

CSE440: Introduction to HCI

Methods for Design, Prototyping and Evaluating User Interaction

Lecture 12:
Heuristic Evaluation

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What we will do today

Inspection-based methods

Heuristic evaluation in practice

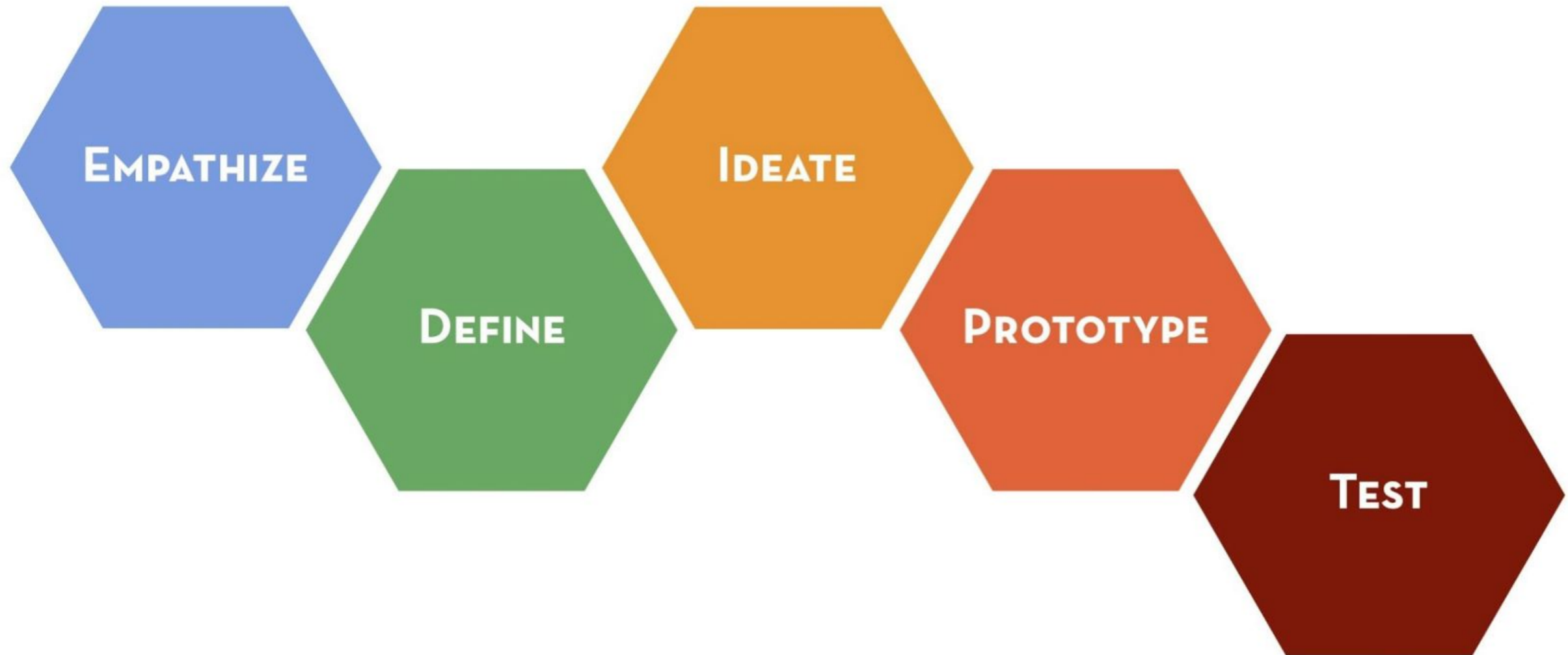
Working on the final design

What we will do today

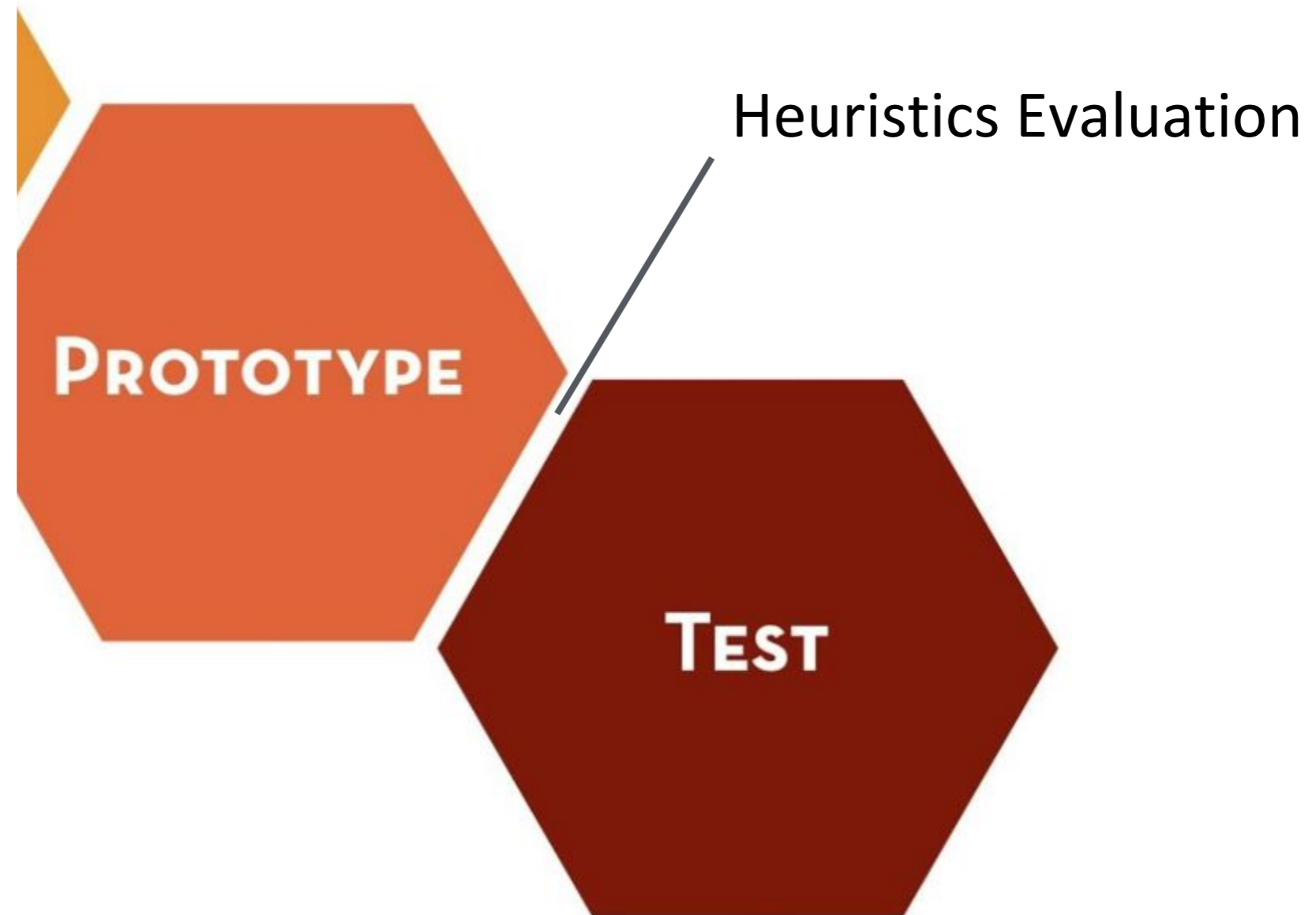
What is a heuristic?



What we will do today



What we will do today



Inspection-Based Methods

We have cut prototyping to its minimum

Sketches, storyboards, paper prototypes

Rapid exploration of potential ideas

But we need evaluation to guide improvement

Evaluation can become relatively slow and expensive

Study participants can be scarce

May waste participants on fairly obvious problems

Inspection-Based Methods

Simulate study participants

Instead of actual study participants, use inspection to quickly and cheaply identify likely problems

