



2023



# Design Theory, Principles and Guidelines

Human Computer Interaction

Luigi De Russis

Academic Year 2023/2024

# Hall of Fame or Shame?

Did we make you smile?

Based on your shopping experience,  
how likely are you to recommend us on  
a scale of 0 - 10?

Extremely unlikely



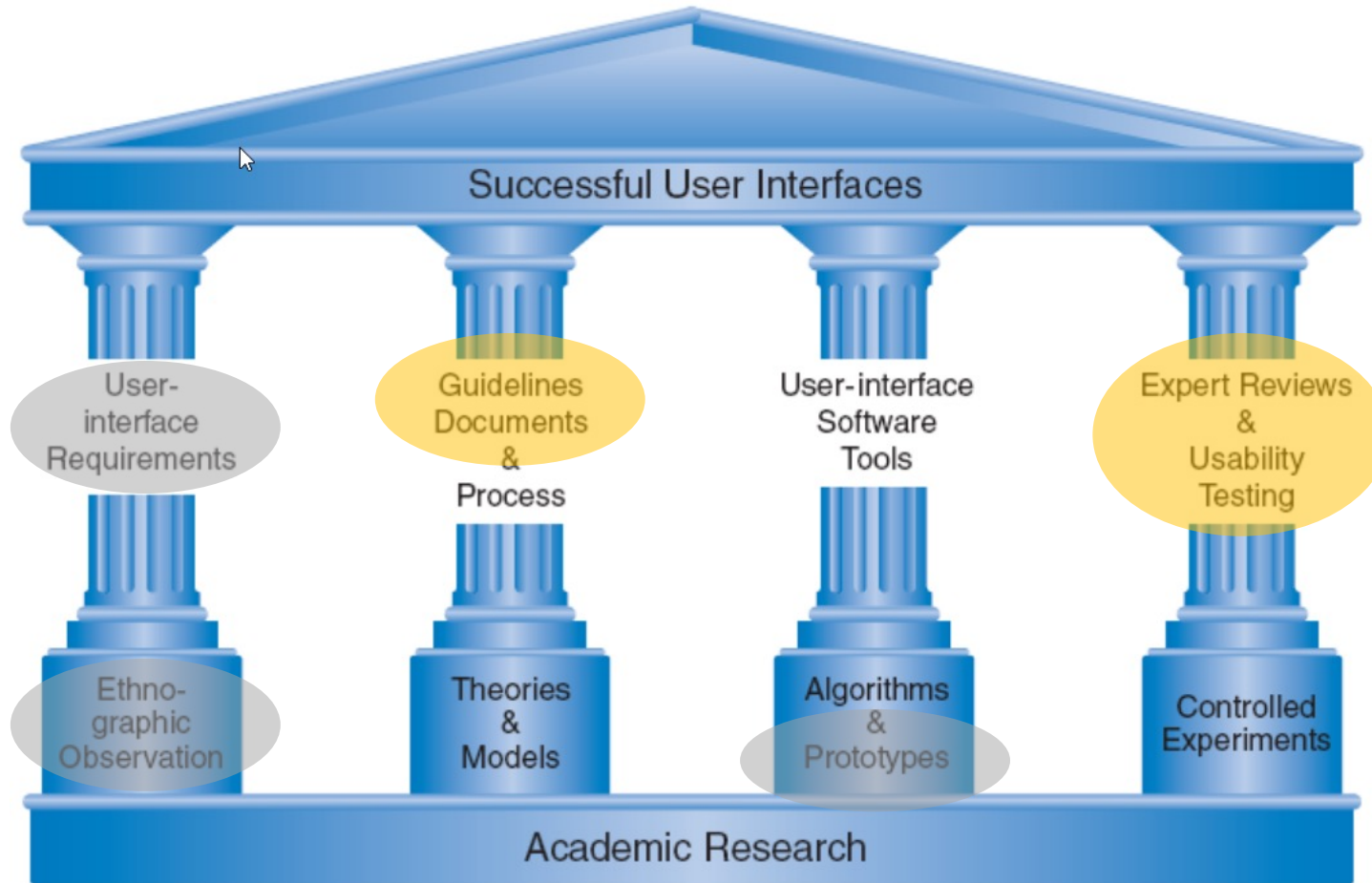
0 1 2 3 4



5 6 7 8 9 10

Extremely likely

# The Four Pillars of Design



Ben Shneiderman & Catherine Plaisant, Designing the User Interface: Strategies for Effective Human-Computer Interaction

