

# “THEY KEEP COMING BACK LIKE ZOMBIES”: IMPROVING SOFTWARE UPDATING INTERFACES

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**Updates Ready to Install**

Some apps could not be updated automatically.

Install Later

Try in an Hour  
Try Tonight  
Remind Me Tomorrow

**Adobe Reader Updater - Adobe Reader (11.0.00)**

**Update is available**

This update addresses customer issues and security vulnerabilities. Adobe recommends that you always install the latest updates.

You can continue working while download is in progress.

Details

**Java Update Needed**

Your Java version is out of date.

Update (recommended)  
Get the latest security update from java.com.

Block  
Block Java content from running in this browser session.

Later  
Continue and you will be reminded to update again later.

Do not ask again until the next update is available.

**Software update**

Update  
Check for updates

Auto update  
Check for updates automatically

Wi-Fi only  
Only downloadable when connected via Wi-Fi

**Update Gear software**

Downloading update package...  
00:00:35  
9% 1.18MB/12.53MB

Cancel Hide

The update package has been downloaded and copied to your Gear. Tap Install below to install the update.

Update details

Size : 12.53 MB  
The range in which your Gear can be detected has been increased and the auto connection feature has been improved  
How long your battery lasts between charges has been increased  
Your Gear's performance has been improved and its features have been enhanced  
S Voice will respond to your searches more quickly

**Notifications**

02/11/2012 4:29 PM  
Wi-Fi Bluetooth GPS Auto rotation  
2:35 PM  
Updates available 10 updates found

**New updates are available**

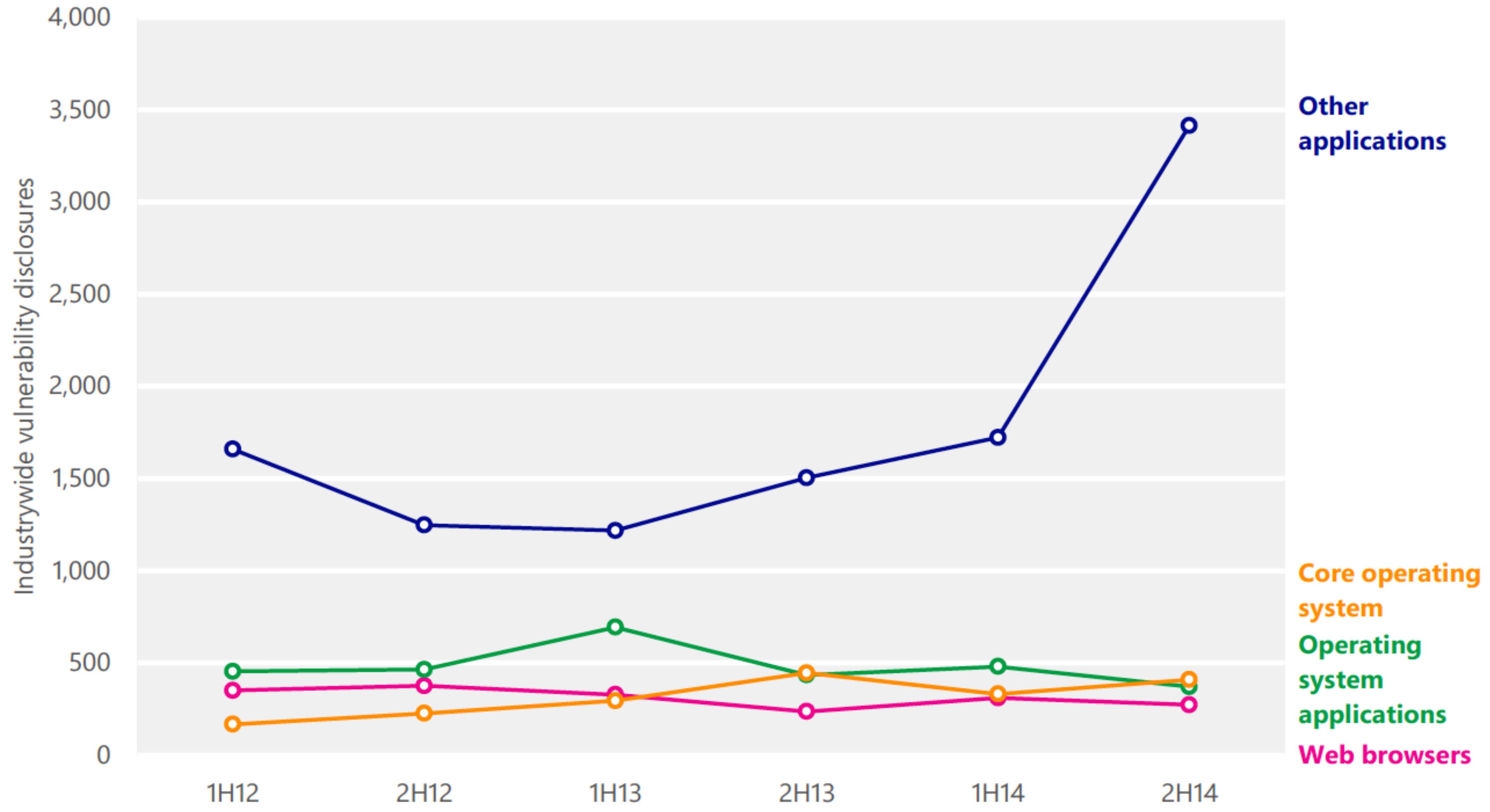
Click to install them using Windows Update.

2

# Why Do We Need Software Updates?

- ▶ No software is perfect
- ▶ Needs continual revision, maintenance, and improvements after initial release
- ▶ Software updates are change bearers
- ▶ They bring security, compatibility, usability, performance and other bug fixes

Figure 5. Industrywide operating system, browser, and application vulnerabilities, 1H12–2H14



# “...no one can hack my mind”: Comparing Expert and Non-Expert Security Practices

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## ABSTRACT

The state of advice given to people today on how to stay safe online has plenty of room for improvement. Too many things are asked of them, which may be unrealistic, time consuming, or not really worth the effort. To improve the security advice, our community must find out what practices people use and what recommendations, if messaged well, are likely to bring the highest benefit while being realistic to ask of people. In this paper, we present the results of a study which aims to identify which practices people do that they consider most important at protecting their security online. We compare self-reported security practices of non-experts to those of security experts (i.e., participants who reported having five or more years of experience working in computer security). We report on the results of two online surveys—one with 231 security experts and one with 294 MTurk participants—on what the practices and attitudes of each group are. Our findings show a discrepancy between the security practices that experts and non-experts report taking. For instance, while experts most frequently report installing software updates, using two-factor authentication and using a password manager to stay safe online, non-experts report using antivirus software, visiting only known websites, and changing passwords frequently.

## 1. INTRODUCTION

Frightening stories about cybersecurity incidents abound. The theft of millions of credit card numbers from a retail chain [10], a billion passwords from various websites [25], and a large set of nude celebrity photos [24] are just a few examples of stories that have been in the news lately.

In response to such security incidents, thousands of online articles and blog entries advise users what to do to stay safe online. Advice ranges from choosing a strong password [27] and having good security questions [38] to making email addresses unguessable [7] and entirely disabling photo backups in the cloud [27]. Besides such incident-related articles, many service providers, enterprises, and universities offer tips and training on how to stay safe online [2, 3, 17, 35].