Inspection methods are rational, not empirical

Heuristic Evaluation

Developed by Jakob Nielsen

Helps find usability problems in a design

Small set of evaluators examine interface

- three to five evaluators

- independently check compliance with principles

- different evaluators will find different problems

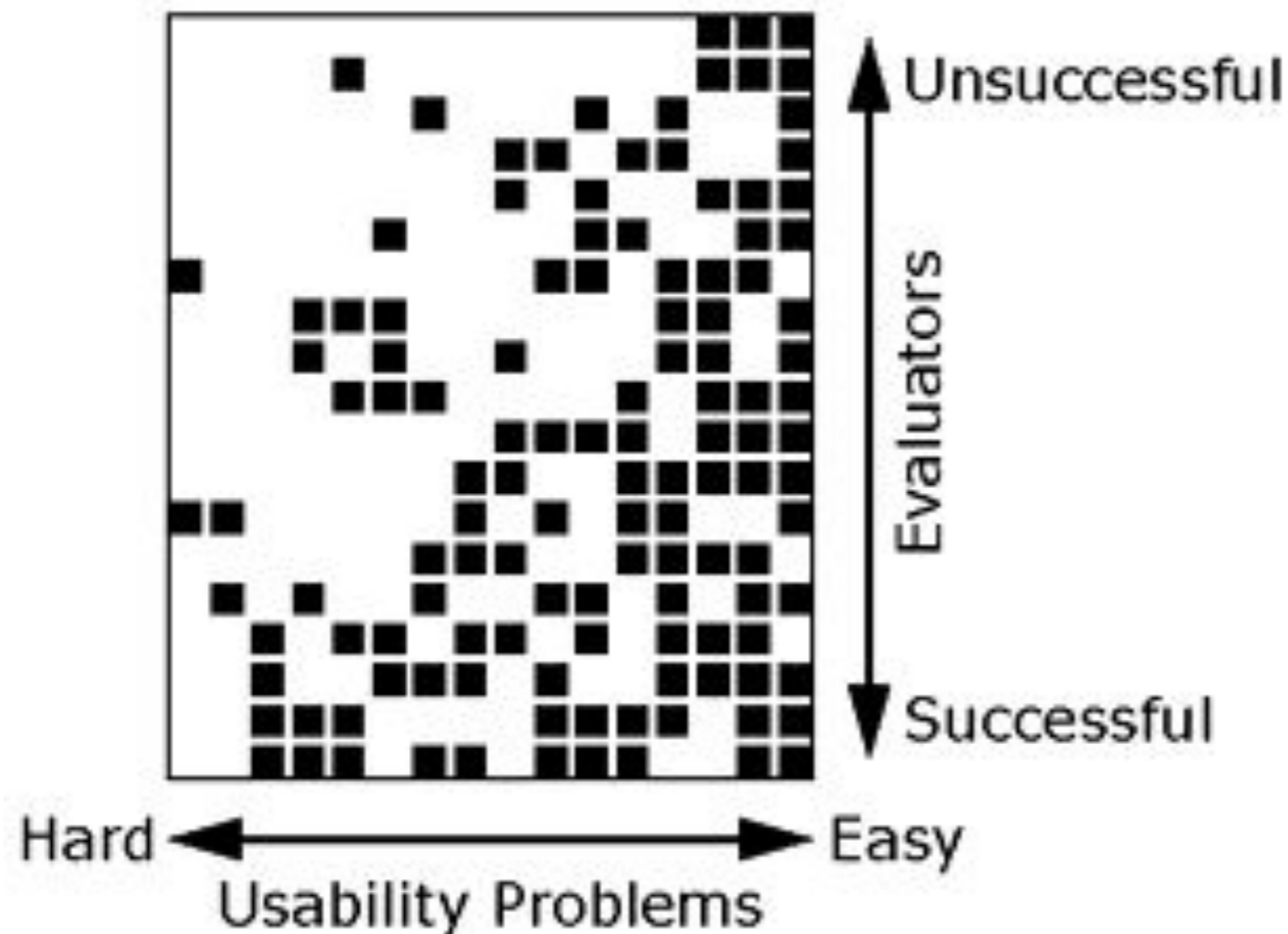
- evaluators only communicate afterwards

Can perform on working interfaces or sketches

Why Multiple Evaluators?

Every evaluator doesn't find every problem

Good evaluators find both easy & hard ones



Results of Using Heuristic Evaluation

Discount: benefit-cost ratio of 48

cost was \$10,500 for benefit of \$500,000

how might we calculate this value?

in-house → productivity; open market → sales

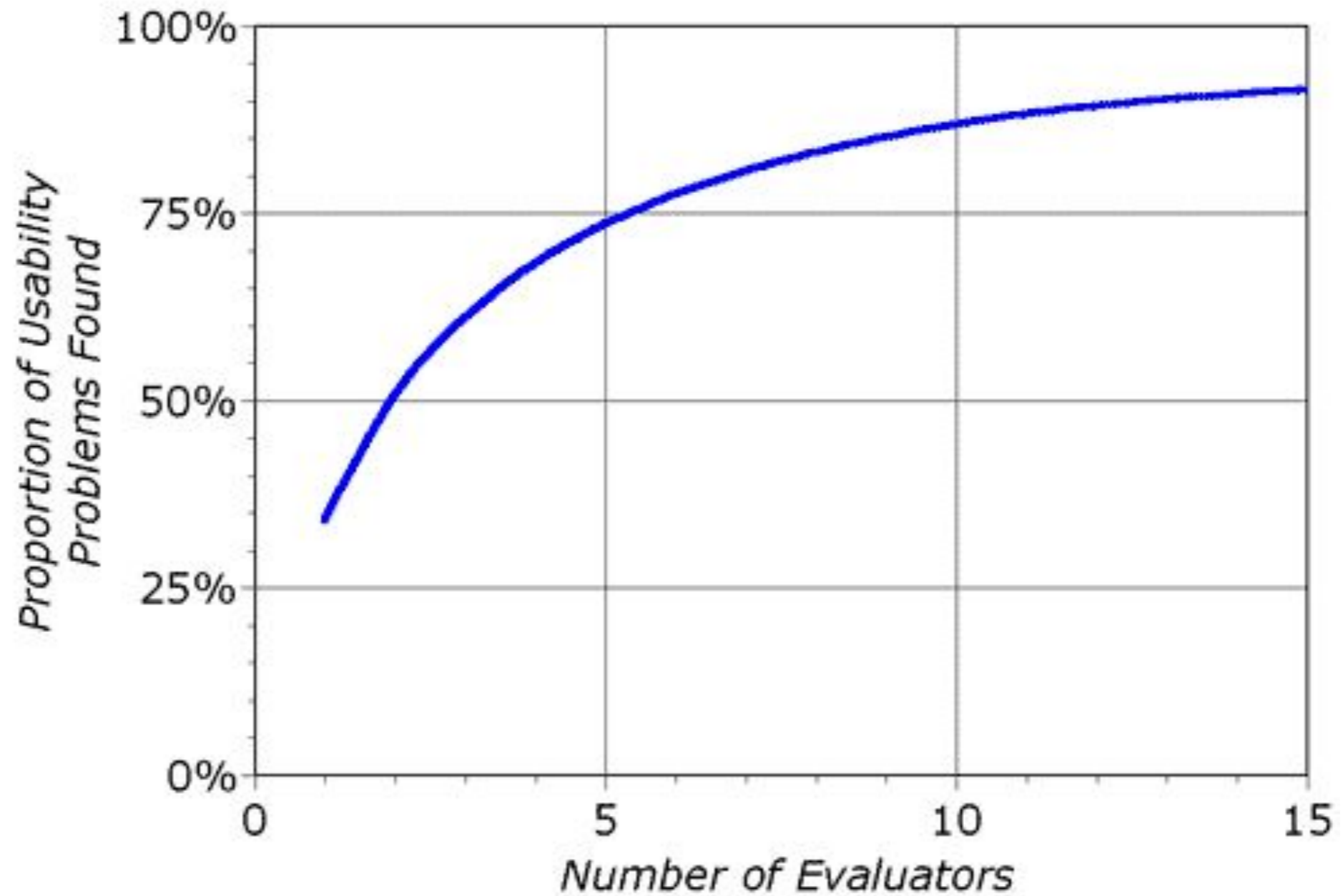
Single evaluator achieves poor results

only finds 35% of usability problems

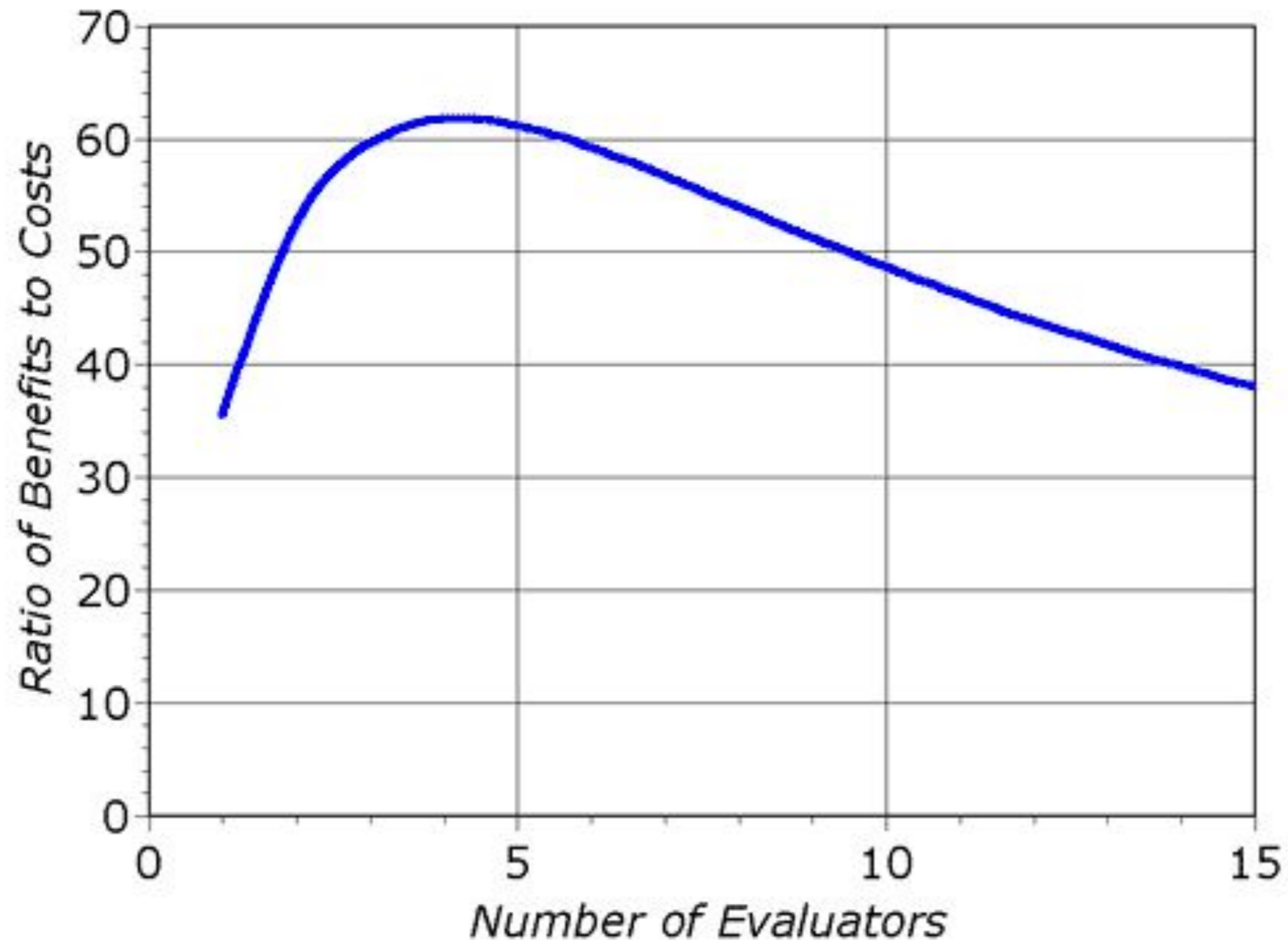
5 evaluators find ~ 75% of usability problems

