

Software Engineering

Week 3: Software User Interfaces

Dr. Sridhar Iyer, IIT Bombay
Dr. Prajish Prasad, FLAME University



Software Engineering

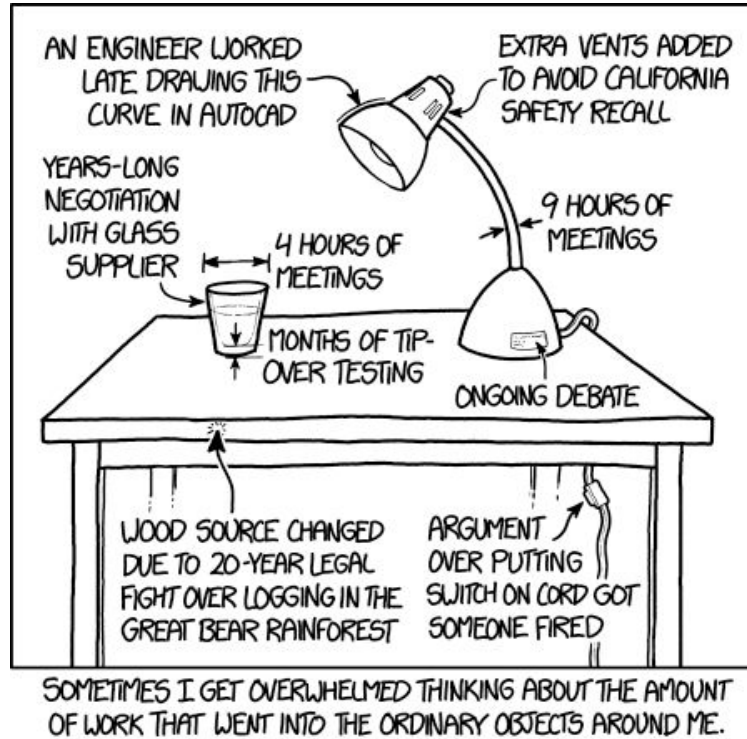
Introduction to Interaction Design

Dr. Sridhar Iyer, IIT Bombay

Dr. Prajish Prasad, FLAME University



Design in Everyday Objects



<https://xkcd.com/1741/>



Reflection Spot

Can you think of experiences where you have been left frustrated by the user interface of a website or an app?



Please pause the video and written down your responses



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Digital-Kikkert
Disko-Lys
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DVD-Spieler
Elektronikk & DAG
EL-Scooter & Bil
Figurer
Golf-biler (m/pått)
Hobby & RC
Hoversnod
HP-Måler (Bil)
Jaktmaskin
Kamera (trådløs)
Kino (trådløs)
Kompass (Bil/Bil)
Laser-Jamer (Bil)
Luft-Jekk
Lys (poppelbar)
Mobil-telefon-1-2
Motorsykkel-Mini
Omformer (110V)
Oversetter (44 sek)
PC-mini (9-12)

Search **Index**

Slik Betaler du

el-retur

el-retur



Activities involved in Interaction Design

- Identifying needs and requirements
- Developing alternative designs that meet those requirements
- Build interactive versions
- Evaluate



Software Engineering

Usability Goals

Dr. Sridhar Iyer, IIT Bombay
Dr. Prajish Prasad, FLAME University



Recap

- Importance of designing “good” user interfaces

Goals + principles required to design “usable” interfaces



Usability

ISO 9241-11 standard

“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”

Usability Goals

- Effectiveness
- Efficiency
- Safe to use
- Learnability
- Memorability



Effectiveness

- How good a system is at doing what it is supposed to do
- Is the system capable of
 - allowing people to learn well
 - carry out their work efficiently
 - access the information they need
 - buy the goods they want etc.?



Effectiveness Examples

Gmail Images  Sign in



Google Search

I'm Feeling Lucky

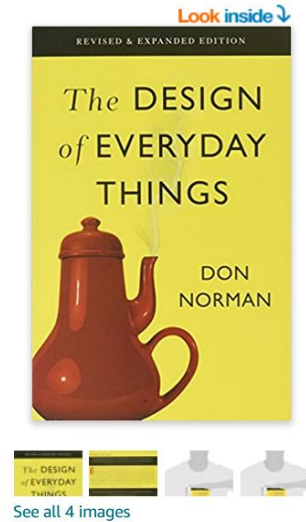
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Effectiveness Examples

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by [Don Norman](#) (Author)

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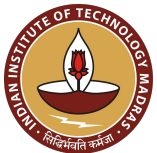
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Efficiency

- How does a system support users in carrying out their tasks
- Common tasks through a minimal number of steps



Efficiency Example

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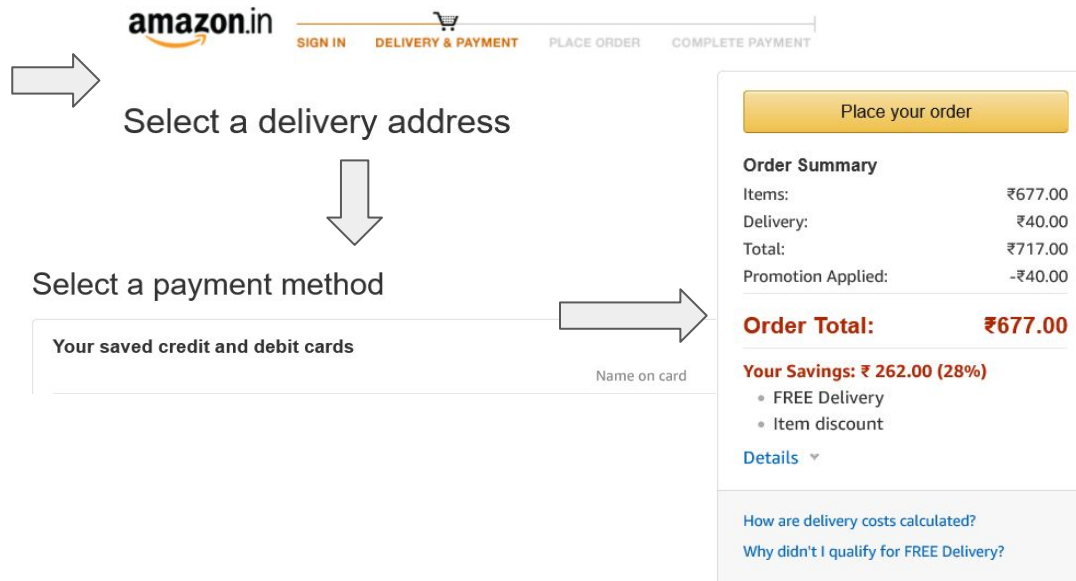
Buy Now

 Secure transaction

☐ Add gift options

Add to Wish List

Add to Baby Wish List



Safety

- Protecting the user from dangerous conditions and undesirable situations
- E.g. X ray machines, chemical plants



Therac - 25



Safety

- Helping users in any situation to avoid carrying out unwanted actions accidentally
 - Reduce the risk of wrong keys being pressed
 - Provide a means of recovery if you made errors

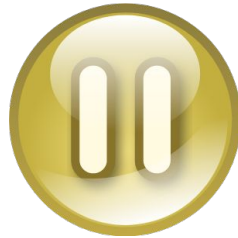


Reflection Spot

Recall software applications that you have used.