If one hour of time from all US users is worth \$2.5 billion [19],

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*Symposium on Usable Privacy and Security (SOUPS) 2015, July 22–24, 2015, Ottawa, Canada.*

carefully considering the most worth-while advice to recommend is imperative. Even if users accept some responsibility for protecting their data [23, 43] and want to put in some effort [41], we should be thoughtful about what we ask them to do [20] and only offer advice that is effective and realistic to be followed.

Existing literature on giving good advice suggests that for recipients to follow it, the advice should be (a) useful, comprehensible and relevant, (b) effective at addressing the problem, (c) likely to be accomplished by the recipient, and (d) not possess too many limitations and drawbacks [34]. Therefore, to improve the state of security advice, we must assess which actions are most likely to be effective at protecting users, understand what users are likely and willing to do, and identify the potential challenges or inconveniences caused by following the advice. Furthermore, lessons from health advice in outreach interventions suggest that people will not initiate certain actions if they do not believe them to be effective [53]. Therefore, to learn how to best deliver the advice to users, we must also understand how users perceive its effectiveness and limitations.

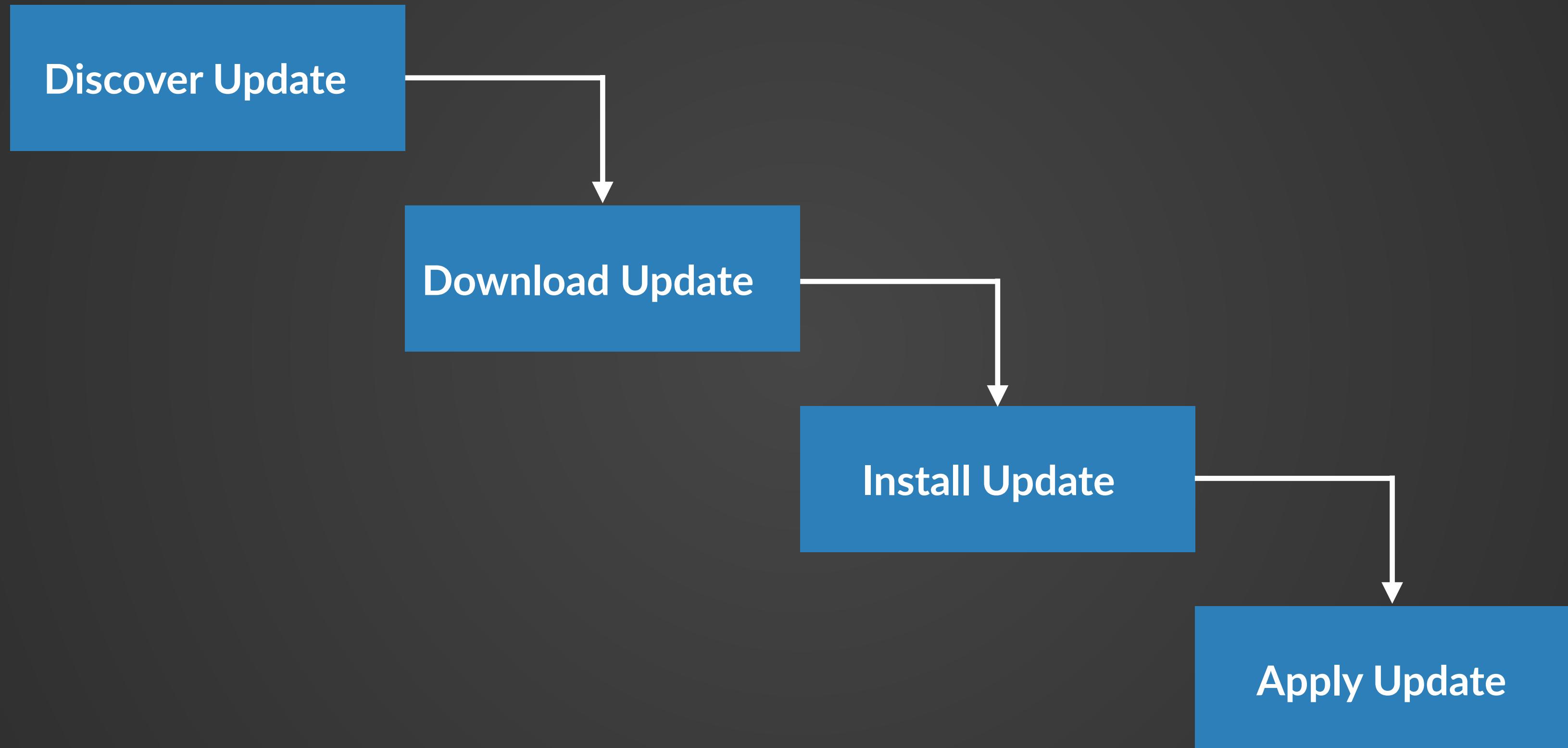
In preliminary work, we surveyed security experts to identify what advice they would give non-tech-savvy users. The most frequently given pieces of advice were, in order of frequency: (1) keep systems and software up-to-date, (2) use unique passwords, (3) use strong passwords, (4) use two-factor authentication, (5) use antivirus software, and (6) use a password manager. In this paper, we report on results of a study which tries to identify what security advice users currently follow and how their attitudes and practices differ from those of security experts. To this end, we conducted a survey with 294 participants recruited from Amazon’s Mechanical Turk crowdsourcing platform and another with 231 security experts recruited through an online blog. Our results help inform what important security advice users aren’t following.

Our results show that expert participants considered keeping the operating system and applications up-to-date, using strong and unique passwords, turning on two-factor authentication, and using a password manager the most important things they do to stay safe online. Non-expert participants, however, considered using antivirus software, using strong passwords, changing passwords frequently, and visiting only trusted websites to be very effective, but admitted to delaying installation of software updates and expressed some lack of trust in password managers. We found that generally experts’ security practices matched the advice they would give non-tech-savvy users, with a few exceptions. Experts recommended not clicking on links or opening emails from unknown people, yet they reported to do so at a higher rate than non-experts reported. Other security practices that non-experts considered very important, such as visiting only known websites, were not being followed by experts nor were they considered good security advice by experts.