why not more evaluators?

Number of Evaluators?



Decreasing Returns



Nielsen's 10 Heuristics

Too few unhelpful, too many overwhelming

“Be Good” versus thousands of detailed rules

Nielsen seeks to create a small set

Collects 249 usability problems

Collects 101 usability heuristics

Rates how well each heuristics explains each problem

Factor analysis to identify key heuristics

Nielsen's 10 Heuristics

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help recognize, diagnose, and recover from errors
10. Help and documentation

1. Visibility

Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

1. Visibility

Visibility of system status

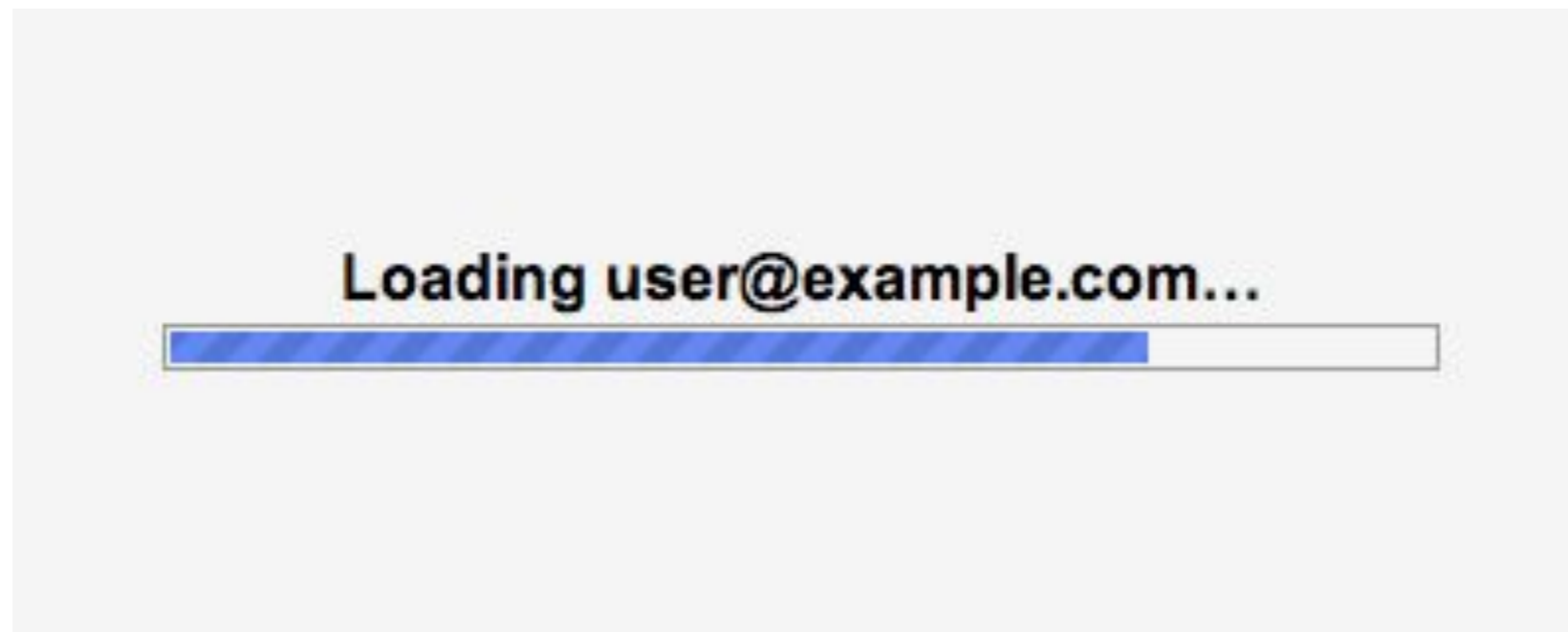
The system should always **keep users informed** about what is going on, through appropriate **feedback** within reasonable time.