Are there ways in which these applications helped -

- Reduce the risk of wrong keys being pressed
- Provide a means of recovery if you made errors

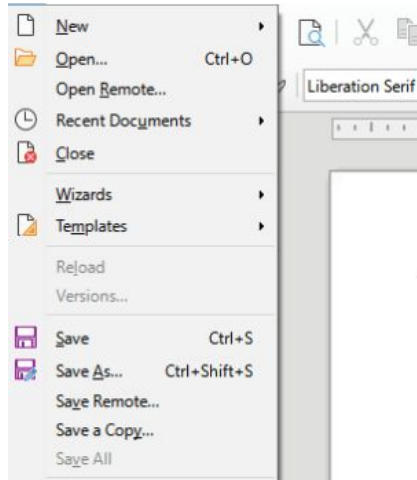


Please pause the video and written down your responses



Safety

- Helping users in any situation to avoid carrying out unwanted actions accidentally
 - Reduce the risk of wrong keys being pressed

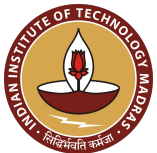


Save and close
are far apart



Safety

- Helping users in any situation to avoid carrying out unwanted actions accidentally
 - Provide a means of recovery if you made errors
 - Accidentally deleted a file → recover from trash
 - Computer accidentally shut down while editing a document → recovery options
 - Undo - Ctrl Z
 - WhatsApp - Delete a message!



Learnability

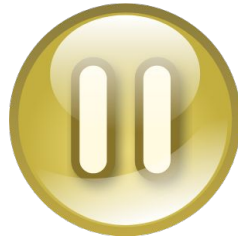
- How easy a system is to learn to use
- Want to get started right away and carry out tasks without much effort
- E.g. - FB, Instagram, WhatsApp, Amazon



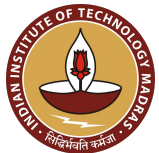
Reflection Spot

But what about complex tasks?

What are ways in which you can help users learn how to use your system?



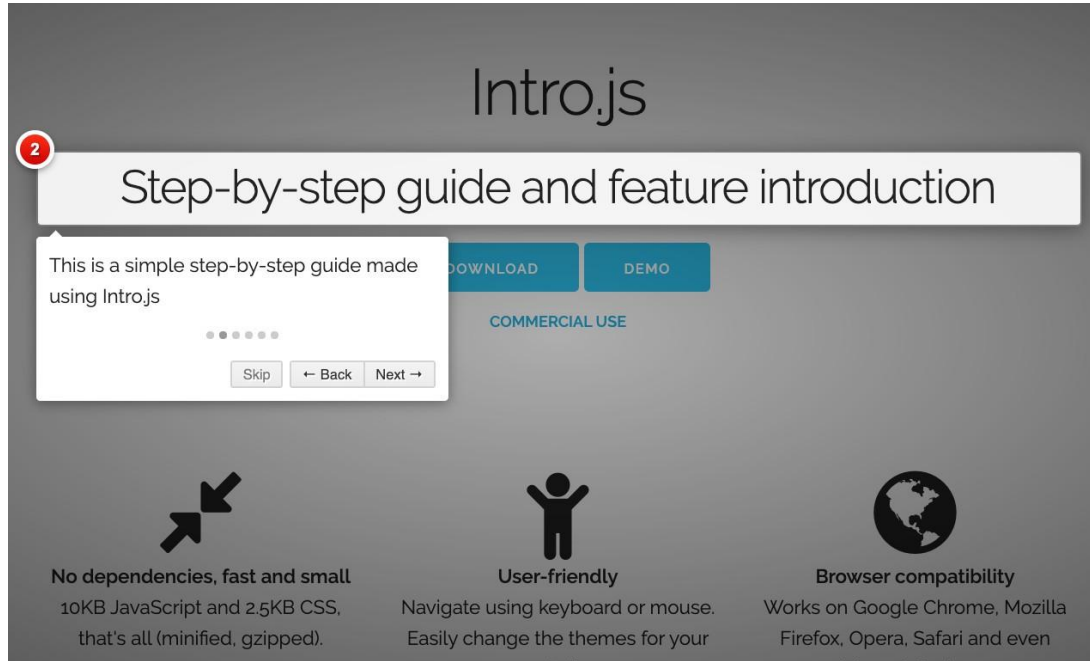
Please pause the video and written down your responses



Learnability - Complex Tasks



Learnability - Complex Tasks



The screenshot shows the Intro.js website with a dark grey background. At the top, the text "Intro.js" is displayed. Below it, a white box contains the text "Step-by-step guide and feature introduction". A red circle with the number "2" is in the top left corner of this box. Below the white box, there are buttons for "DOWNLOAD" and "DEMO", and a link for "COMMERCIAL USE". A white tooltip box is overlaid on the left side, containing the text "This is a simple step-by-step guide made using Intro.js". The tooltip has a progress indicator with five dots, the first of which is filled, and navigation buttons: "Skip", "← Back", and "Next →". At the bottom of the page, there are three columns of text, each with an icon above it. The first column has an icon of two arrows pointing towards each other and the text "No dependencies, fast and small" followed by "10KB JavaScript and 2.5KB CSS, that's all (minified, gzipped)". The second column has an icon of a person with arms raised and the text "User-friendly" followed by "Navigate using keyboard or mouse. Easily change the themes for your". The third column has an icon of a globe and the text "Browser compatibility" followed by "Works on Google Chrome, Mozilla Firefox, Opera, Safari and even".

Intro.js

Step-by-step guide and feature introduction

This is a simple step-by-step guide made using Intro.js

DOWNLOAD DEMO

COMMERCIAL USE

Skip ← Back Next →

No dependencies, fast and small
10KB JavaScript and 2.5KB CSS, that's all (minified, gzipped).

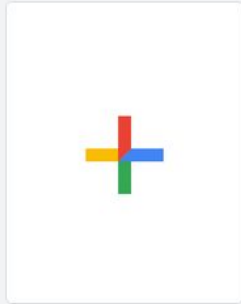
User-friendly
Navigate using keyboard or mouse. Easily change the themes for your

Browser compatibility
Works on Google Chrome, Mozilla Firefox, Opera, Safari and even



Learnability - Complex Tasks

Recently used



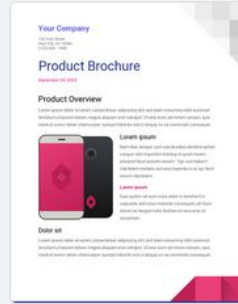
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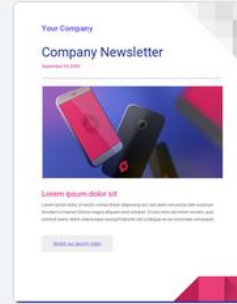
Sales quote
by PandaDoc