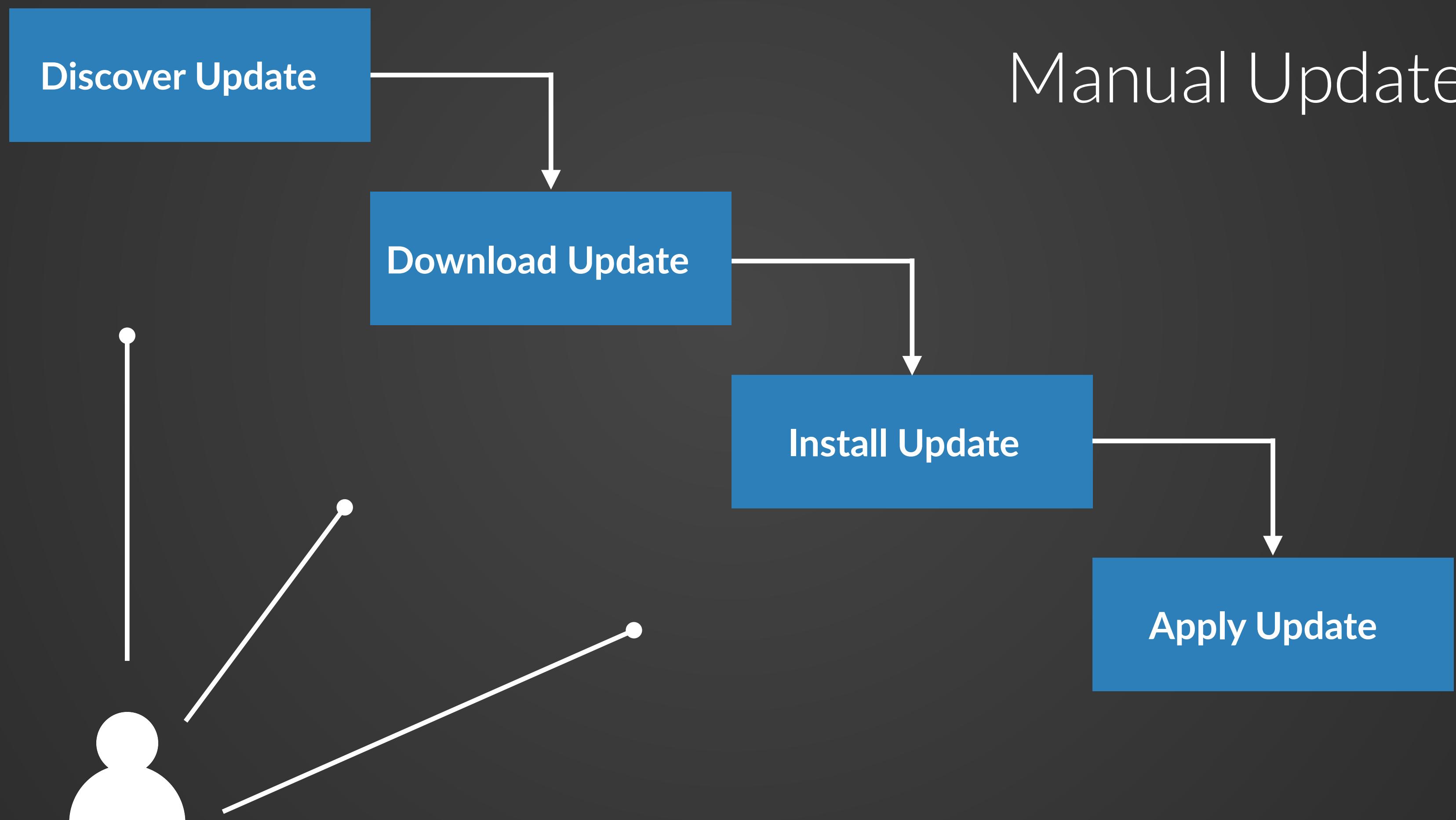
“ ...experts most frequently report installing software updates, using two-factor authentication and using a password manager to stay safe online.”

- Ion et al  
(SOUPS 2015)

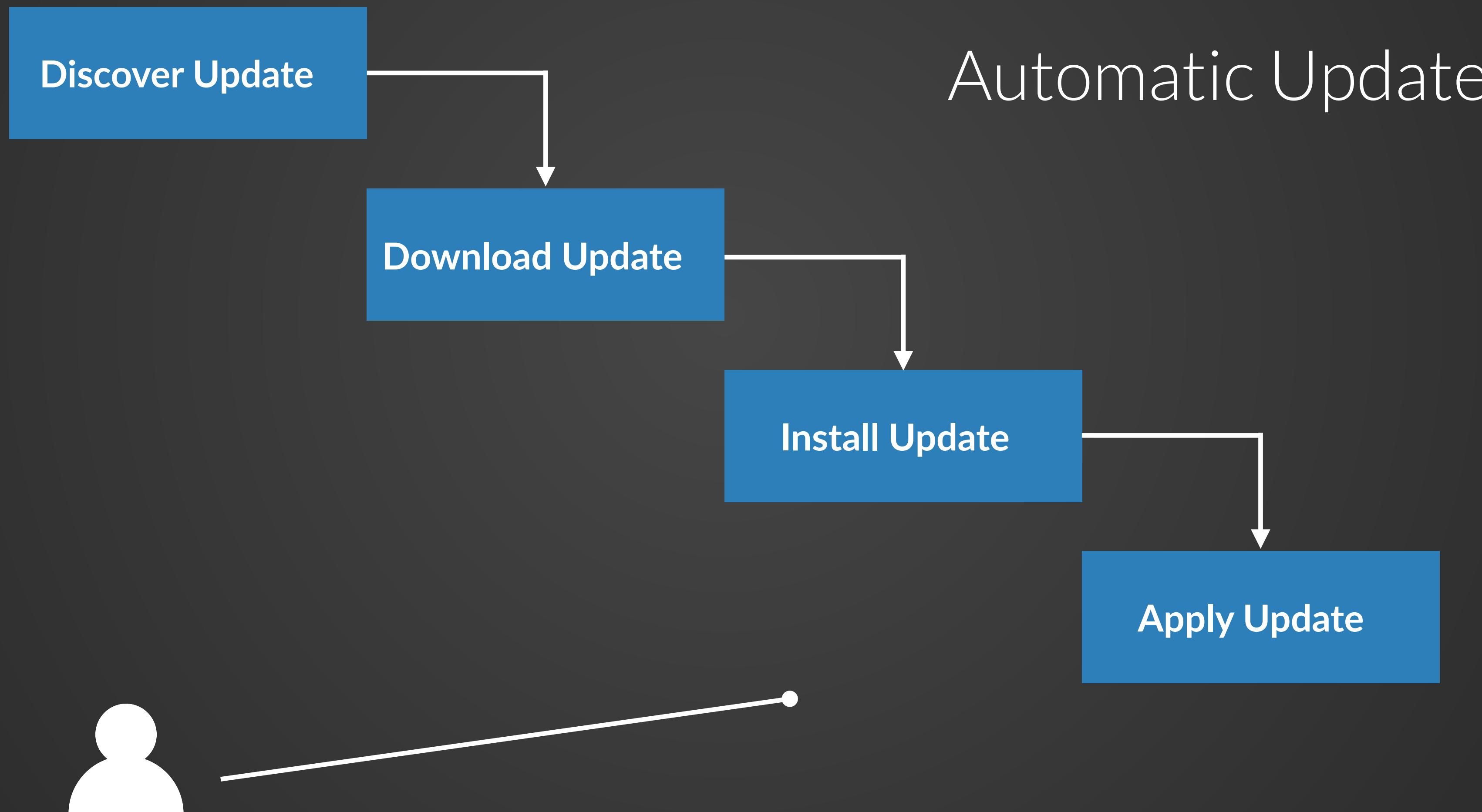
# How Do Updates On Clients Work?