Refers to both visibility of system status and use of feedback

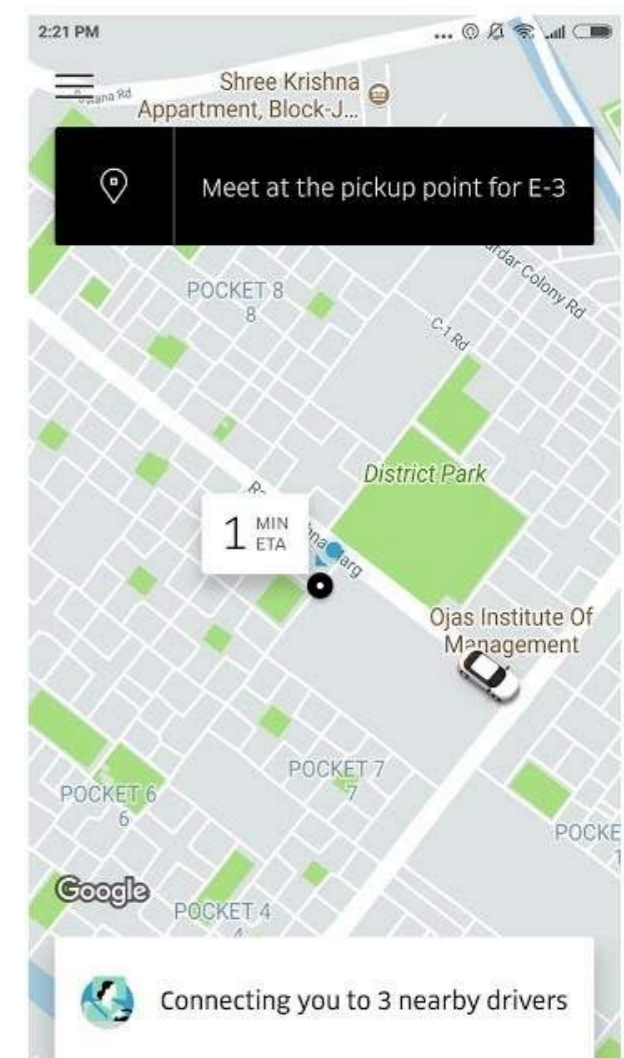
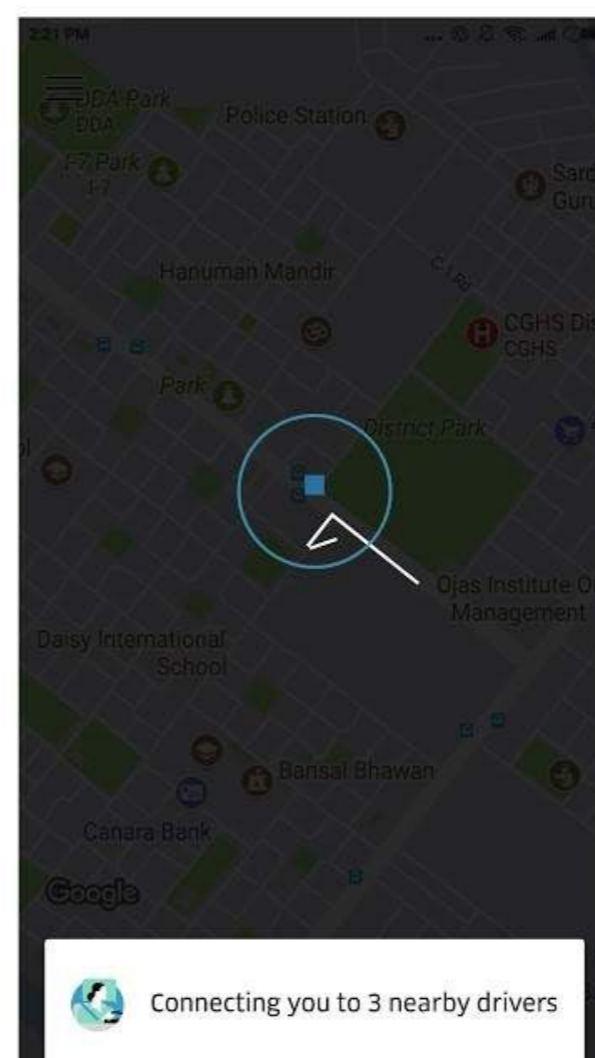
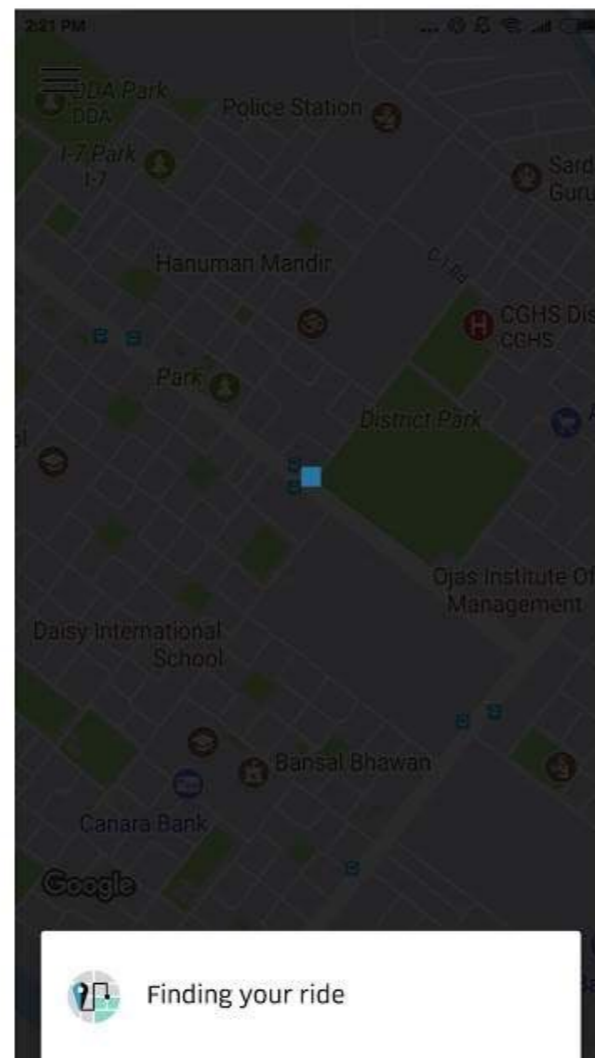
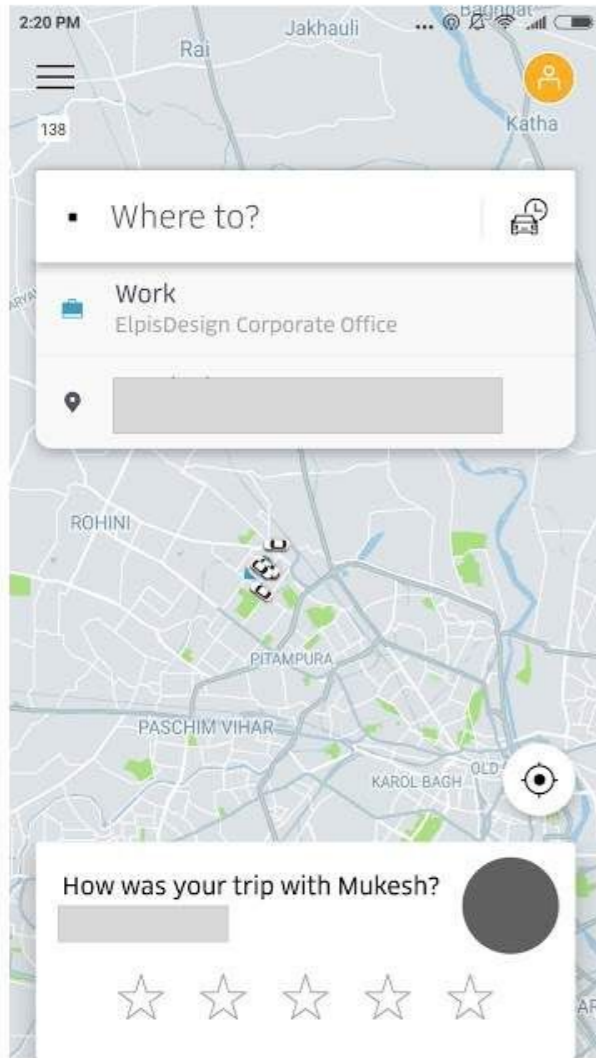
Anytime wondering what state the system is in, or the result of some action, this is a visibility violation.

Heuristics

Gmail Progress Indicator



Heuristics



Heuristics



Visibility of system status

pay attention to response time

0.1 sec: no special indicators needed

1.0 sec: user tends to lose track of data

10 sec: maximum duration if user to stay focused on action

longer delays absolutely require percent-done progress bars

2. Real World Match

Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

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Refers to word and language choice, mental model, metaphor, mapping, and sequencing

2. Real World Match



2. Real World Match

Mac desktop

Dragging disk to trash should delete, not eject it

Match system to real world

Speak the user's language

Follow conventions



3. User in Control

User control and freedom

Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

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User control and freedom

Users often choose system functions by mistake and will need a clearly marked “emergency exit” to **leave the unwanted state** without having to go through an extended dialogue.

Support undo and redo.

Not just for navigation exits,
but for getting out of any situation or state.

Heuristics



Heuristics



User control & freedom

provide “exits” for mistaken choices, undo, redo
don’t force down fixed paths

Heuristics

\$1,618
Federal Refund
(in progress)

\$268
CA Refund
(in progress)

Wages & Income

Deductions & Credits

Health Insurance

Other Tax Situations

Federal Review

Smart Check

How do you want to enter your 1095-A?

Upload the PDF

Choose a file to upload

Browse...

Type it in

[How do I get my 1095-A PDF?](#)

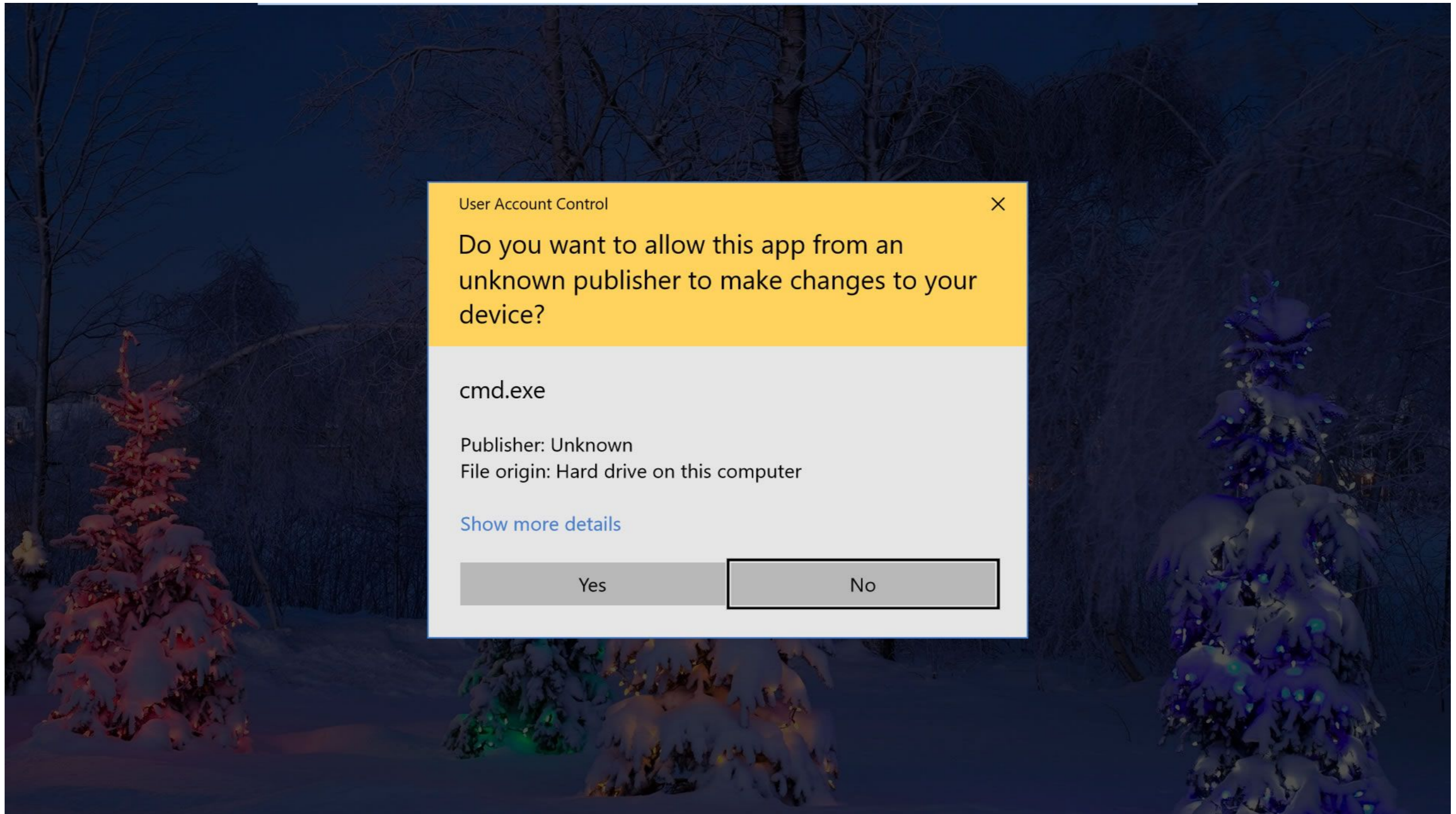


[View sample form](#)

< Back

Continue

Heuristics



Heuristics

User control & freedom

- provide “exits” for mistaken choices, undo, redo
- don't force down fixed paths

Wizards

- must respond to question before going to next
- good for beginners, infrequent tasks
- not for common tasks

4. Consistency

Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

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Consistency and standards

Users should not have to wonder whether different words, situations, or actions **mean the same thing.**

Follow platform conventions.