# Goals

## Generating design solutions

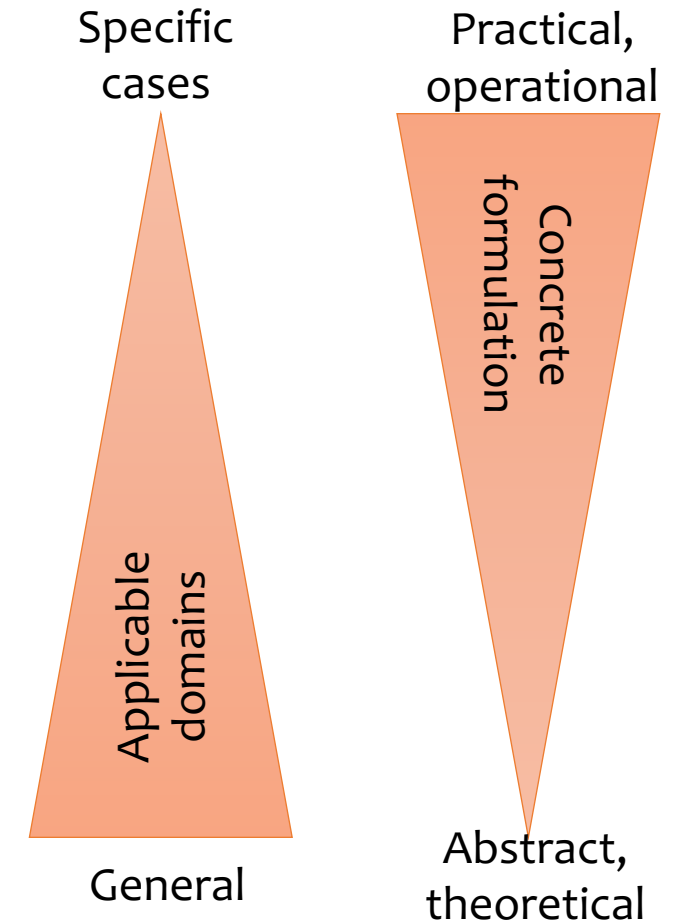
- Guidelines
- Principles
- Theories

## Evaluating generated designs

- Expert reviews and heuristics
- Usability testing
- Controlled experiments

# Generating Design Solutions

- **Guidelines:** Low-level focused advice about good practices and cautions against dangers
- **Principles:** Mid-level strategies or rules to analyze and compare design alternatives
- **Theories:** High-level widely applicable frameworks to draw on during design and evaluation, as well as to support communication and teaching



# Design Theories

Theoretical frameworks enabling foundational research

The “Why”

# Design Theories

## Types of theories

- Descriptive
  - UI elements, terminology, semantics
- Explanatory
  - Sequences of events with causal relationships
- Prescriptive
  - Guidelines for designers to make decisions
- Predictive
  - Comparison of design alternatives based on performance figures