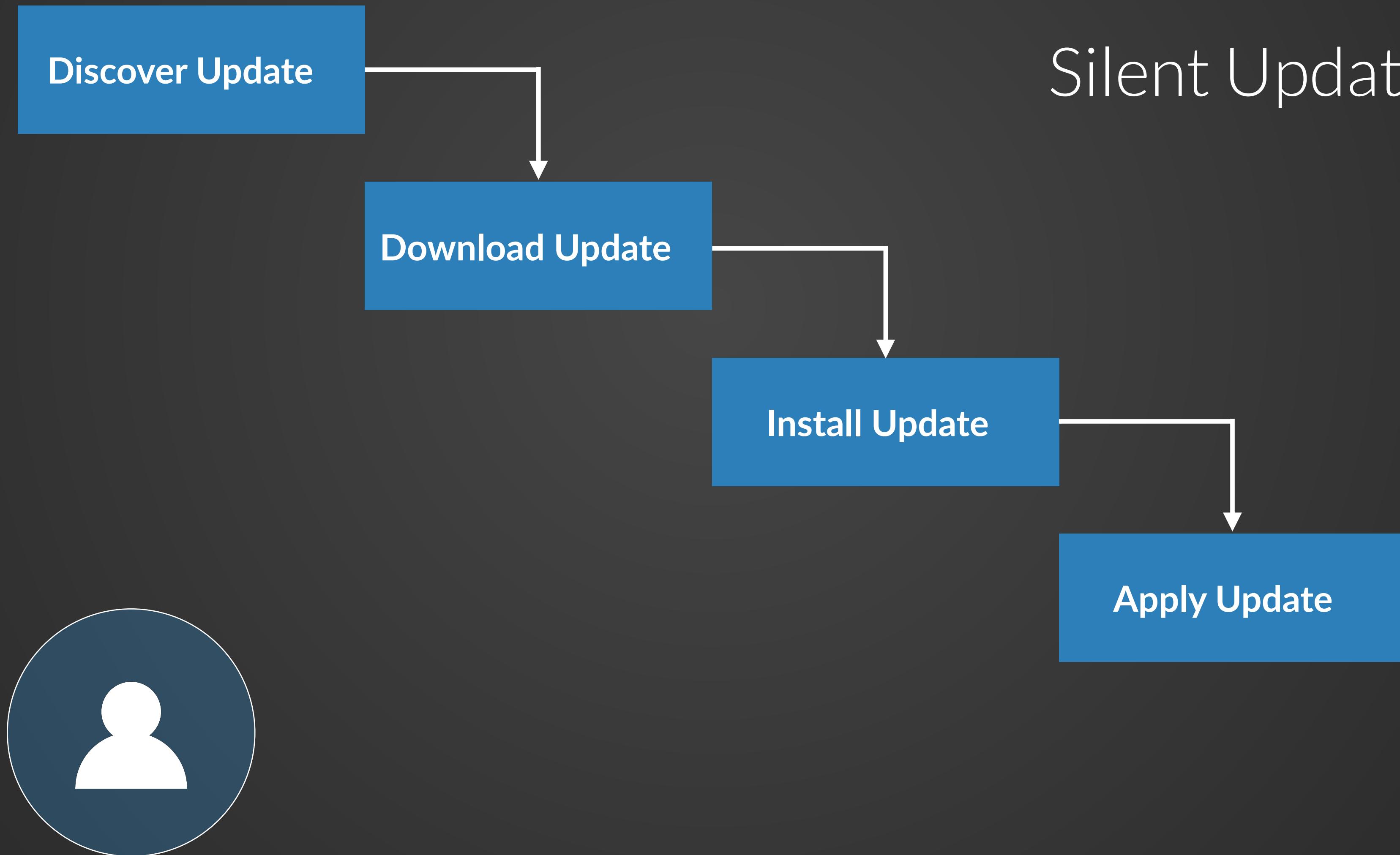
# How Do Updates On Clients Work?



# How Do Updates On Clients Work?



# How Do Updates On Clients Work?



# Research Questions

- ▶ How do users **navigate through** the software update process on **desktop** machines?
- ▶ How can we **redesign** the update experience on **desktop** machines to **increase patching rates** using **silent updates**?

# Timeline

Phase	Timeline
Phase One	Fall 2014
Phase Two	Spring 2015
Phase Three	Spring 2015

# Timeline

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**Phase One:** How do users navigate through the software update process on desktop machines?

# How Do Users Experience Desktop Updates?

- ▶ How do users **learn** when updates are **available**?
- ▶ How do they **understand** an update's **purpose**?
- ▶ How do they make **decisions** about updates?
- ▶ Why do they **avoid** updates?

# Method

## Interviews



- ▶ Advertised study through social media, mailing lists
- ▶ 30 participants
- ▶ 45 - 60 mins / \$15 gift cards
- ▶ Audio-taped and transcribed
- ▶ Open and inductive thematic coding (3 researchers)

# Results

- ▶ Software update notifications interrupt users' primary tasks

## Interruption: Notifications and Reminders (22/30)

“

I tend to let the update notifications **go away** but these days it looks like **people keep forcing** it so it comes back and **back like a zombie.**

”

## Interruption: Rebooting and Context Switch (19/30)

“

I absolutely **put them off until later**, because the update requires me to **stop** what I'm doing, **restart** the program and computer, and then **completely try to reconstruct where I left off.**

”

# Results

- ▶ Software update notifications interrupt users' primary tasks
- ▶ Software updating is an information problem (or lack of information problem)

## Information: What is this update about?

- ▶ Prioritized “**major**” updates over others 24/30
- ▶ Glanced through **change logs** 20/30
- ▶ Failed to identify **changes post-update** 11/30
- ▶ Information on **social media** / via **friends** 10/30

## Information: Will I regret updating?

- ▶ Uncomfortable **user interface** changes 16/30
- ▶ **Compatibility issues** with software 16/30
- ▶ **Infrastructure** constraints (disk, data) 8/30
- ▶ **Long** installation time 7/30

# Results

- ▶ Software update notifications interrupt users' primary tasks
- ▶ Software updating is an information problem (or lack of information problem)
- ▶ Users have insufficient control over tracking updates across applications and the operating system

## Insufficient Control: Hard to Track Updates (11/30)

Participants found it difficult to track update downloads and installs because update **settings and notifications** were **spread over multiple locations** for the operating system and third party applications.

## Insufficient Control: Frequently Used Apps (17/30)

“

An Evernote plug-in was not up to date and it asked me to update it. I just **deleted** it because I don't want to deal with going through an update for a program that I **don't use all that much**.

”

# Phase One Summary

- ▶ Software update notifications interrupt users' primary tasks
- ▶ Software updating is an information problem (or lack of information problem)
- ▶ Users have insufficient control over tracking updates across applications and the operating system

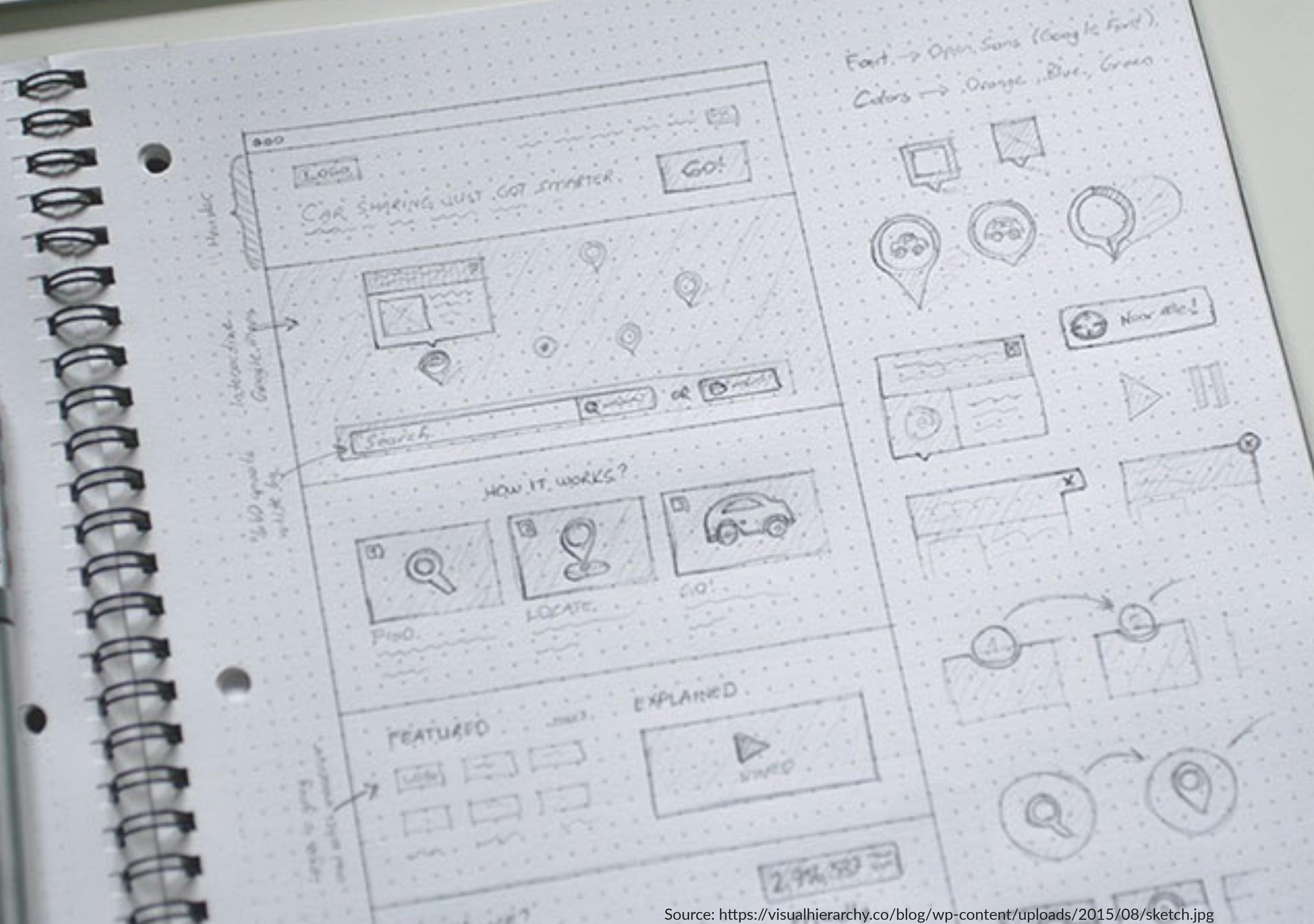
**Phase Two,Three:** How can we redesign the update experience on desktop machines to increase patching rates using silent updates?