Internal consistency is consistency throughout the same product. External consistency is consistency with other products in its class.

Heuristics

The screenshot shows the Spotify desktop application. On the left is a sidebar with navigation options: Home, Browse, Radio, and a 'YOUR LIBRARY' section containing 'Made For You', 'Recently Played', 'Songs', 'Albums', 'Artists', 'Stations', 'Videos', and 'Podcasts'. Below these are 'PLAYLISTS' and a 'New Playlist' button. The main area is titled 'Songs' and features a search bar, a 'PAUSE' button, and a 'Filter' dropdown. A table of songs is displayed with columns for 'TITLE', 'ARTIST', 'ALBUM', and a date indicator. The song 'Heaven/Hell' by CHVRCHES is highlighted. At the bottom, a player bar shows 'Heaven/Hell' by CHVRCHES is playing at 0:24 of 5:05.

TITLE	ARTIST	ALBUM	
Wow.	Post Malone	Wow.	a day ago
Heaven/Hell	CHVRCHES	Love Is Dead	a day ago
I'm Into You	Nick Murphy / Chet Faker	Thinking In Textures	2 days ago
We Didn't Start the Fire	Billy Joel	Storm Front	3 days ago
Family Tree	Meadowlark	Family Tree	3 days ago
Never No	Nick Murphy / Chet Faker	Run Fast Sleep Naked	3 days ago
Duck Shoot	Rupert Gregson-Williams	The Crown: Season One (Soundtrack from the TV Series)	4 days ago
Empty Room	Big Wild, Yuna	Invincible EP	4 days ago
Coming of Age	Foster The People	Supermodel	4 days ago
Home Is A Feeling	Ride	Weather Diaries	5 days ago
Consolation	Clan of Xymox	The Best Of Clan Of Xymox	5 days ago
Second Hand Smoke (feat. Lonesome Animals) - Alternate Version	William Fitzsimmons, Lonesome Animals	In the Light: Mission Bell Alternative Versions	5 days ago
Eagle Birds	The Black Keys	Eagle Birds / Lo/Hi	5 days ago
Dangerous	Nick Murphy / Chet Faker	Run Fast Sleep Naked	5 days ago
Main on End	Alan Silvestri	Avengers: Endgame (Original Motion Picture Soundtrack)	5 days ago
Breathe	Seeb, Neev	Breathe	8 days ago
My Life - KRANE Remix	ZHU, Tame Impala, KRANE	My Life (Remixes)	8 days ago
The Earth Prelude	Ludovico Einaudi	Music For Mindfulness	8 days ago

The screenshot shows the Spotify mobile application. At the top, it says 'All Songs' with a back arrow and a 'SHUFFLE PLAY' button. Below this is a 'Downloading' toggle switch and a message: 'Go to Settings to download using cellular.' A list of songs follows, each with a download icon and a menu icon. The song 'Heaven/Hell' by CHVRCHES is highlighted. At the bottom, a player bar shows 'Heaven/Hell' by CHVRCHES is playing at 0:24 of 5:05. The bottom navigation bar includes Home, Search, and Your Library.

Heuristics

Consistency & Standards

Heuristics



External Consistency

5. Error Prevention

Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

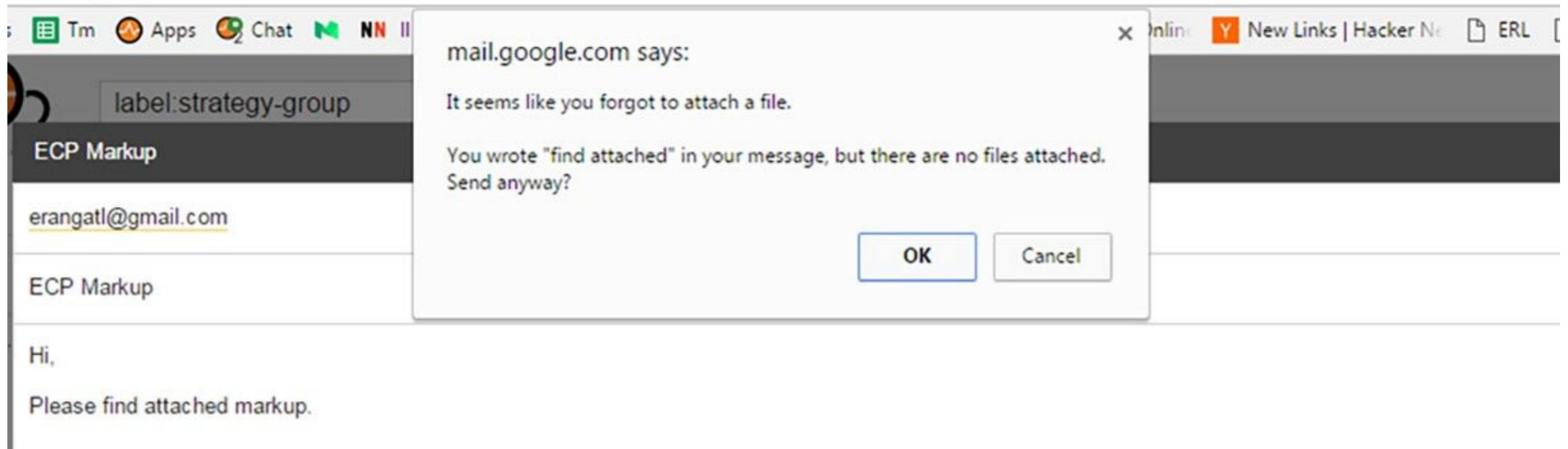
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Try to commit errors and see how they are handled. Could they have been prevented?

5. Error Prevention



Heuristics

Your password must have:

- ✓ 8 or more characters
- ✓ Upper & lowercase letters
- ✓ At least one number

Strength: strong



Avoid passwords that are easy to guess or used with other websites.

6. Recognition not Recall

Recognition rather than recall

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

6. Recognition not Recall

Recognition rather than recall

Minimize the user's memory load by **making objects, actions, and options visible.**

The user **should not have to remember information** from one part of the dialogue to another.

Instructions for use of the system should be visible or easily retrievable whenever appropriate.