Statement of work
by Upwork



Brochure
Geometric



Newsletter
Geometric



Resume
Serif

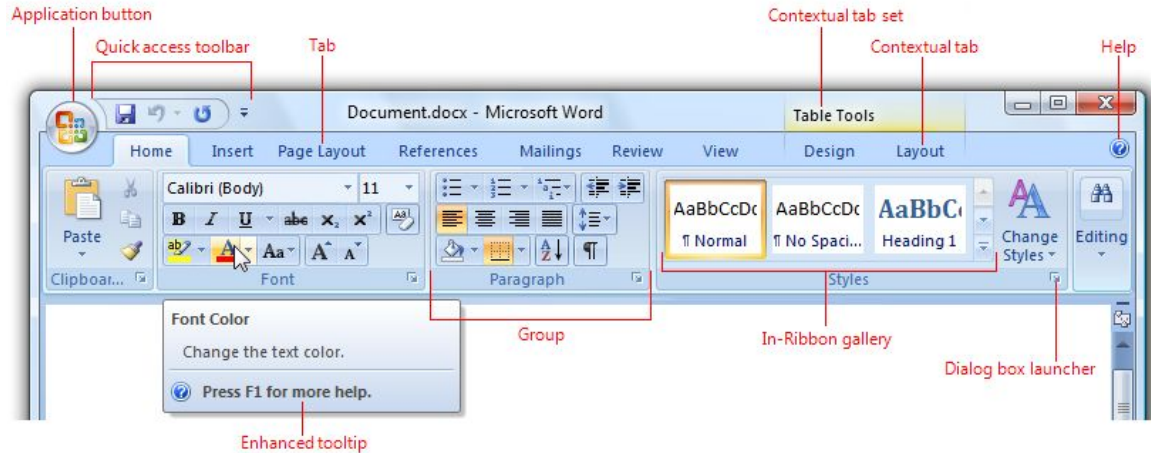


Resume
Coral



Memorability

How easy a system is to remember how to use, once learned



User Experience Goals

- Want users to experience positive emotions while using the software
- E.g. - satisfying, enjoyable, fun, helpful, entertaining, helpful, motivating, emotionally fulfilling etc.
- More subjective
- How users experience a product from their perspective



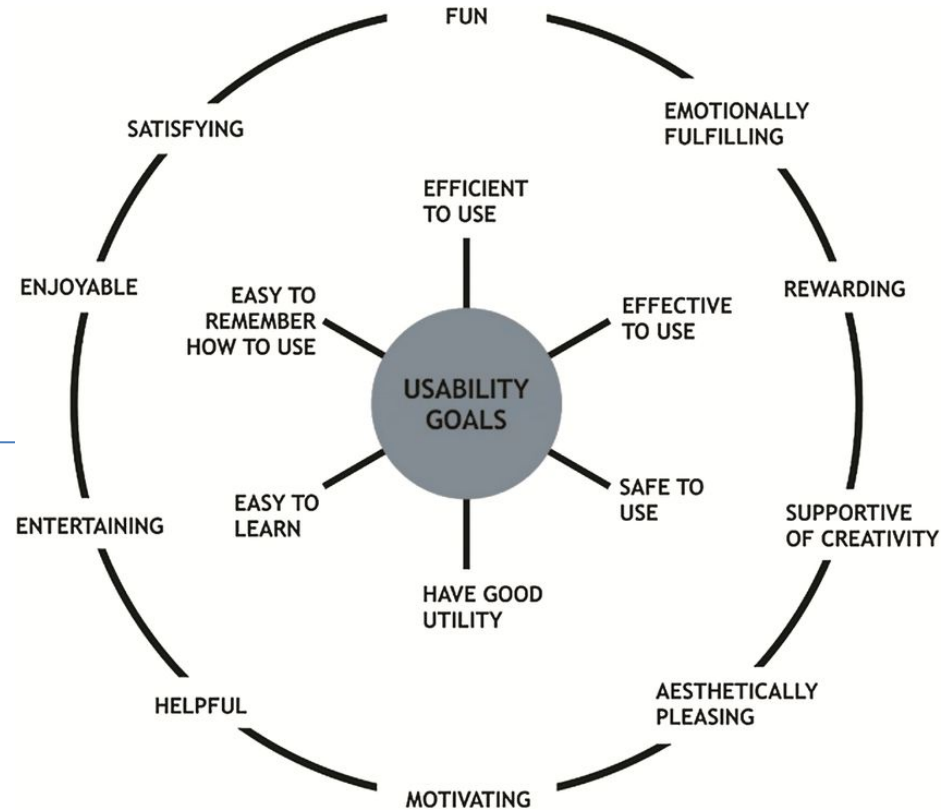


Diagram Jennifer Preece on usability goals and user experience.

Source: www.sharritt.com/CISHCIExam/preece.html



Software Engineering

Prototyping Techniques

Dr. Sridhar Iyer, IIT Bombay

Dr. Prajish Prasad, FLAME University



Recap

- Goals and principles to design “usable” interfaces
- Process of interaction design -
 - Identifying needs and requirements
 - Developing alternative design that meet those requirements
 - Build interactive versions
 - Evaluate



Reflection Spot

Are we ready to code? Why shouldn't we code the UI right away?



Please pause the video and written down your responses



Why we shouldn't start coding

- Initial design ideas might not be the best ones
- Developing an interface takes time, money, effort
- Prototypes allow you to quickly test on users, get feedback, iterate, and pivot

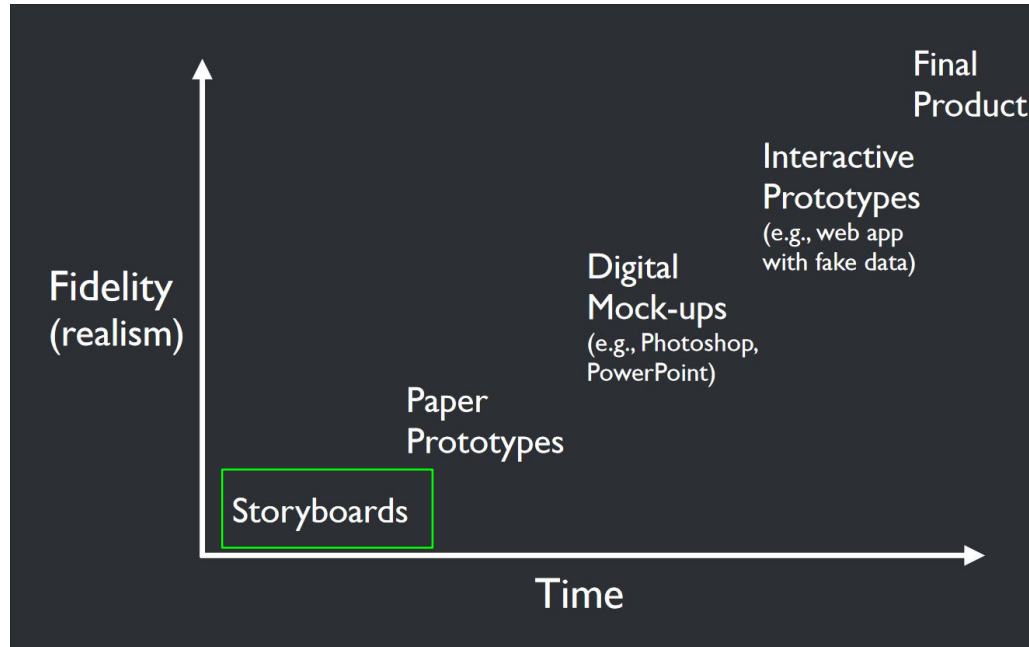


Prototyping

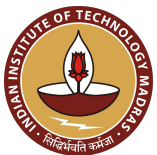
- Prototypes answer questions and support designers in choosing between alternatives.
- Purpose -
 - Test out technical feasibility of an idea
 - Clarify some vague requirements
 - User testing and evaluation



Types of Prototypes



Taken from Prof. Philip Guo's Intro to HCI course -
<https://ixd.ucsd.edu/home/f16/lectures/IntroHCI-f16-Week2.pdf>



Storyboard

A hand-drawn comic that features:
Setting + Sequence + Satisfaction

Setting

- People involved
- Environment
- Task being accomplished

Sequence

- What steps are involved?
- What leads someone to use the app?
- What task is being illustrated?