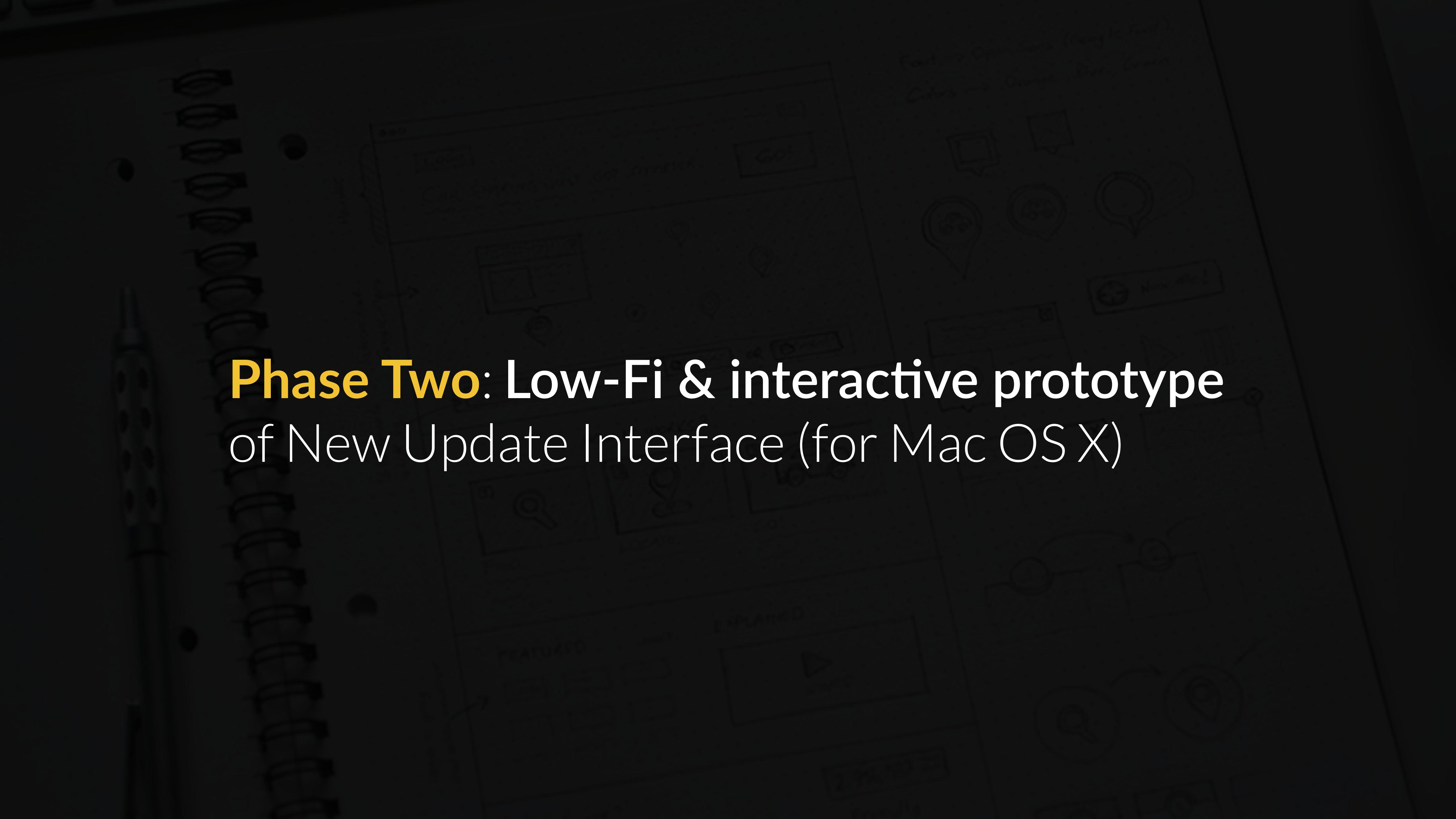
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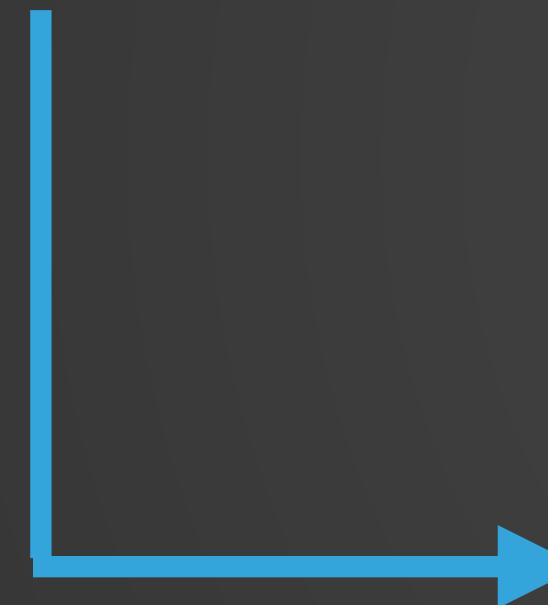