People should never carry a memory load

6. Recognition not Recall

Addresses visibility of features & information

where to find things

Visibility addresses system status & feedback

what is going on

6. Recognition not Recall

Problems with affordances may go here

hidden affordance: remember where to act

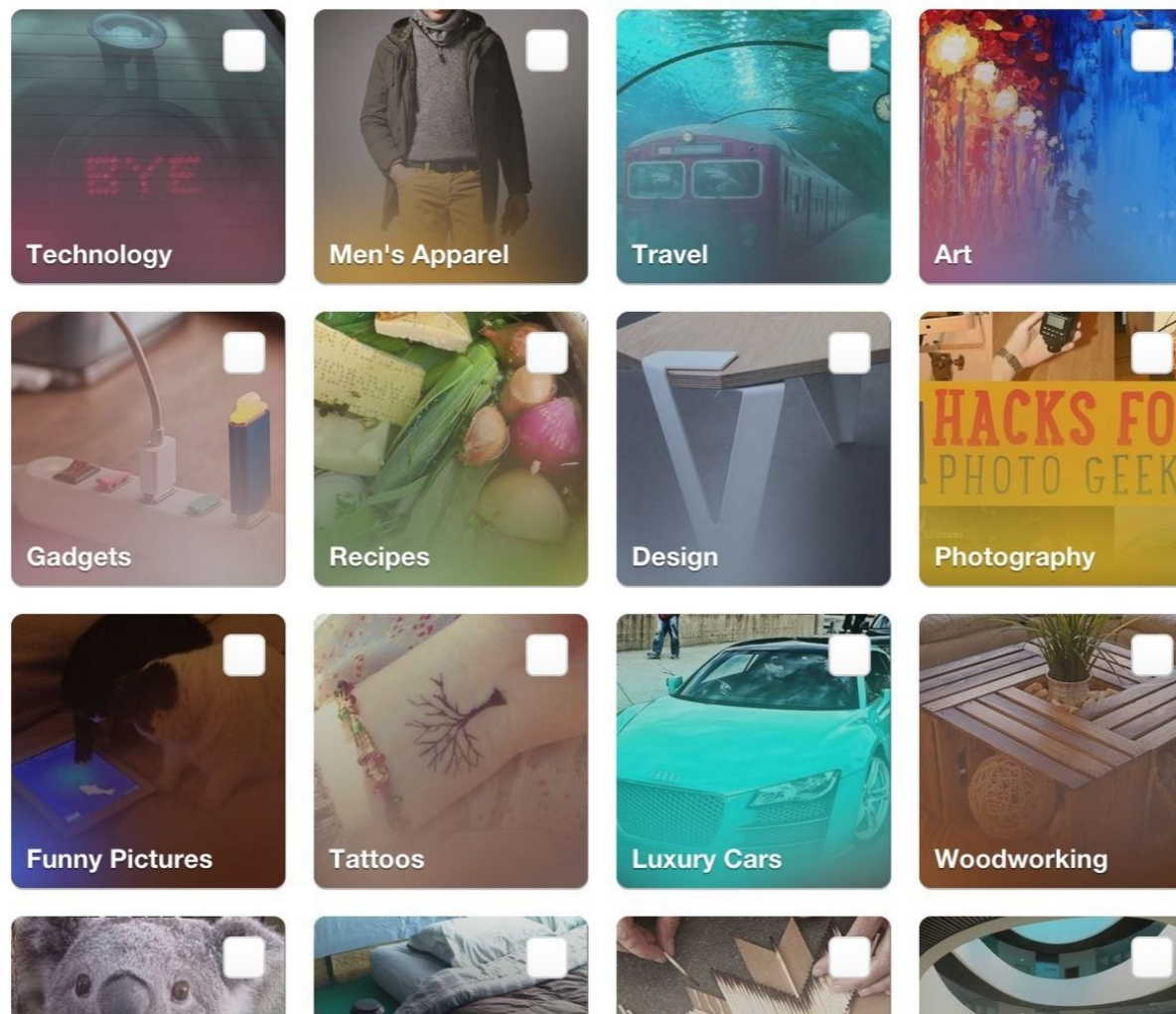
false affordance: remember it is a fake



6. Recognition not Recall

What are you interested in?

Pick whatever catches your eye...you can always fine-tune things later



Pick more

7. Flexibility and Efficiency

Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

7. Flexibility and Efficiency

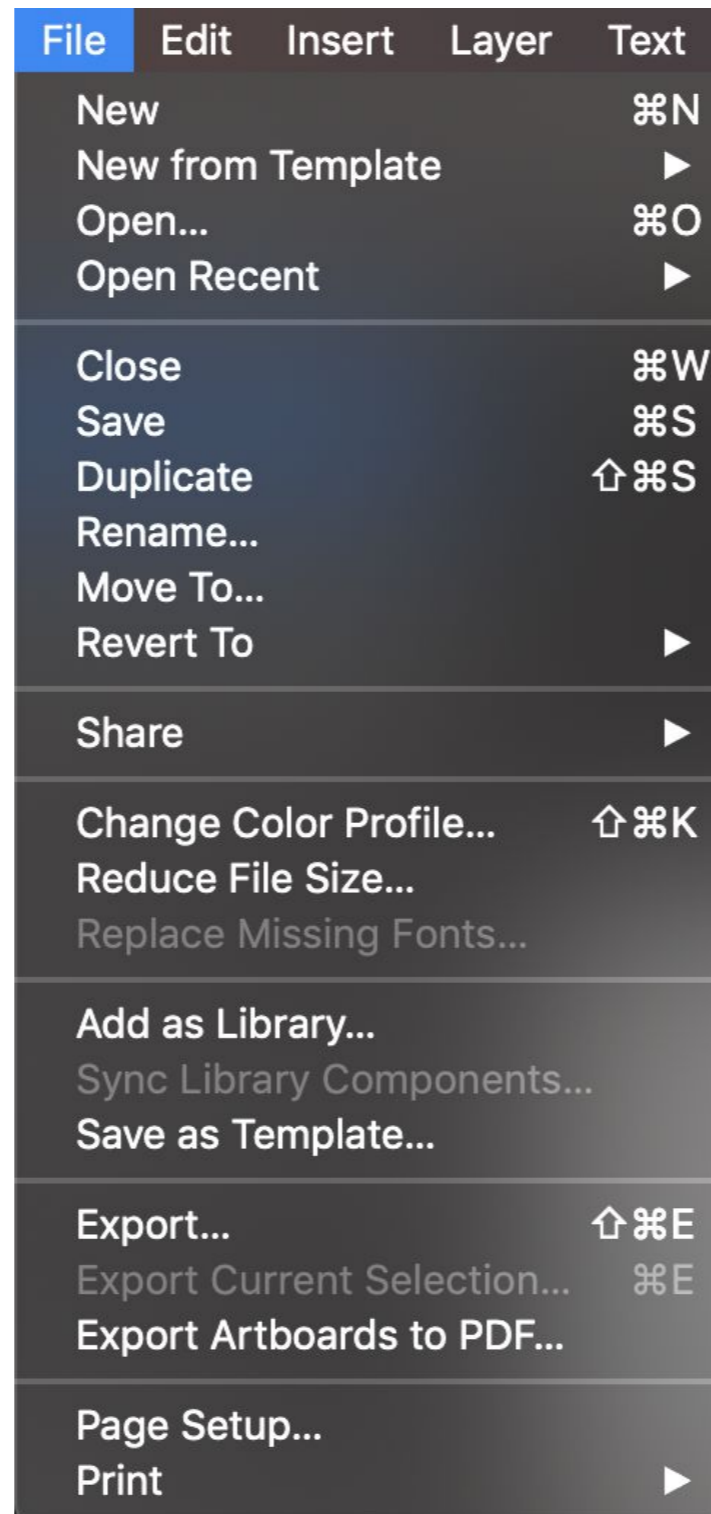
Flexibility and efficiency of use

Accelerators -- unseen by the novice user -- may often **speed up the interaction** for the expert user such that the system can cater to both inexperienced and experienced users.

Allow users to tailor frequent actions.

Concerns anywhere users have repetitive actions that must be done manually. Also concerns allowing multiple ways to do things.

7. Flexibility and Efficiency



7. Flexibility and Efficiency



7. Flexibility and Efficiency

Flexibility and Efficiency of Use

accelerators for experts (e.g., keyboard shortcuts)
allow tailoring of frequent actions (e.g., macros)



8. Aesthetic Design

Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

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Aesthetic and minimalist design

Dialogues should **not contain information which is irrelevant or rarely needed**. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Not just about “ugliness”.

About clutter, overload of visual field, visual noise, distracting animations, and so on.

Heuristics

Fac: Order# 99004234 New 99031927 Report Selection OCB SSF View Dupl View Routing Print Call Canceled
 View Invest Sheet Bill Log

Order# 99004234 Mode From SC To SC Find CAW# 100670861 Charges: 701.50
 Ptn Unknown Shipper: Air AD1 AD1 CAW# 100670861 Discount: 0%
 Terms: Prepaid Collect 3rd Party STD Tariff CA099-00-01 Ship Rat BL SubTotal: 701.50
 Cust: Hi Fo Holdings, Ltd. HFO From YVR WZ To YYY AE GBL Num Billing Rat 5 Accessorial: 40.00
 Inv: Hi Fo Holdings, Ltd. HFO Deliver By 06-12-02 17:00 Clock Stop MasterID: MAWB Non Freight Manifest Hold Post Hold Rate
 Add: 1125 STREET SUITE 1200 CSFC VANCOUVER BC V6Z2K8 CSFC SCARBOROUGH ON M1B5M4
 Ptn: CSFC VANCOUVER BC V6Z2K8 CSFC SCARBOROUGH ON M1B5M4
 Cont: Appointment D: 06-18-02 F: T:

Cntr: CANADIAN HARDWARE & H AVENUE SUITE 101
 CSFC VANCOUVER BC V6Z2K8 CSFC SCARBOROUGH ON M1B5M4
 Ptn: CSFC VANCOUVER BC V6Z2K8 CSFC SCARBOROUGH ON M1B5M4
 Cont: Appointment D: F: T:

Value: 0.00 USD
 Non Freight Manifest Hold Post Hold Rate
 Notify on POD
 Hourset

SAVED
 14 15 16 17 18

Units	Type	H Description	Stated	ACTWT	Dimensions	CB	ChgWt	Rate	Charge
1	CRATE	CRATE	91	94	97 (5x25x3)	97	50.00	40.50	
1	2MAN	2 MAN P&D						40.00	40.00
2	CRATE	CRATE	500		1,426 (50x48x49)	1,426	50.00	713.00	
0								0.00	0.00