Satisfaction

- What motivates people to use the system?
- What does it enable people to accomplish?
- What need does the system fill?



Storyboard example

Speak-Up - Virtual reality tool to help give effective presentations

- Simulate a presentation setting
- Recording of audio during the presentation
- Hints are provided during the presentation process

Taken from Introduction to Human Computer Interaction course - Prof. Chandan Dasgupta - IIT Bombay
Team members - Nagesh Pokle, Deepika Kanojia, Vishvanath Falegaonkar, Dr. Veenita Shah

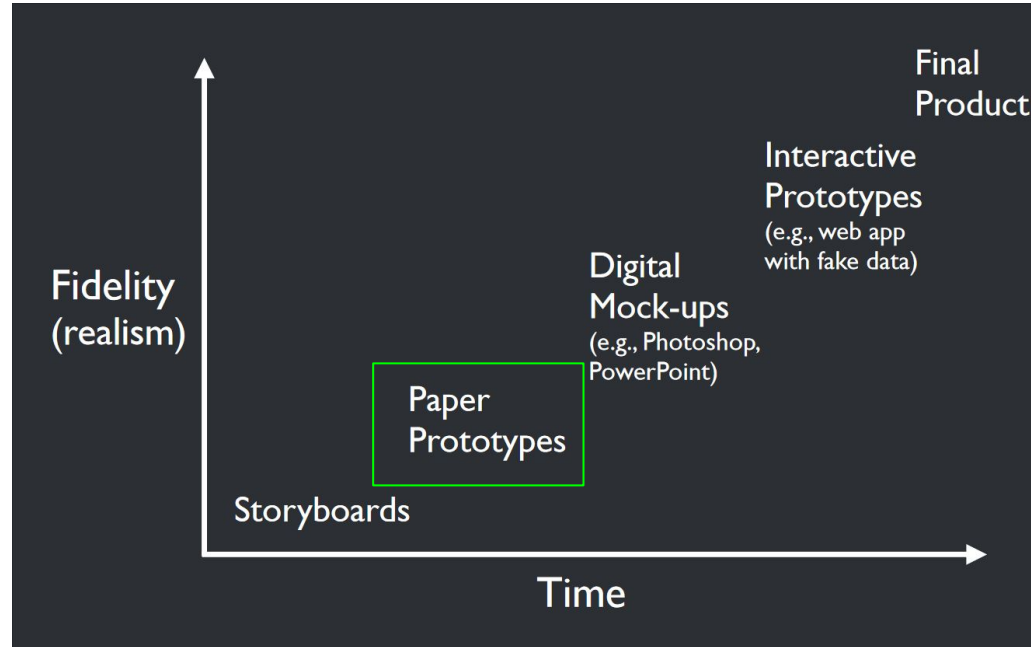


Benefits of Storyboard

- Emphasizes how interface accomplishes a task
- Avoids commitment to a particular user interface
- Shared understanding among stakeholders



Types of Prototypes



Taken from Prof. Philip Guo's Intro to HCI course -
<https://ixd.ucsd.edu/home/f16/lectures/IntroHCI-f16-Week2.pdf>



Paper Prototypes

- Hand-drawn interface
- Multiple pieces of paper



Paper Prototypes Example

Online Library for Deaf and Hard of Hearing (DHH) and Speech Impaired Students

- Books in Indian Sign Language (ISL)
- Speech Therapy

Taken from Introduction to Human Computer Interaction course - Prof. Chandan Dasgupta - IIT Bombay
Team members - Meera Daulatrao Pawar, Jyoti Kolap, Nisumba Soodhani K, Vijaya Singh, Devanshu Saindane

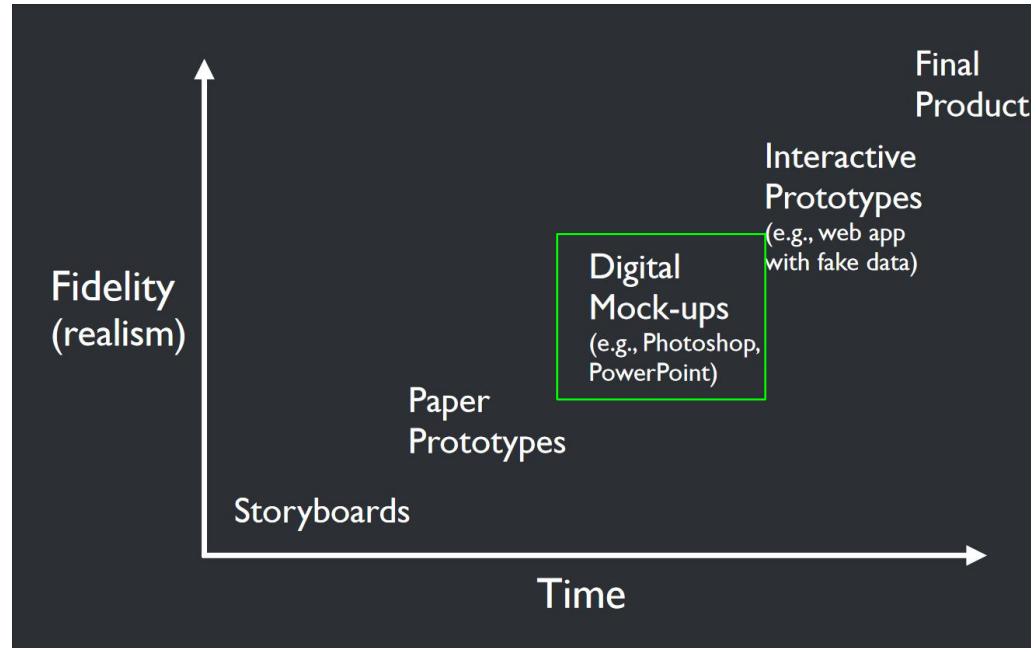


Benefits of Paper Prototypes

- Easier than writing code for user interface
- Starts conversation about user interactions
- Elements can be changed immediately based on given feedback