## **Phase Two:** Low-Fi & interactive prototype of New Update Interface (for Mac OS X)

# Design Decision 1

- ▶ Software update notifications interrupt users' primary tasks



Minimize Interruptions



Desktop

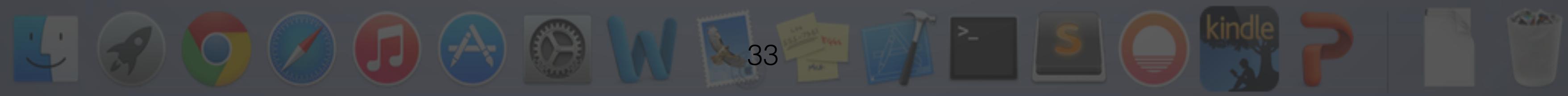


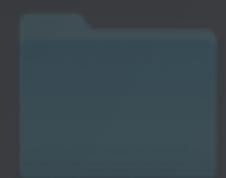


Desktop



**Single update  
notification icon:**  
Animates when  
updates download or  
install

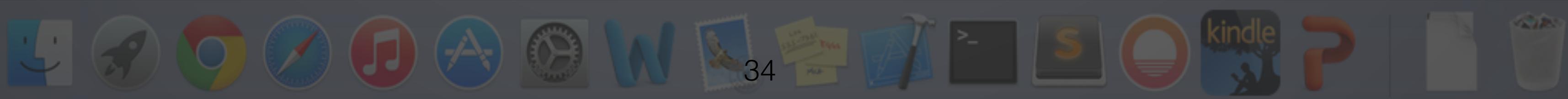




Desktop

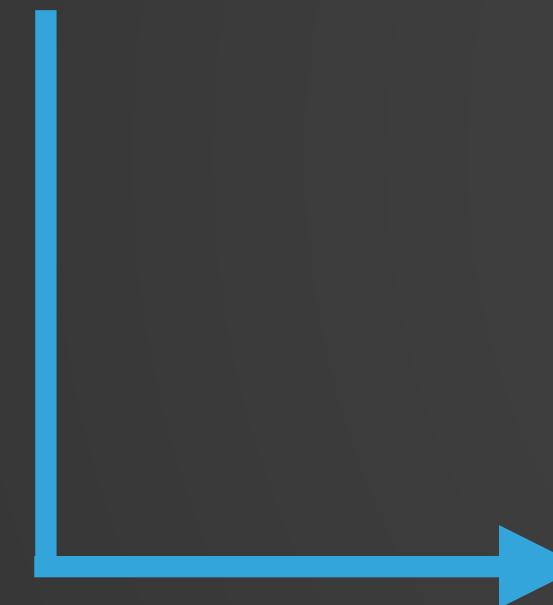
## Silent updates:

- ▶ All updates (including third-party) download and install without consent (by default).
- ▶ Piggyback restarts off other times



# Design Decision 2

- ▶ Software updating is an information (or lack of information) problem



Rich Update Information



Desktop

4 updates ready to install ▶

View recent updates

**Recommended Performance**

- Update

1/5. iTunes 11.1.1 (300 Mb)  
Improves performance on ipad and  
iphone

Source

View ratings

Find out more

Cancel this update

Next update





Desktop

Update Type

Update Size

Update Summary

Update Ratings

4 updates ready to install

View recent updates

**Recommended Performance - Update**

1/5. iTunes 11.1.1 (300 Mb)  
Improves performance on ipad and  
iphone

Source

View ratings

Find out more

Cancel this update

Next update



Josefine's Kindle for Mac 2

by Recently Viewed

LIBRARY

- All Items 71
- Downloaded Items 10
- Archived Items 61

COLLECTIONS

SQL: Visual QuickStart Guide, Third Edition by Chris McCallum

Rating: ★★★★☆

Write a Review

OK

Application

Kindle was recently updated on 2/22/2015. Before shutting the application, please provide a rating of this new update.

A Beautiful Wedding: A Novella by Jamie McGuire

The Shell Collector by Hugh Howey

Hadoop: The Definitive Guide by Tom White

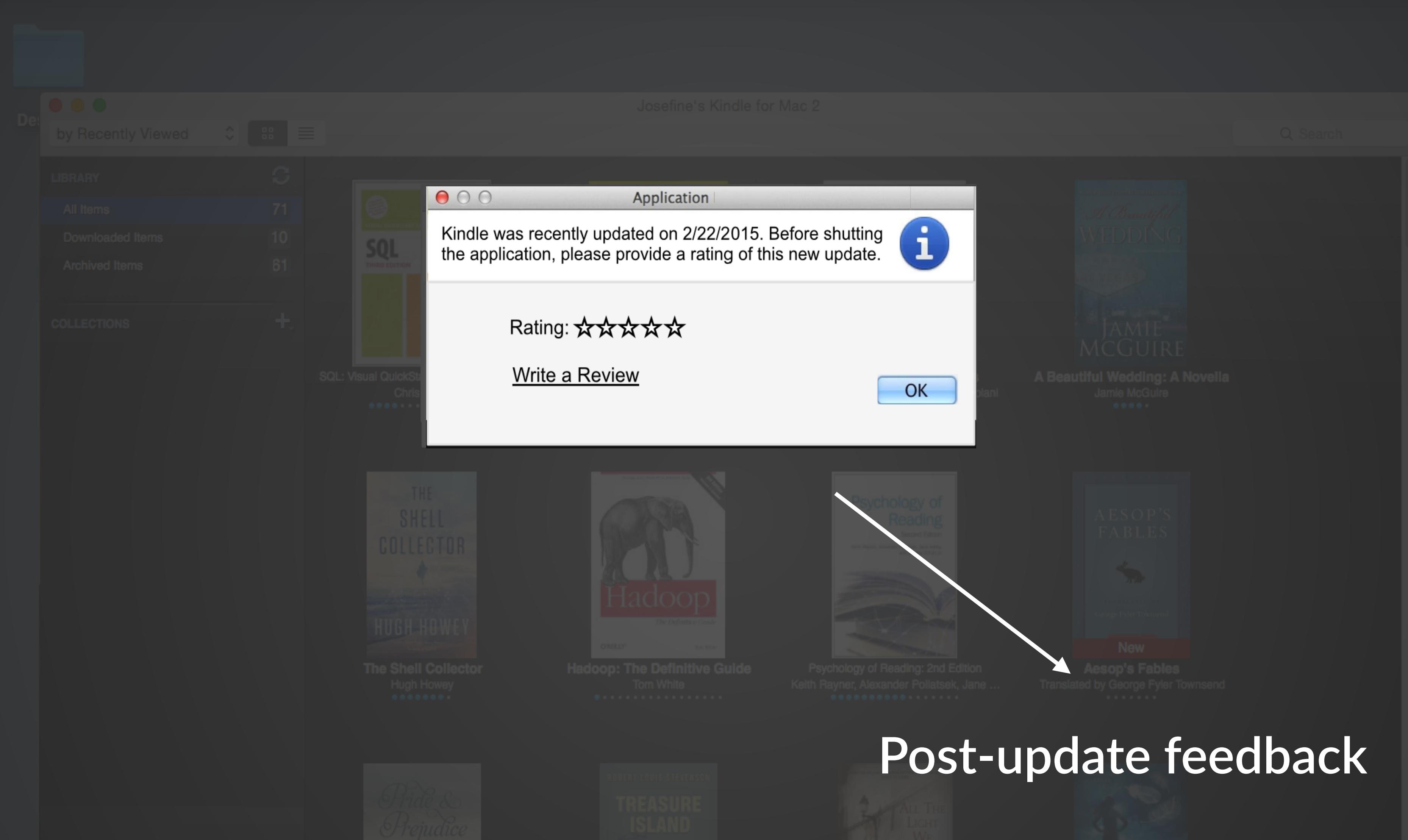
Psychology of Reading: Second Edition by Keith Rayner, Alexander Pollatsek, Jane Willis, and Charles Clifton Jr.