3 Accs: 40.00 DV: 0 50.00 501 944 1523 1,523 761.50

Heuristics

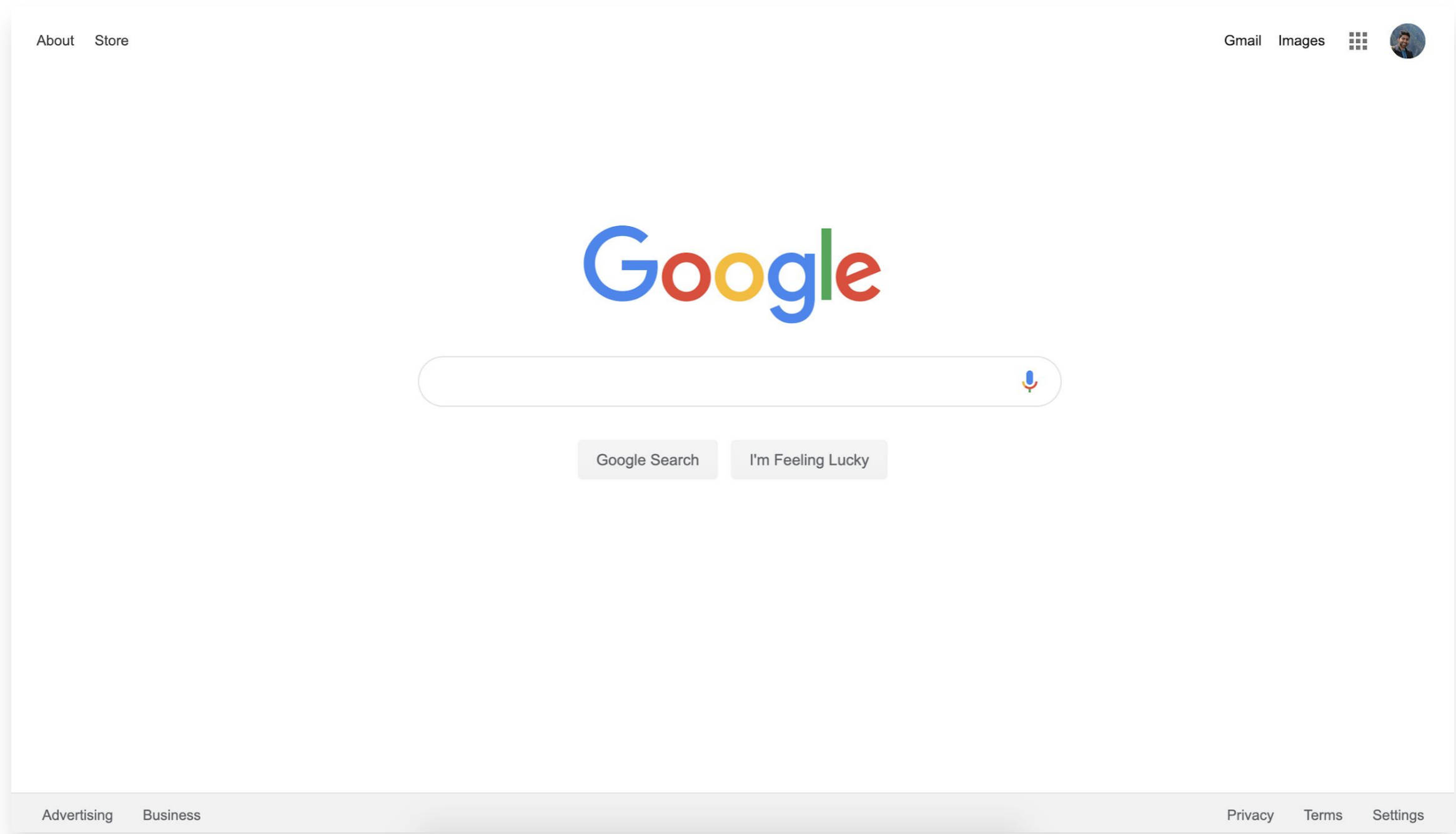
Aesthetic & Minimalist design

no irrelevant information in dialogues

The screenshot displays a complex shipping software interface. At the top, there is a menu bar with options like 'Fac', 'Order', 'New', 'Report Selection', 'OCB', 'SSF View', 'Dupes Load', 'View Invent', 'Routing Sheet', 'Print Bill', 'Call Log', and 'Cancelled'. Below this, the main area is divided into several sections:

- Customer Information:** Includes fields for 'Cust', 'Inv', 'At', 'Add', 'City', 'Prov', 'Cont', and 'Appointment D'. Two addresses are visible: one for 'VANCOUVER' and another for 'SCARBOROUGH'.
- Shipping Details:** Includes 'Mode' (Air), 'From SC', 'To SC', 'Tariff Service', 'From', 'To', 'Deliver By', and 'Clock Stop'.
- Charges Summary:** A table on the right side shows: Charges (701.50), Discount (0%), SubTotal (701.50), Accessorial (40.00), DV (0.00), FSC (38.00), Total (839.50), and Balance (839.50).
- Buttons and Controls:** Includes 'Addend', 'Closed', 'Print', 'Non Freight', 'Manifest Hold', 'Print H/M', 'Rate', and 'SAVED'.
- Table:** A table at the bottom lists items with columns for 'Units', 'Type', 'H Description', 'Stated', 'AWT', 'Dimensions', 'ChQM', 'Rate', and 'Charges'. It shows three items: 1 CRATE, 1 2MAN, and 2 CRATE.

Heuristics



9. Error Recovery

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

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Help users recognize, diagnose, and recover from errors

Error messages should be expressed in **plain language** (no codes), **precisely indicate the problem**, and **constructively suggest a solution**.

Error prevention is about preventing errors before they occur. This is about after they occur.

9. Error Recovery

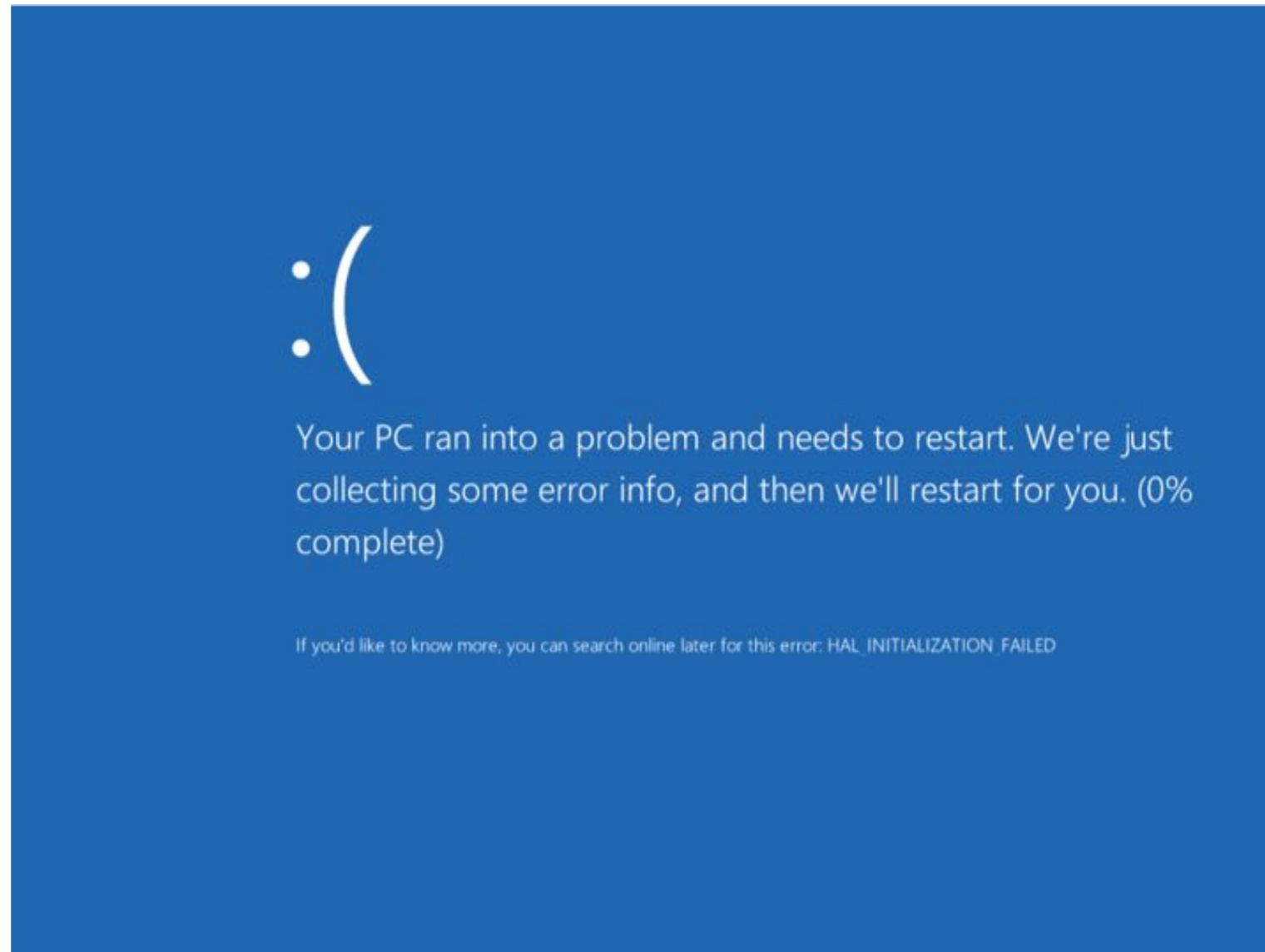
Help recognize, diagnose, & recover from errors

error messages in plain language

precisely indicate the problem

constructively suggest a solution

9. Error Recovery



Help recognize, diagnose, & recover from errors

9. Error Recovery

Overheard in a Lander lounge:
Boi: ACCHHHOOOOOOOOO!
Girl: "FOR THE FIFTEENTH TIME, GOD BLESS YOU AND GOD BLESS AMERICA!!!"