## Human capacity

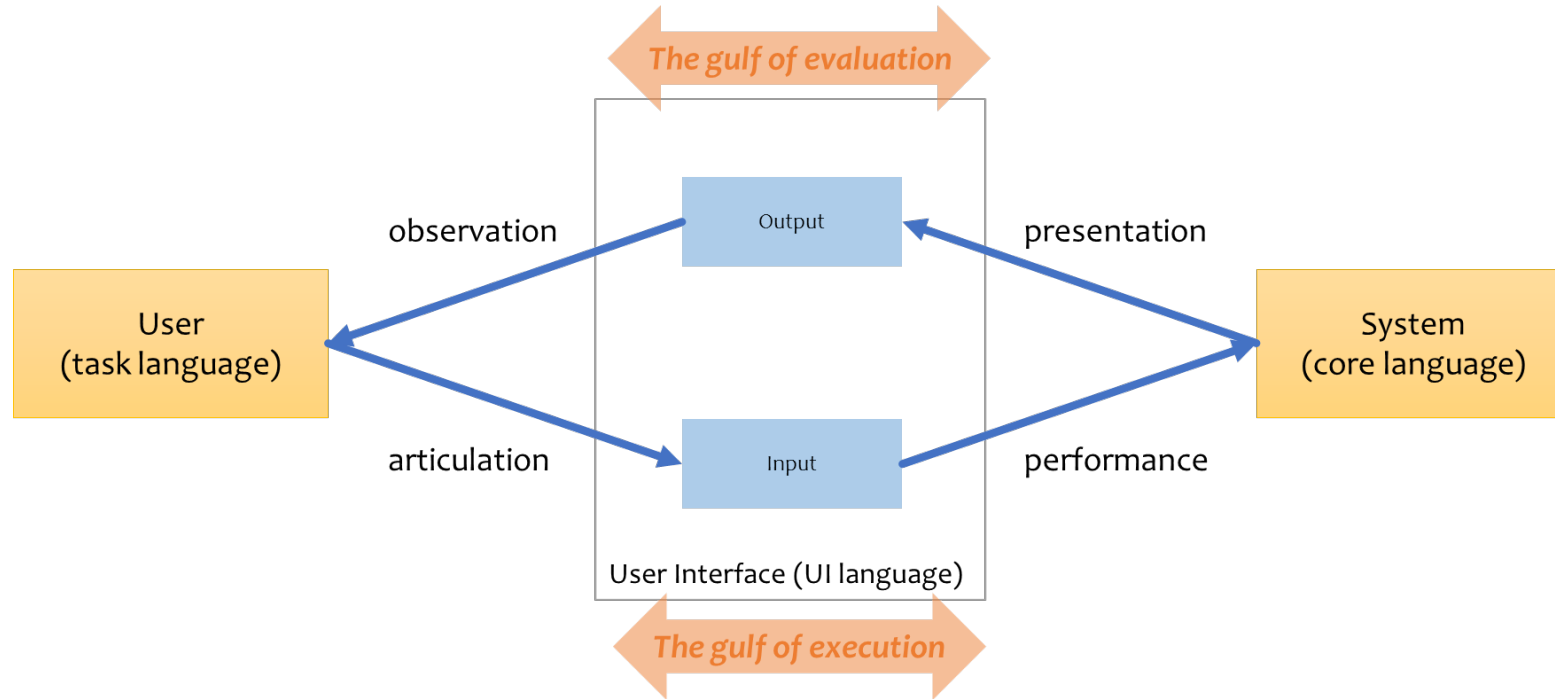
- Motor task
  - Skill in pointing, clicking, ... movements
- Perceptual
  - Sensory inputs
- Cognitive
  - Problem-solving, short-/long-term memory

# Foley and van Dam Four-level Approach (Descriptive)

- **Conceptual level**
  - User's mental model of the interactive system
- **Semantic level**
  - Describes the meanings conveyed by the user's command input and by the computer's output display
- **Syntactic level**
  - Defines how the units (words) that convey semantics are assembled into a complete sentence that instructs the computer to perform a certain task
- **Lexical level**
  - Deals with device dependencies and with the precise mechanisms by which a user specifies the syntax



# Norman's Action Models (Explanatory)



1. **Goal** (form the goal)
2. **Plan** (the action)
3. **Specify** (an action sequence)
4. **Perform** (the action sequence)
5. **Perceive** (the state of the world)
6. **Interpret** (the perception)
7. **Compare** (the outcome with the goal)