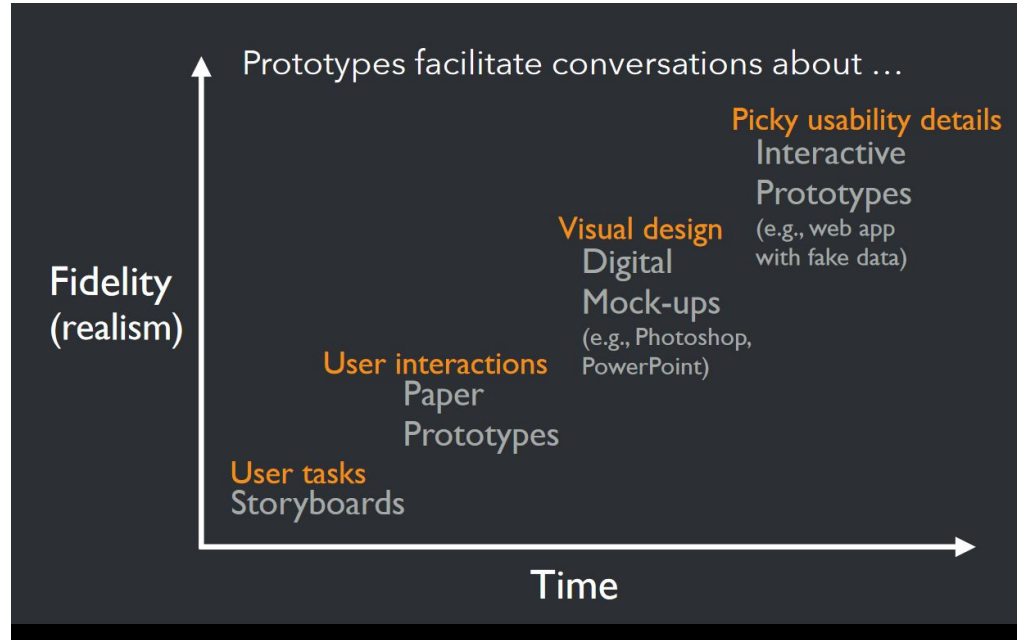
Types of Prototypes



Taken from Prof. Philip Guo's Intro to HCI course -
<https://ixd.ucsd.edu/home/f16/lectures/IntroHCI-f16-Week2.pdf>



Summary



Taken from Prof. Philip Guo's Intro to HCI course -
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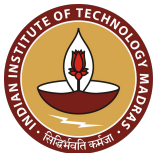


Software Engineering

Evaluation using Design Heuristics - Heuristics for Understanding

Dr. Sridhar Iyer, IIT Bombay

Dr. Prajish Prasad, FLAME University



Recap

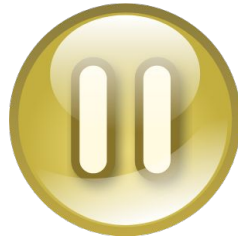
- Usability, user experience goals
- Prototyping

How do we evaluate the UI of the prototype?



Reflection Spot

What are ways in which you can evaluate the user interface of your prototype?



Please pause the video and written down your responses



Evaluation of User Interface

- Assess with real users
- Critique from expert designers
 - Subjective?
 - Specific guidelines



Heuristic Evaluation

- Heuristics are the strategies derived from previous experiences with similar problems
- Rules of thumb/guidelines



Heuristic Evaluation

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



Clean & Functional Design

ACTION



Freedom



Flexibility



Recognition Over
Recall

FEEDBACK



Show Status



Prevent Errors



Support Error
Recovery



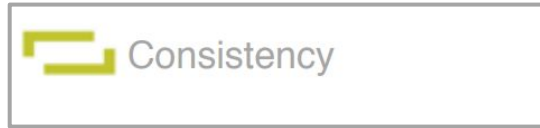
Provide Help

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Heuristic Evaluation

UNDERSTANDING



ACTION



FEEDBACK

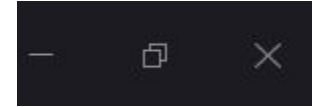
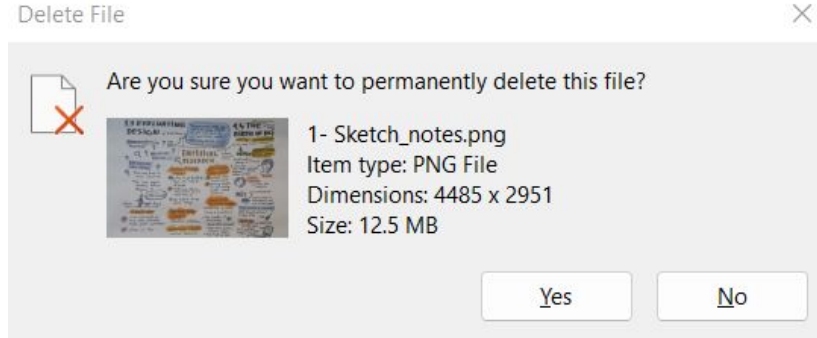


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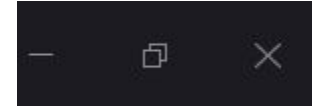
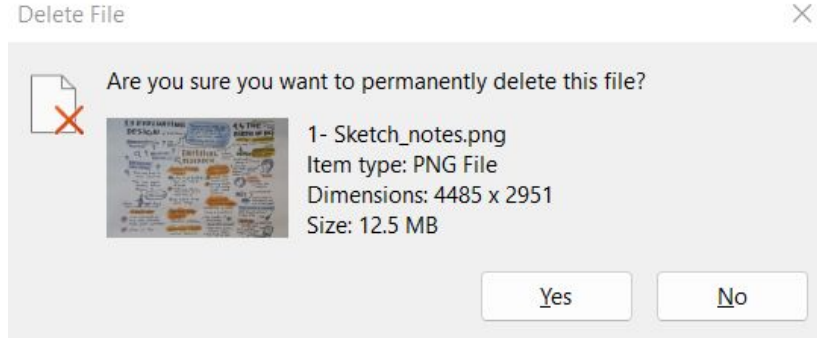
Heuristics for Understanding

- Consistency
 - Consistent Layout



Heuristics for Understanding

- Consistency
 - Consistent Layout



- Consistent Name



Heuristic Evaluation

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



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Provide Help

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Heuristics for Understanding

Use Familiar Languages and Metaphors

- Online Shopping

Shopping Cart
Deselect all items



- Paying Online - “Mobile Wallet”



Heuristic Evaluation

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



Clean & Functional Design

ACTION



Freedom



Flexibility



Recognition Over
Recall

FEEDBACK



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Support Error
Recovery



Provide Help

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Heuristics for Understanding

Clean and Functional Design



Heuristics for Understanding

Clean and Functional Design

✈ Flights SALE

🏠 Hotels DEALS

★ Cleartrip for Work

⚙ Top Offers

🎁 Gift Card

🎧 Support

🧳 Manage trips

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Summary

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



Clean & Functional Design

ACTION



Freedom



Flexibility



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Recall

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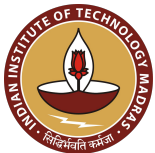


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Evaluation using Design Heuristics - Heuristics for Action

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Heuristic Evaluation

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Provide Help

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Freedom

- Freedom to Undo
 - Deleted a file? Recover from trash
 - Document - recovery options
 - Undo - Ctrl Z



Freedom

- Freedom to Explore

The screenshot displays the IRCTC website's header and navigation sections. The header features the IRCTC logo, the company name "Indian Railway Catering and Tourism Corporation Limited", and the tagline "A Government of India Enterprise". It also includes a language selector for "हिन्दी वेबसाइट (Beta)" and a "Contact Us" link. The main navigation bar contains links for "Train Reservation", "Hotels", "Tourist Trains", "Tour Packages", and "Loyalty Program".