44 1 Comment

Like

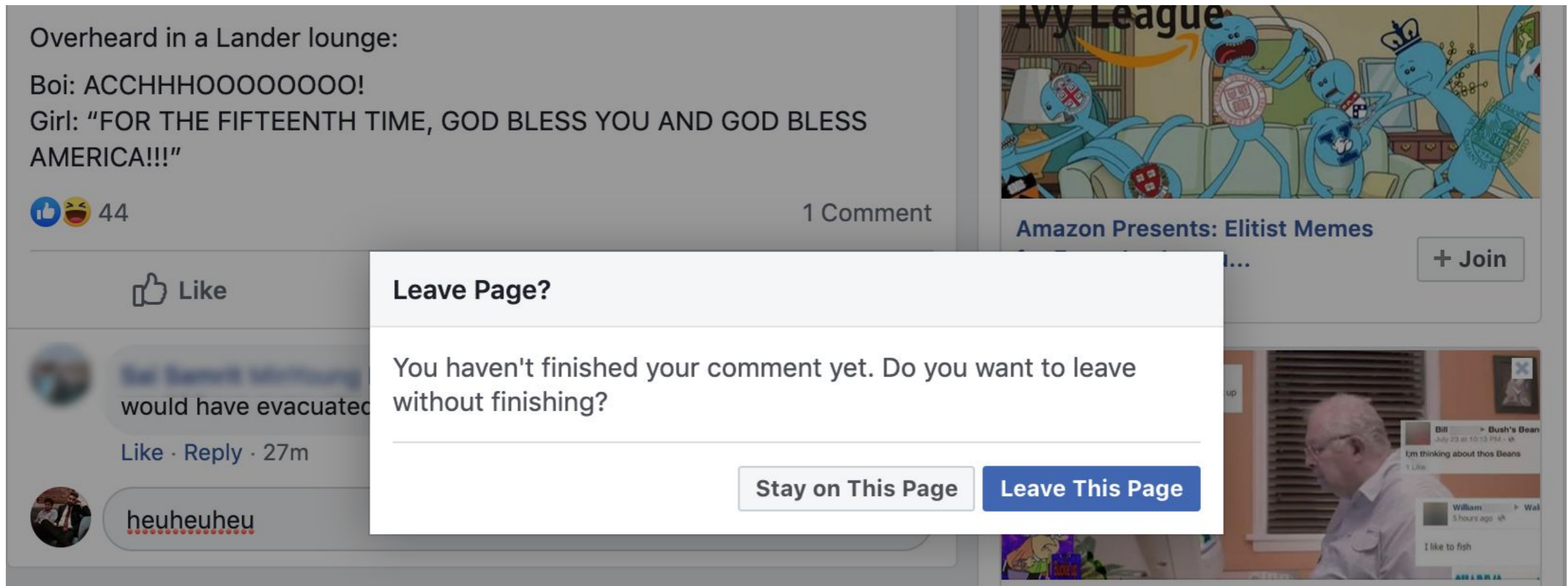
Amazon Presents: Elitist Memes

+ Join

Leave Page?

You haven't finished your comment yet. Do you want to leave without finishing?

Stay on This Page Leave This Page

A screenshot of a Facebook post. The post text reads: "Overheard in a Lander lounge: Boi: ACCHHHOOOOOOOOO! Girl: 'FOR THE FIFTEENTH TIME, GOD BLESS YOU AND GOD BLESS AMERICA!!!'". Below the text are 44 likes and 1 comment. The post is from "Amazon Presents: Elitist Memes" and has a "+ Join" button. A "Leave Page?" dialog box is overlaid on the post, asking "You haven't finished your comment yet. Do you want to leave without finishing?" with two buttons: "Stay on This Page" and "Leave This Page". The background shows a meme of blue cartoon figures and a video thumbnail of a man in a white shirt.

9. Error Recovery



Sorry, we couldn't find an account with that username. Can we help you recover your [username](#)?

Username

[I forgot](#)

freshsparkss

Password

[I forgot](#)

 Show

Log In

Stay logged in

[Create an account](#) · [Trouble logging in?](#)



Sorry, that password isn't right. We can help you recover your [password](#).

Username

[I forgot](#)

freshsparks

Password

[I forgot](#)

 Show

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10. Help

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

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Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be **easy to search**, **focused on the user's task**, **list concrete steps** to be carried out, and not be too large.

This does not mean that the user must be able to ask for help on every single item.

10. Help

Slackbot ☆ | ♥ active | Slackbot

Thursday, April 4th

Slackbot 1:19 PM
Right now anyone in your workspace can invite a new member. If you'd like, you can restrict that to just administrators.
[Only allow administrators to invite](#)
Okay, only admins can invite new members.

Today

Abhinav Yadav 1:28 AM
how to change settings?

Slackbot 1:28 AM
I searched for that on our Help Center. Perhaps these articles will help:

- [Change a member's email address](#)
- [Guide to single sign-on settings](#)
- [Customize message and file retention policies](#)

Abhinav Yadav 1:28 AM
how can I disable snooze?

Slackbot 1:28 AM
I searched for that on our Help Center. Perhaps these articles will help:

- [Pause notifications with Do Not Disturb](#)
- [Guide to Slack notifications](#)
- [Remove single sign-on](#)

Abhinav Yadav 1:29 AM
what is love?

Slackbot 1:29 AM
I'm sorry, I don't understand! Sometimes I have an easier time with a few simple keywords.
Or you can head to our wonderful [Help Center](#) for more assistance!

+ | Message Slackbot

Heuristic Evaluation Process

Evaluators go through interface several times

inspect various dialogue elements

compare with list of usability principles

Usability principles

Nielsen's "heuristics"

supplementary list of category-specific heuristics
(competitive analysis or testing existing products)

Use violations to redesign/fix problems

Examples

Can't copy info from one window to another

violates "Minimize memory load" (H6)

fix: allow copying

Typography uses different fonts in 3 dialog boxes

violates "Consistency and standards" (H4)

slows users down

probably wouldn't be found by usability testing

fix: pick a single format for entire interface

Phases of Heuristic Evaluation

1) Pre-evaluation training

give expert evaluators needed domain knowledge & information on the scenario

2) Evaluation

individuals evaluate interface & make lists of problems

3) Severity rating

determine how severe each problem is

4) Aggregation

group meets & aggregates problems (w/ ratings)

5) Debriefing

discuss the outcome with design team

How to Perform Evaluation

At least two passes for each evaluator

first to get feel for flow and scope of system

second to focus on specific elements

If system is walk-up-and-use or evaluators are domain experts, no assistance needed

otherwise might supply evaluators with scenarios

Each evaluator produces list of problems

explain why with reference to heuristic

be specific & list each problem separately

Example Heuristic Violation

1. [H4 Consistency]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

How to Perform Heuristic Evaluation

Why separate listings for each violation?

- risk of repeating problematic aspect
- may not be possible to fix all problems

Where problems may be found

- single location in interface
- two or more locations that need to be compared
- problem with overall structure of interface
- something that is missing

common problem with paper prototypes

(sometimes features are implied by design documents and just haven't been "implemented" – relax on those)

Severity Rating

Used to allocate resources to fix problems

Estimates of need for more usability efforts

Combination of

frequency

impact

persistence (one time or repeating)

Should be calculated after all evaluations are in

Should be done independently by all judges

Severity Rating

- 0 - Do not agree this is a problem.
- 1 - Usability blemish. Mild annoyance or cosmetic problem. Easily avoidable.
- 2 - Minor usability problem. Annoying, misleading, unclear, confusing. Can be avoided or easily learned. May occur only once.
- 3 - Major usability problem. Prevents users from completing tasks. Highly confusing or unclear. Difficult to avoid. Likely to occur more than once.
- 4 - Critical usability problem. Users will not be able to accomplish their goals. Users may quit using system all together.

Example Heuristic Violation

1. [H4 Consistency] [Severity 3]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

Debriefing

Conduct with evaluators, observers, and development team members

Discuss general characteristics of interface

Suggest potential improvements to address major usability problems

Development team rates how hard to fix

Make it a brainstorming session

Fixability Scores

- 1 - Nearly impossible to fix. Requires massive re-engineering or use of new technology. Solution not known or understood at all.
- 2 - Difficult to fix. Redesign and re-engineering required. Significant code changes. Solution identifiable but details not fully understood.
- 3 - Easy to fix. Minimal redesign and straightforward code changes. Solution known and understood.
- 4 - Trivial to fix. Textual changes and cosmetic changes. Minor code tweaking.

Example Heuristic Violation

1. [H4 Consistency] [Severity 3] [Fix 3]

The interface used the string "Save" on the first screen for saving the user's file, but used the string "Write file" on the second screen. Users may be confused by this different terminology for the same function.

Fix: Change second screen to "Save".

Ask us something!

Finalizing the Design

Select one design and two tasks:

- Why this design and these tasks?
(Designs can be combined if necessary)
- What makes the design better suited to the people for whom you are targeting your design?
- Why are these tasks more compelling than the others?

Working Time