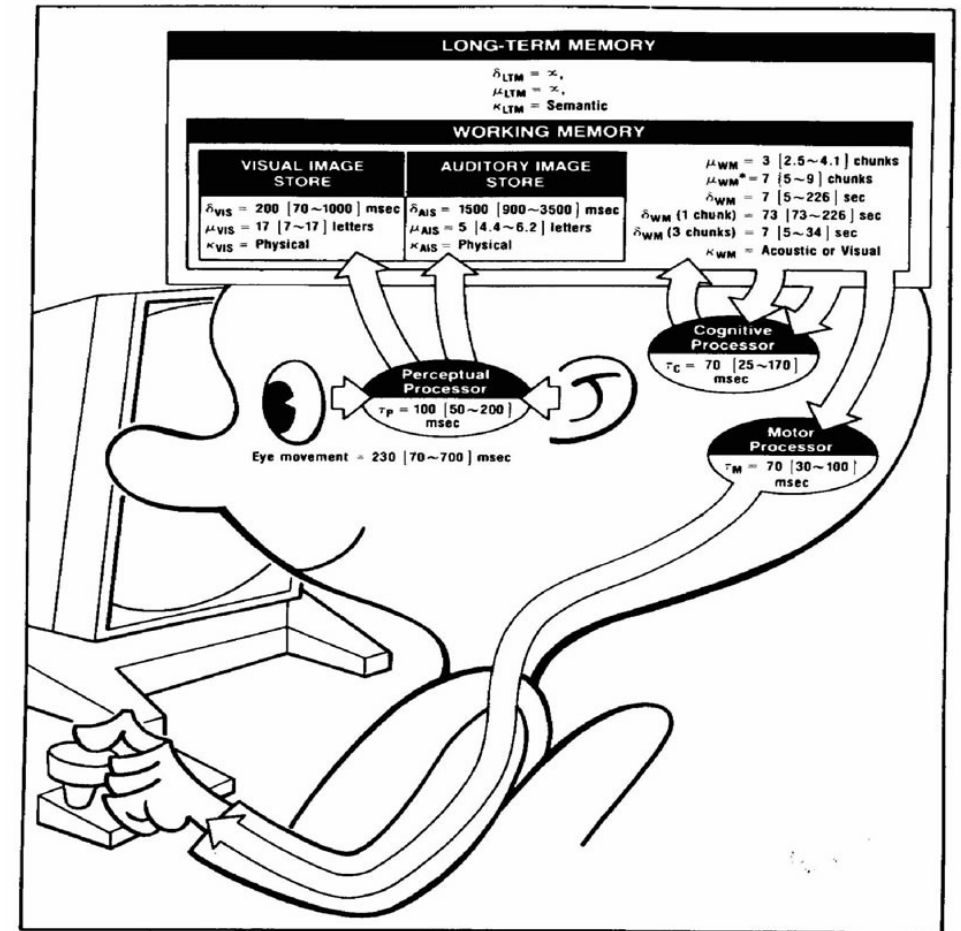
**Consistent**  
delete/insert character  
delete/insert word  
delete/insert line  
delete/insert paragraph

# Consistency Theories (Prescriptive)

- **Consistency** of nouns (objects) and verbs (actions)
  - Reduces learning time and errors
- Consistency of
  - Color
  - Layout
  - Icons
  - Fonts and Font sizes
  - Button sizes
  - ...
- Inconsistencies might be used (sparingly!) for drawing attention

# Human Processor Model

- Cognitive modelling method used to **calculate** how long it takes to perform a given task
  - prediction the system's performance (time to complete a task)
  - analogy between processing and storage areas of a computer with the perceptual, motor, cognitive and memory areas (working and long-term) of a person
- The calculations can be also used to determine the probability of a user remembering an item encountered during the task
- Underlies other usability techniques (GOMS, KLM, ...)