Aesop's Fables Translated by George Fyler Townsend

Pride & Prejudice by Jane Austen

TREASURE ISLAND by Robert Louis Stevenson

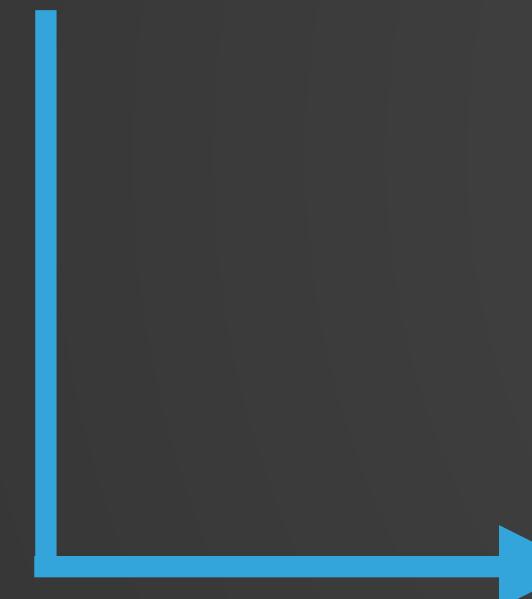
ALL THE LIGHT WE CANNOT SEE by Anthony Doerr



Post-update feedback

# Design Decision 3

- ▶ Users have insufficient control over tracking updates across applications and the operating system



Central Update Manager



2 Updates Available

UPDATE ALL ▾



OS X 10.9.2

Critical – Security Update



Size: (522 Mb)

- Improves the reliability of VPN connections that use the USB smart cards for authentication
- Improves the reliability of accessing files located on a SMB server
- Includes Safari 7.0.6

CANCELLED

SILENT ▾

Source

Estimated time for installation: 10 minutes

[Compatibility report](#)



iTunes 11.1.1

Recommended – Bug Fix



Size: (300 Mb)

- Supports the ability to sync your favorite music, movies, and more to devices with iOS 8
- Improves performance when syncing with your iPhone, iPad, or iPod

CANCEL

SILENT ▾

Source

Estimated time for installation: 8 minutes

[Compatibility report](#)



2 Updates Available

Pending

Installed Ratings

UPDATE ALL ▾

CANCELLED

SILENT ▾

CANCEL

SILENT ▾

OS X 10.9.2

Critical – Security Update

★★★★★ (522 Mb)

- Improves the reliability of VPN connections that use the USB smart cards for authentication
- Improves the reliability of accessing files located on a SMB server
- Includes Safari 7.0.6

Source ✓

Estimated time for installation: 10 minutes

[Compatibility report](#)

iTunes 11.1.1

Recommended – Bug Fix

★★★★★ (300 Mb)

- Supports the ability to sync your favorite music, movies, and more to devices with iOS 8
- Improves performance when syncing with your iPhone, iPad, or iPod

Source ✓

Estimated time for installation: 8 minutes

[Compatibility report](#)

Change Log,  
Install Time,  
Compatibility Report

Update Rating,  
Update Size,  
Update Type

Update Control

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XESX



Pending

Installed

Ratings

Show updates for

Last week

Last 30 days

All



Garage Band 10.0.1

Recommended - New Feature



Updated on Jan 21, 2015

- New Voice Template for fast and easy vocal recordings
- Vertical zoom to automatically adjust the height of your tracks
- Added support for OS X Yosemite

Source

Estimate time for installation: 10 minutes

[Compatibility report](#)

Kindle 1.10.5

Recommended - New Feature



Updated on Jan 01, 2015

- Supports the ability to sync your favorite books and more to other devices
- Improves performance when syncing with your phone, tablet, and computer

Source

Estimate time for installation: 10 minutes

[Compatibility report](#)



Pending

Installed

Ratings

Show updates for

Last week

Last 30 days

All



Garage Band 10.0.1

Recommended - New Feature



Updated on Jan 21, 2015

- New Voice Template for fast and easy vocal recordings
- Vertical zoom to automatically adjust the height of your tracks
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Source

Estimate time for installation: 10 minutes

[Compatibility report](#)

Kindle 1.10.5

Recommended - New Feature



Updated on Jan 01, 2015

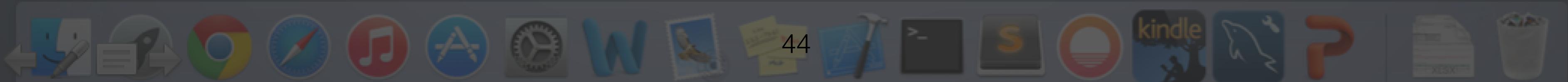
- Supports the ability to sync your favorite books and more to other devices
- Improves performance when syncing with your phone, tablet, and computer

Source

Estimate time for installation: 10 minutes

[Compatibility report](#)

## Update History





## Reviews



Kindle 1.10.5



Size: (244 Mb)

Performance yay

Jane– Version 11.1.1– 02/17/2015

Sending books to all my devices is so much better now.

Lost songs

By LadyM – Version 11.1.1 – 02/01/2015

Sadly some of my books were lost during this update. Went to the kindle store to get it fixed but they didn't know what happened either.

More

### Write a Review

Click to rate

Rating: Click to rate

Review this application (optional):

Title:

Nickname:

Review 6000 characters remaining

If you need support, please visit [Paint X Lite Support](#) >

If a review is deemed inappropriate, it will not be posted to the App Store.

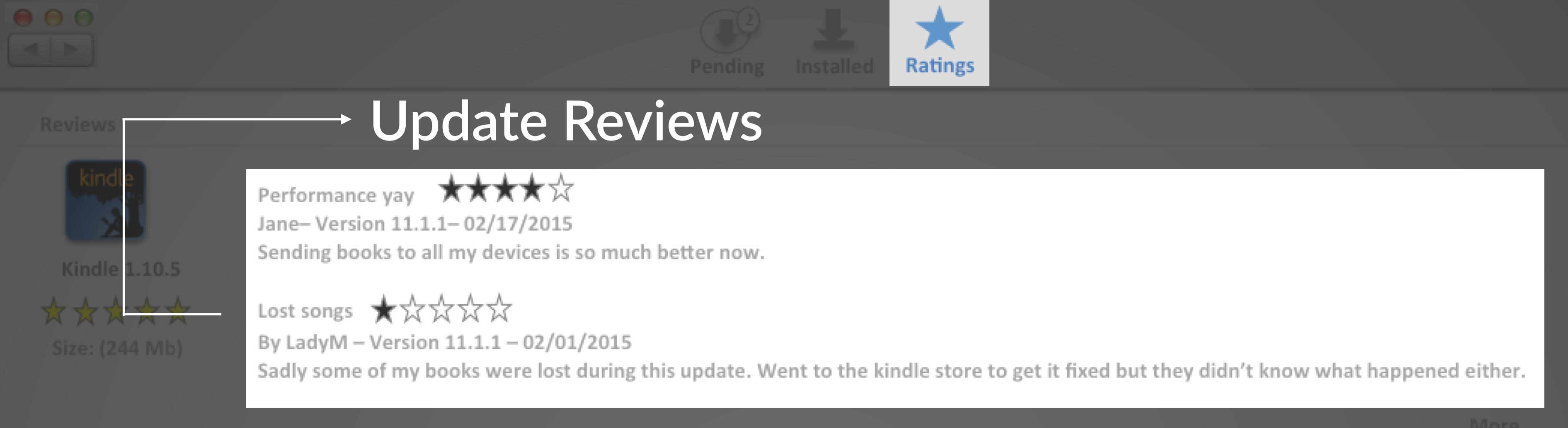
Cancel

Submit

#### Tips for writing a great review:

- Keep reviews short and to the point. Average customer reviews are about 200 words.
- Praise applications on their own terms, not at the expense of other developers or applications.
- Take the time to copy edit your work so that you avoid embarrassing typos or grammatical errors.
- Do not use profanity or overtly sexual language.
- Do not use language that can be construed as hateful, especially in regards to lifestyle, religion, or race.





## Write a Review

Click to rate

Rating: ★ ★ ★ ★ ★ Click to rate

Review this application (optional):

Title:

Nickname:

Review 6000 characters remaining

If you need support, please visit [Paint X Lite Support >](#)

If a review is deemed inappropriate, it will not be posted to the App Store.

[Cancel](#)

[Submit](#)

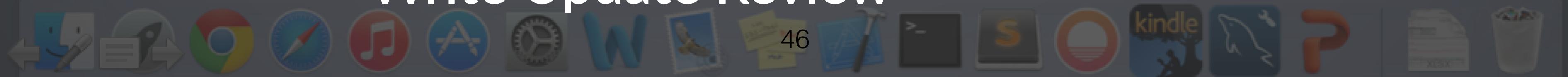
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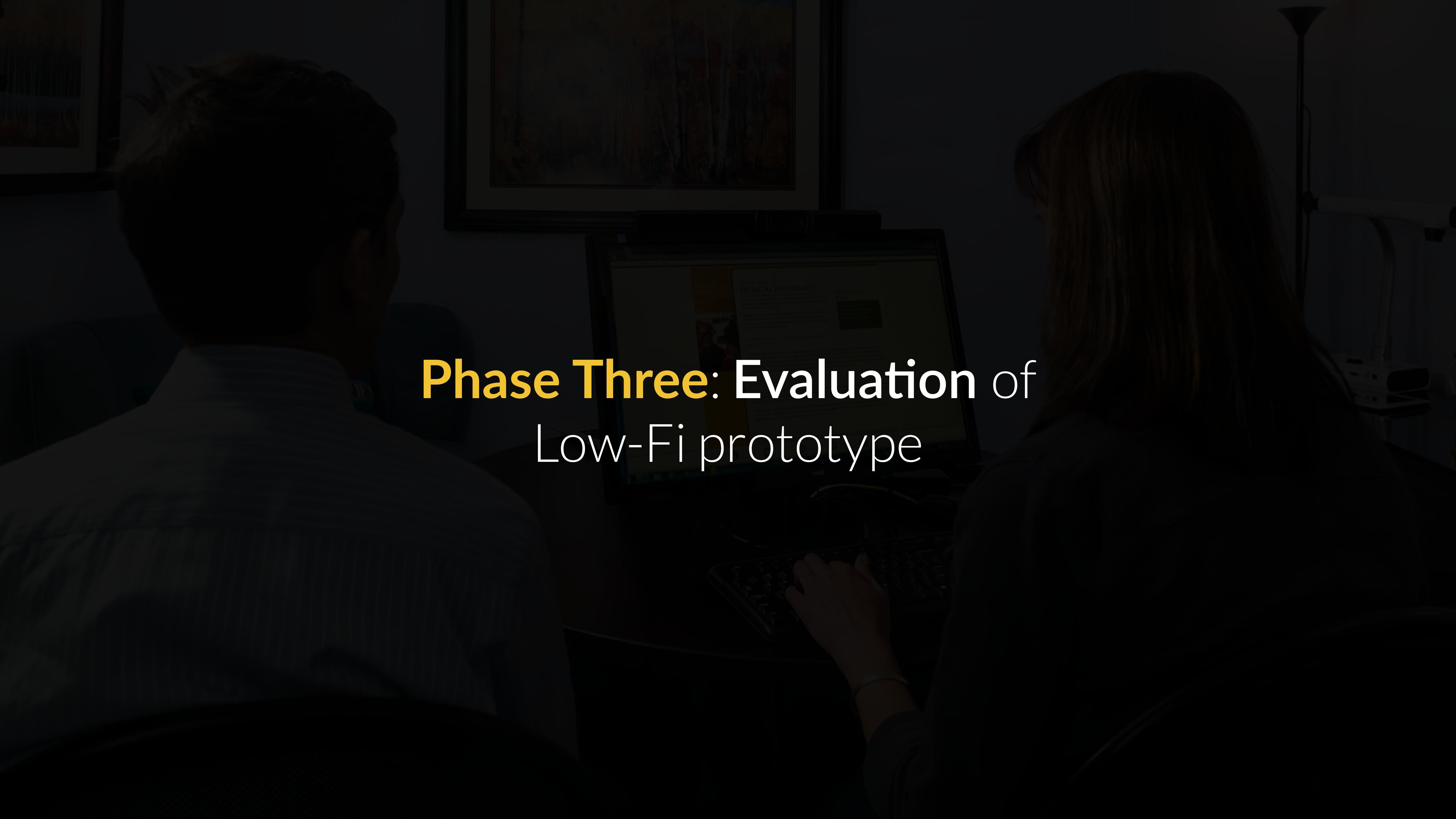
Cancer

[Submit](#)

# Write Update Review







## Phase Three: Evaluation of Low-Fi prototype

# Method



## Think-aloud + Interviews

- ▶ Advertised study through social media, mailing lists
- ▶ 22 Mac OS X users
- ▶ 45-60 mins / \$15 gift cards
- ▶ Audio & video taped and transcribed
- ▶ Open and inductive thematic coding (3 researchers)

# Results

- ▶ Minimize Interruptions: 11/22 participants preferred no update notifications, while others wished to be notified about all updates

## Minimize Interruptions: (11/22)

“

It prompts me the least. I don't have to worry about it, I don't have to think about it.

”

“

I want to know how frequently the updates are, how frequently they're occurring and if there's something new or there's a bug. If there are any changes, I want to know when and how they happened.

”

# Results

- ▶ **Minimize Interruptions:** 11/22 participants preferred no update notifications, while others wished to be notified about all updates
- ▶ **Rich Update Information:** Participants appreciated information to varying degrees; could possibly help drive decisions

## Rich Update Information:

- ▶ Compatibility report (19/22)
- ▶ Update labels (15/22)
- ▶ Ratings (15/22)
- ▶ Time to install (13/22)
- ▶ Source verification (9/22)
- ▶ Installation size (4/22)

# Results

- ▶ **Minimize Interruptions:** 11/22 participants preferred no update notifications, while others wished to be notified about all updates
- ▶ **Rich Update Information:** Participants appreciated information to varying degrees; could possibly help drive decisions
- ▶ **Update Manager:** Participants indicated preference towards centralization; particularly for third-party apps

## Update Manager: (11/22)

“

I like it. It seems more comprehensive because it has the Microsoft stuff in in so you don't have to run the Microsoft updater as well as the app store update mechanism.

”

# Implication #1

- ▶ Minimize Interruptions: Notify only when necessary
- ▶ Personalize silent updates (e.g., importance of update, or frequency of use of app)
- ▶ Gentle reminders + nudges to restart
- ▶ Decouple security updates

## Implication #2

- ▶ Rich Update Information: Make information count when displayed
  - ▶ How do we generate compatibility reports?
  - ▶ How do we leverage social proof and ratings?
  - ▶ Can we predict installation time?
  - ▶ Use visual elements indicate trust & type

# Implication #3

- ▶ Centralizing Updates:
  - ▶ Helps build trust, better mental models of how updates are taking place
  - ▶ Can be one-stop location to preview updates, uninstall updates, examine update history for all applications

# Ongoing and Future Work

- ▶ Large scale study of attitudes and preferences towards auto-updating
- ▶ Multiple stakeholders: who decides?
- ▶ Examine software updating from lens of network administrators and software developers
- ▶ Recommend testing higher fidelity prototypes (with a more representative sample)

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