The "Train Reservation" section is highlighted, showing a "Login" form with fields for "Username" and "Password", and a "Login" button. Below the login form are links for "Signup", "Forgot Password", "Agent Login", and "Find Agents". To the right of the login form is a "Train Ticket" selection area with radio buttons for "Train Ticket", "Tourism Services", and "Mumbai Season Ticket".

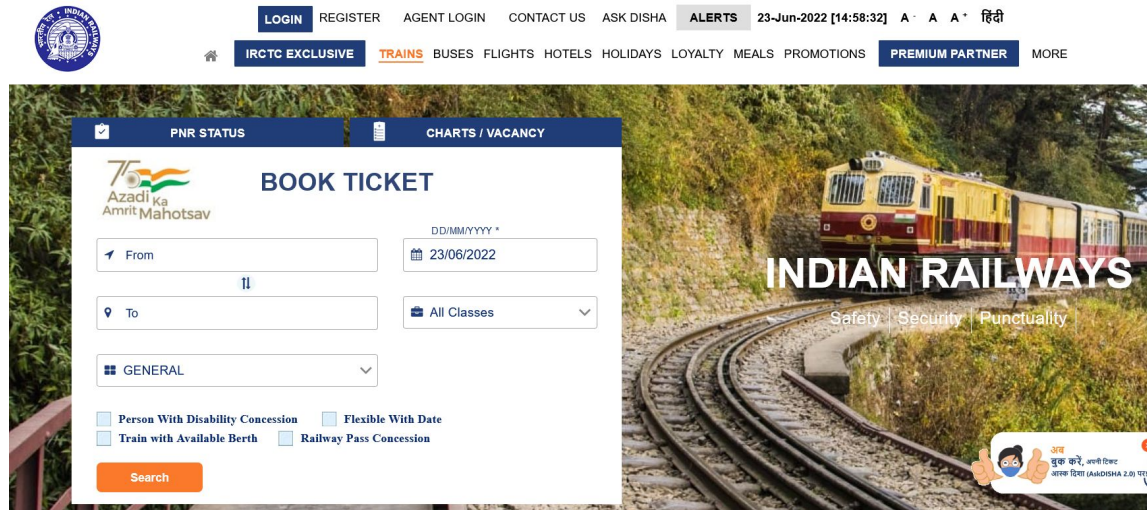
Below the login form is a "Help & Info" section with links for "Enquiries", "Loyalty Program", "Special Offers", "IRCTC Zone", "Mobile Zone", and "Catering".

On the right side of the page, there is a "24x7 Customer Care" section with contact numbers for "Mon - Sat (10 AM to 6 PM)" and "Chennai Customer Care", along with an email address "care@irctc.co.in". There is also an "SMS 139" section and an "IRCTC Updates / Alerts" section with a warning message: "by a user is not permitted. Users are requested to mail the user-id that they would like to keep active at care@irctc.co.in."



Freedom

- Freedom to Explore



The screenshot displays the Indian Railways website interface. At the top, there is a navigation bar with links: LOGIN, REGISTER, AGENT LOGIN, CONTACT US, ASK DISHA, ALERTS, 23-Jun-2022 [14:58:32], A · A · A · हिंदी. Below this is a secondary navigation bar with links: IRCTC EXCLUSIVE, TRAINS, BUSES, FLIGHTS, HOTELS, HOLIDAYS, LOYALTY, MEALS, PROMOTIONS, PREMIUM PARTNER, MORE. The main content area features a 'BOOK TICKET' form on the left and a large banner on the right. The banner shows a train on tracks with the text 'INDIAN RAILWAYS' and 'Safety | Security | Punctuality'. The 'BOOK TICKET' form includes fields for 'From', 'To', 'Date' (DD/MM/YYYY), 'Class' (All Classes), and 'Passenger Type' (GENERAL). There are also checkboxes for 'Person With Disability Concession', 'Flexible With Date', 'Train with Available Berth', and 'Railway Pass Concession'. A 'Search' button is at the bottom of the form. The form also features the '75 Azadi Ka Amrit Mahotsav' logo.



Heuristic Evaluation

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



Clean & Functional Design

ACTION



Freedom



Flexibility



Recognition Over
Recall

FEEDBACK



Show Status



Prevent Errors



Support Error
Recovery



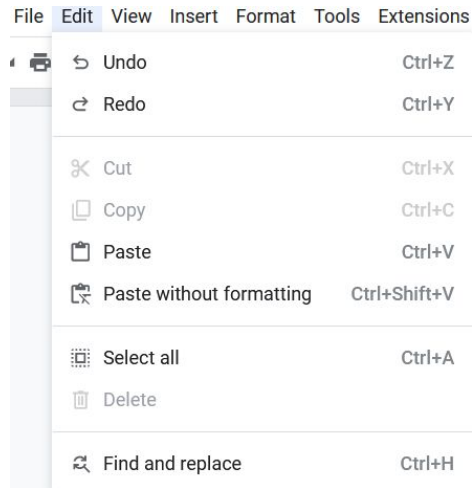
Provide Help

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Adapted from Jacob Nielsen's heuristics - <https://www.nngroup.com/articles/ten-usability-heuristics/>



Flexibility

- Experts as well as new users should be able to carry out tasks efficiently
- Example: Word, Google Docs etc.



Flexibility

- **Personalization** - Tailoring content/functionality for individual users
 - Social media apps
- **Customization** - allow users to make selections about how they want the product to work
 - E.g. - News apps - asks users to select which topics they want news about



Heuristic Evaluation

UNDERSTANDING



Consistency



Use Familiar
Metaphors & Language



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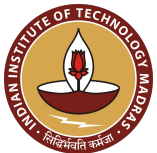
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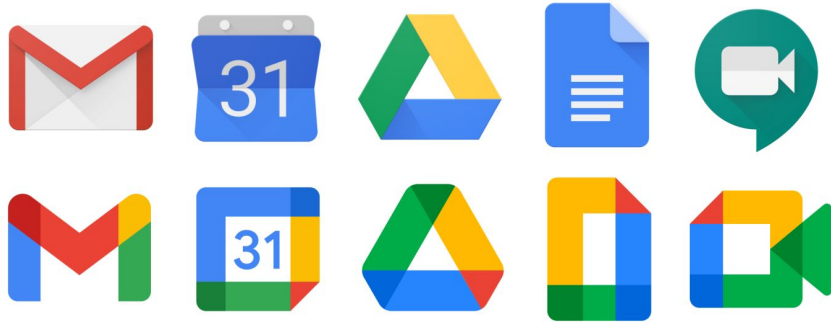
Recognition over Recall

- Users find it easier to recognize something they have seen earlier
- E.g -
 - Pre-GUI era - Moving a file from one location to another in linux?
 - `mv temp.txt new_folder/`
 - Now - Moving a file from one location to another?
 - Right click on the file!