Card, Stuart K.; Moran, Thomas P; and Newell, Allen. Human-computer interaction – Psychological aspects, Erlbaum Associates, 1983, ISBN: 9780898592436

# Memory

- Working memory (short-term)
  - small capacity ( $7 \pm$  “chunks”)
    - +393475812632 vs. (+39) 347 581 2632
    - FGIHHJLMQ vs. FGI HHJ LMQ
  - rapid access ( $\sim 70\text{ms}$ ) and decay ( $\sim 200\text{ms}$ )
    - pass to long-term memory after a few seconds of continued storage
- Long-term memory
  - huge (unlimited, almost)
  - slower access time ( $\sim 100\text{ms}$ ) with little decay

# Fitts's Law

- Demonstration: <https://fww.few.vu.nl/hci/interactive/fitts/>
- “The amount of time required for a person to move a *pointer* to a target area is a function of the distance to the target divided by the size of the target”
  - the longer the distance and the smaller the target's size, the longer it takes
  - created by psychologist Paul Fitts in 1954 examining the human motor system
- Widely used in HCI:
  - influenced the convention of making interactive buttons large (especially on finger-operated mobile devices)
  - the distance between a user's task/attention area and the task-related button should be kept as short as possible

# Design Principles

The important aspects that we need to consider when creating a design.

The “What”

# Design Principles

- More practical than Theories
- More fundamental, widely applicable, and enduring than Guidelines
- Fundamental principles (→ from Needfinding)
  - Determine user's skill levels
  - Identify the tasks
- 5 primary interaction styles
- 8 golden rules of interface design
- Prevent errors
- Automation and human control

# Interaction Styles

- Direct manipulation
- Menu selection
- Form fill-in
- Command language
- Natural language

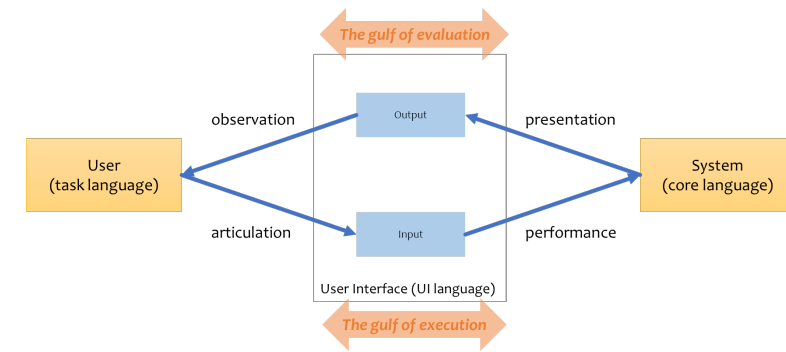
Advantages	Disadvantages
<b>Direct manipulation</b> Visually presents task concepts Allows easy learning  Allows easy retention Allows errors to be avoided Encourages exploration Affords high subjective satisfaction	May be hard to program May require graphics display and pointing devices
<b>Menu selection</b> Shortens learning Reduces keystrokes Structures decision making Permits use of dialog-management tools Allows easy support of error handling	Presents danger of many menus May slow frequent users Consumes screen space Requires rapid display rate
<b>Form fill-in</b> Simplifies data entry Requires modest training Gives convenient assistance Permits use of form-management tools	Consumes screen space
<b>Command language</b> Flexible Appeals to "power" users  Supports user initiative Allows convenient creation of user-defined macros	Poor error handling Requires substantial training and memorization
<b>Natural language</b> Relieves burden of learning syntax	Requires clarification dialog May not show context May require more keystrokes Unpredictable



# Norman's Principles from Action Models

## Principles of good design

- State and the action alternatives should be visible
- Should be a good conceptual model with a consistent system image
- Interface should include good mappings that reveal the relationships between stages
- User should receive continuous feedback



## User failures can occur

- Users can form an inadequate goal
- Might not find the correct interface object because of an incomprehensible label or icon
- May not know how to specify or execute a desired action
- May receive inappropriate or misleading feedback

# The 8 Golden Rules of Interface Design

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- Design dialogs to yield closure
- Prevent errors
- Permit easy reversal of actions
- Keep users in control
- Reduce short-term memory load

# The 8 Golden Rules of Interface Design

## ▪ Strive for consistency

- Cater to universal usability
- