential.

(Please, do not put your name on this form!)

1. Age: (check one) ☐ 18-30 ☐ 31-50 ☐ 51+
2. Sex: (check one) ☐ male ☐ female
3. In what academic program are you enrolled?
4. At what level are you studying?
☐ Undergraduate ☐ Masters ☐ Ph.D
5. What year of study are you in? _____
6. On a scale of 1 (novice) to 10 (expert), how would you rate yourself with respect to your computer skills?
7. How often do you browse the web?
☐ Daily ☐ Several times a week ☐ Once a week ☐ Less than once a week
8. Approximately how many web sites do you visit that require a username and password?
9. Do you sometimes re-use the same password on different web sites?

10. Are you concerned about the security of your passwords?

11. How do you decide if a web site is secure?

12. What criteria do you use for choosing a password? (Select more than one if appropriate)

- | | |
|--|--|
| <input type="checkbox"/> It is easy for you to remember | <input type="checkbox"/> It is suggested by the system |
| <input type="checkbox"/> It is difficult for others to guess | <input type="checkbox"/> It is the same as another password you currently have |
| <input type="checkbox"/> Other (please specify): | |

13. Do you participate in the following activities? (Select more than one if appropriate)

- | | |
|---|---|
| <input type="checkbox"/> Online purchases | <input type="checkbox"/> Online bill payments |
| <input type="checkbox"/> Online banking | <input type="checkbox"/> Other activities requiring personal or financial details |

14. If so, what extra measures do you take for securing your passwords for these accounts (if any)?

Participant Information – Usability Test – Non-Student

This information will be held completely confidential.

(Please, do not put your name on this form!)

1. Age: (check one) ☐ 18-30 ☐ 31-50 ☐ 51+
2. Sex: (check one) ☐ male ☐ female
3. What is your occupation?
4. On a scale of 1 (novice) to 10 (expert), how would you rate yourself with respect to your computer skills?
5. How often do you browse the web?
☐ Daily ☐ Several times a week ☐ Once a week ☐ Less than once a week
6. Approximately how many web sites do you visit that require a username and password?
7. Do you sometimes re-use the same password on different web sites?

8. Are you concerned about the security of your passwords?

9. How do you decide if a web site is secure?

10. What criteria do you use for choosing a password? (Select more than one if appropriate)

☐ It is easy for you to remember

☐ It is suggested by the system

☐ It is difficult for others to guess

☐ It is the same as another password
you currently have

☐ Other (please specify):

11. Do you participate in the following activities? (Select more than one if appropriate)

☐ Online purchases

☐ Online bill payments

☐ Online banking

☐ Other activities requiring personal or
financial details

12. If so, what extra measures do you take for securing your passwords for these accounts (if any)?

1.7. Appendix E - Usability Test Instructions

This is a usability test designed to test the practicality and ease of use of the password managing software. Please keep in mind that I am testing the effectiveness of the software and not you.

I will provide you with test accounts and passwords; you will not need to use your real passwords. I will ask you to complete a series of tasks and would like you to think aloud while you try to complete them - that means telling me what's happening as you work on the tasks – tell me what you're doing, mention anything you find easy, difficult, or unexpected - just keep me updated on what is happening. I will give you an instruction sheet for each program and you can refer to it whenever you need to.

Some tasks are easy, while some are more difficult. Don't worry if you can't find the answer every time. If you think you've tried everything and you can't figure out how to finish a task just let me know and we will move on to the next task. The goal of this test is to evaluate how easy or difficult it is for people to use the software.

For each task, I will give you a card that describes the task and then asks two questions. We'll complete 5 tasks with one program and then we'll repeat the same tasks with the second program. I'll ask you to fill in questionnaires at different points during the experiment.

The test will take about an hour, you may take breaks whenever you need them.

Do you have any questions?

Please pretend you are at your home computer and have already installed the necessary software. I would like you to perform the following task:

1.8. Appendix F - Sample Usability Task

1a. Visit www.yahoo.com to check your email. Your username is “test99” and your master password for Password Multiplier is “password99”

1b. How easy or difficult was it to log in to the website?

Very Difficult	Difficult	Neutral	Easy	Very Easy
----------------	-----------	---------	------	-----------

1c. For this task, how satisfied are you with the software used to manage the password?

Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
---------------------	-------------	---------	-----------	-------------------

1.9. Appendix G - Sample Post-Test Questionnaire

The questionnaire will contain Likert-scale questions and some open-ended questions to gather participants' opinion of the password managers.

Question 1 – (opinion about ease of use)

I could easily log on to websites and manage my passwords.

Question 2 – (opinion about perceived security)

A cyber criminal could get my passwords if I use this software.

Question 3 – (opinion about usefulness)

This software is useful for managing my passwords.

Question 4 – (opinion about acceptance)

I would install and use this software on my computer.

Question 5 – (opinion about ease of learning)

It is initially difficult to learn to use this software.

1.10. Appendix H - Debriefing Form - Usability Test

The research I am conducting is part of a class project for a graduate level Computer Security class. Password security is a large problem because people usually pick passwords that are easy for cyber criminals to guess. People also often re-use passwords, so guessing one password can give criminals access to many accounts. Password Multiplier and PwdHash have been proposed as solutions to help protect passwords. We want to see if these are viable solutions.

The usability test was designed to identify problems with using these programs.

The results of the usability test will be used to evaluate the practicality of the programs and to make recommendations on how they can be improved. Your thoughts, comments, and opinions will be taken into consideration in making design recommendations. Thank you for participating in this usability test. Your time and effort are greatly appreciated!

If you have any further questions regarding this research, please contact:

***** Principle Investigator Carleton University (613) ***** Email: *****	Dr. ***** Faculty Sponsor Carleton University (613) ***** Email: *****
---	--

If you have concerns about the ethics of this research, please contact:

Dr. ***** Chair, Department of Psychology Carleton University (613) ***** Email: *****	Dr. ***** Chair, Carleton University Ethics Committee for Psychological Research Carleton University (613) ***** Email: *****
--	--