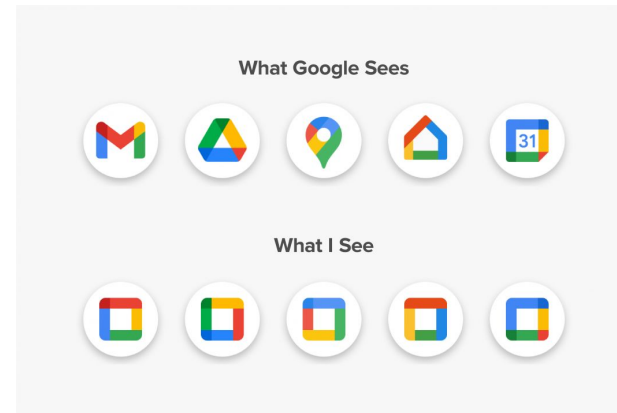


Recognition over Recall

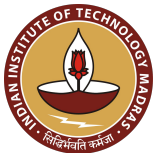
- Interface - buttons, navigation etc. should help the user reach his goal



<https://techcrunch.com/2020/10/06/googles-new-logos-are-bad/>



<https://thehardcopy.co/is-the-criticism-of-google-icons-justified/>



Evaluation using Design Heuristics - Heuristics for Feedback

Dr. Sridhar Iyer, IIT Bombay

Dr. Prajish Prasad, FLAME University



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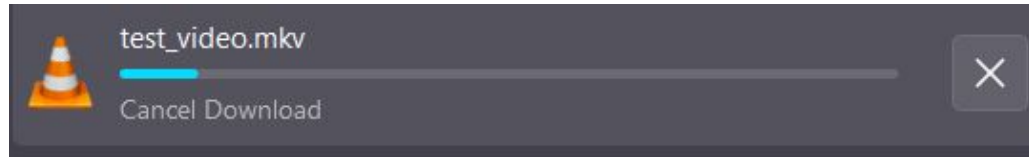
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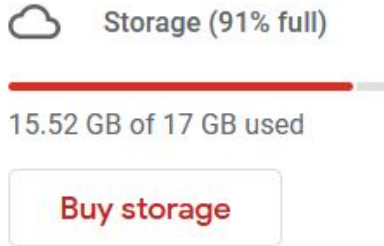
Show Status

- Keep users informed about what is happening, through appropriate feedback within a reasonable amount of time.
 - Loading Status in browsers
 - How much time a particular action will take



Show Status

- Provide next steps
 - Example form signup, email signup
- Provide warnings in advance



Prevent Errors

- Why do users make errors?



Prevent Errors

Include helpful constraints

☐ One way ☒ Round trip

From: BOM - Mumbai, IN To: MAA - Chennai, IN

Depart on: Tue, Jul 19 Return on: Tue, Jul 19

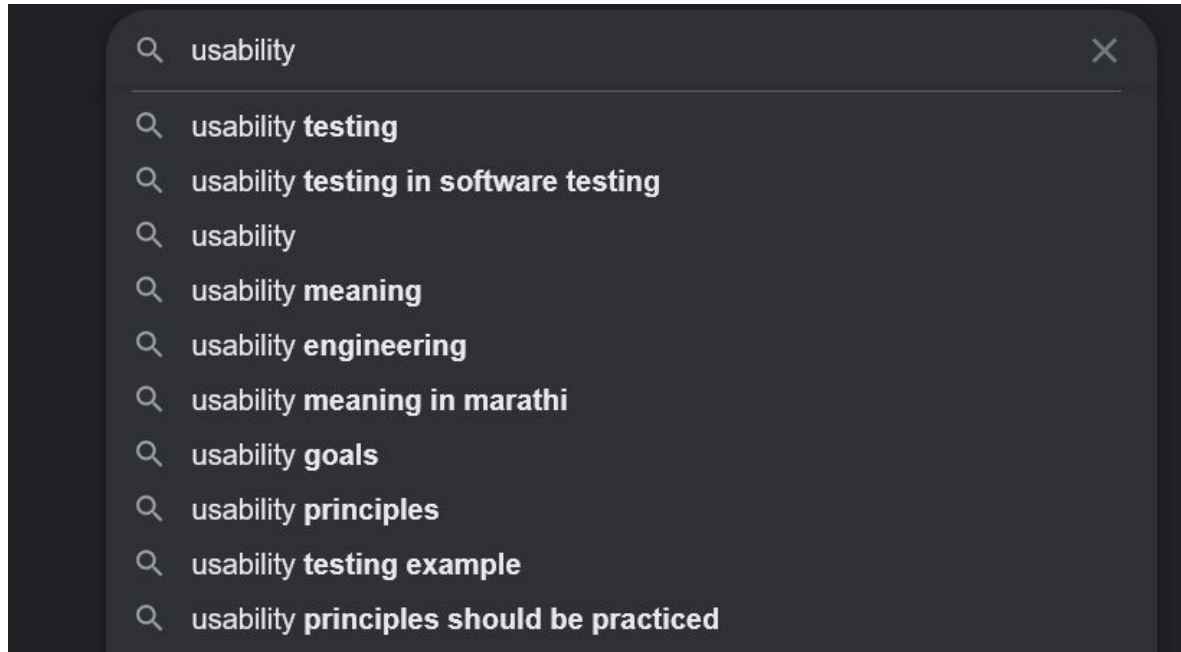
July 2022 August 2022

M	T	W	T	F	S	S	M	T	W	T	F	S	S
				1	2	3	1	2	3	4	5	6	7
4	5	6	7	8	9	10	8	9	10	11	12	13	14
11	12	13	14	15	16	17	15	16	17	18	19	20	21
18	19	20	21	22	23	24	22	23	24	25	26	27	28
25	26	27	28	29	30	31	29	30	31				



Prevent Errors

Offer Suggestions



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Support Error Recovery

Make the problem clear

Sign Up



It's quick and easy.

First name

!

Surname

!

Mobile number or email address

!

New password

!

Date of birth ?

!

19

▼

Jul

▼

2022

▼

Gender ?

!

Female

☐

Male

☐

Custom

☐

People who use our service may have uploaded your contact information to Facebook. [Learn more.](#)

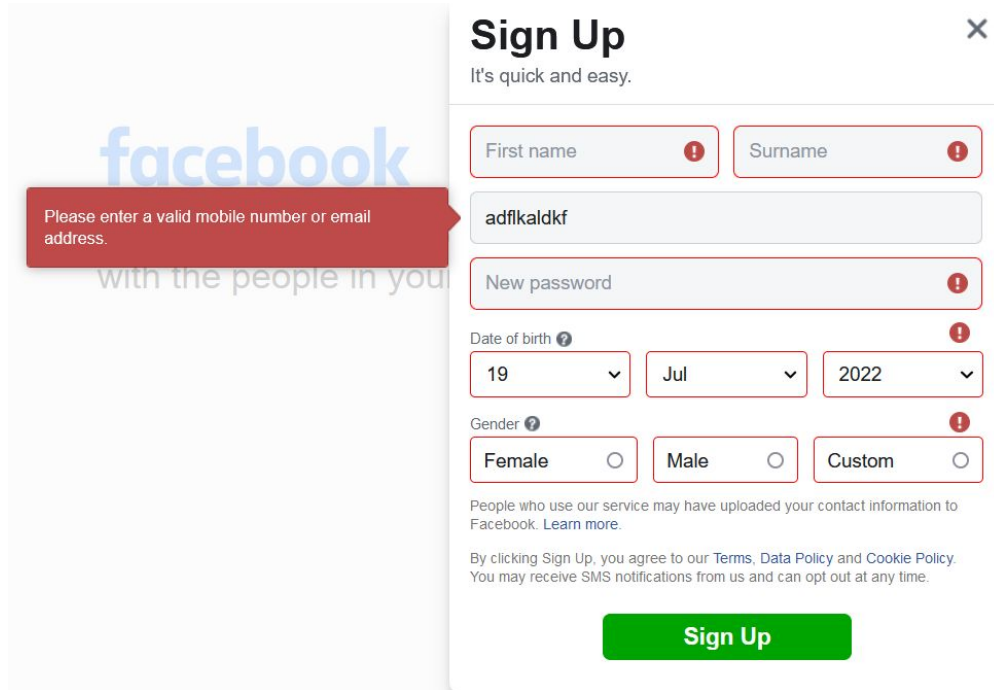
By clicking Sign Up, you agree to our [Terms](#), [Data Policy](#) and [Cookie Policy](#).
You may receive SMS notifications from us and can opt out at any time.

Sign Up



Support Error Recovery

Provide a solution



The image shows a Facebook Sign Up form with several error messages. A red banner at the top left says "Please enter a valid mobile number or email address." The form fields are: First name (error), Surname (error), New password (error), Date of birth (error), and Gender (error). The Date of birth field is set to 19 Jul 2022. The Gender field has radio buttons for Female, Male, and Custom. The form also includes a green Sign Up button and a link to Learn more.

Sign Up ×

It's quick and easy.

First name ! Surname !

adfkaldkf

New password !

Date of birth !

19 ▼ Jul ▼ 2022 ▼

Gender !

Female ☐ Male ☐ Custom ☐

People who use our service may have uploaded your contact information to Facebook. [Learn more.](#)

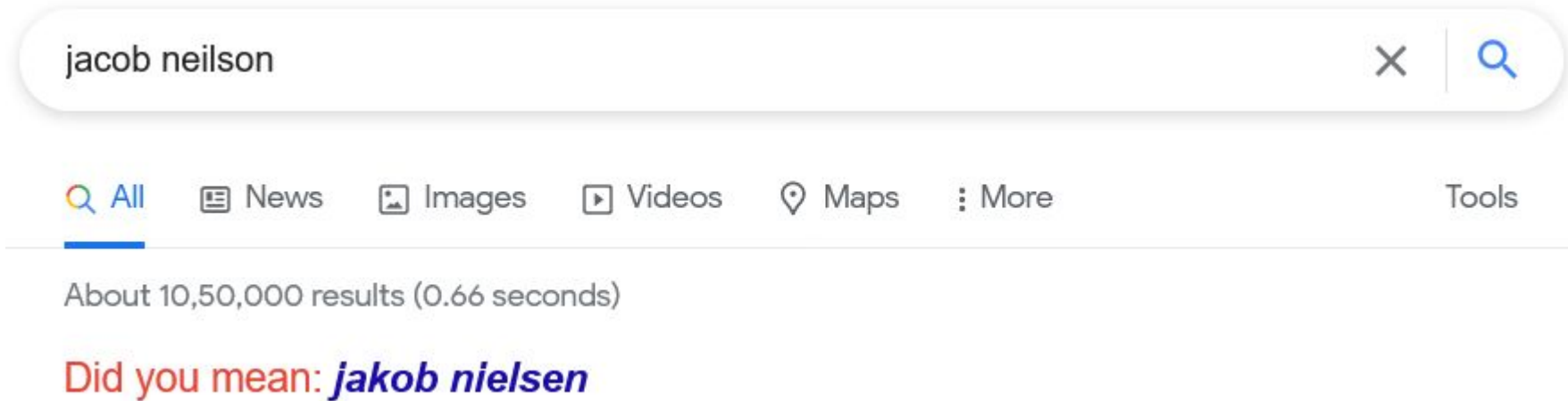
By clicking Sign Up, you agree to our [Terms](#), [Data Policy](#) and [Cookie Policy](#).
You may receive SMS notifications from us and can opt out at any time.

Sign Up



Support Error Recovery

Provide an alternative



A screenshot of a Google search interface. The search bar contains the text "jacob neilson". To the right of the search bar are a close button (X) and a search button (magnifying glass). Below the search bar, there are tabs for "All", "News", "Images", "Videos", "Maps", and "More". The "All" tab is selected and underlined. To the right of these tabs is a "Tools" link. Below the tabs, it says "About 10,50,000 results (0.66 seconds)". Below that, it says "Did you mean: ***jakob nielsen***".



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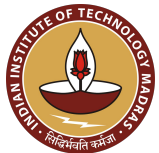
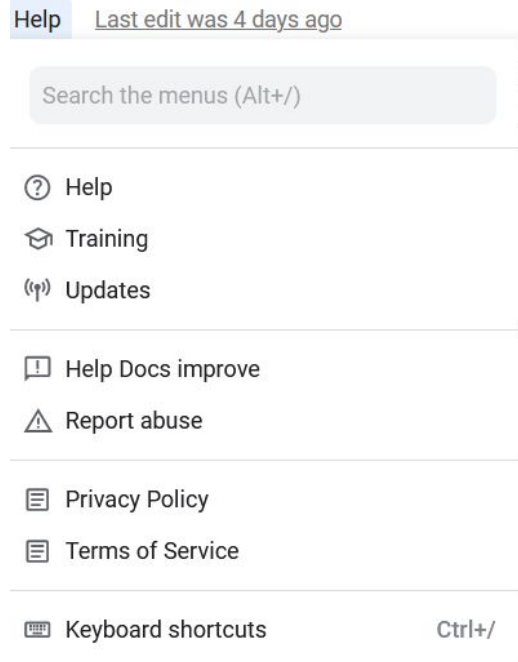
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Provide Help

Ensure help is easy to search



Provide Help

Provide help in context

Add a new course

[Expand all](#)

▼ General

Course full name ⓘ ⓘ

Course short name ⓘ ⓘ

Course category ⓘ ⓘ × Miscellaneous

Course visibility ⓘ ⓘ

This setting determines whether the course appears in the list of courses and whether students can access it. If set to Hide, then access is restricted to users with the capability to view hidden courses (such as teachers).

Course start date ⓘ ⓘ 00 ⓘ 00 ⓘ

Course end date ⓘ ⓘ 20 ⓘ July ⓘ 2023 ⓘ 00 ⓘ 00 ⓘ ☒ Enable

Course ID number ⓘ



Heuristic Evaluation

- Experts evaluate the prototype
 - Do multiple passes
 - List of issues that violate design heuristics

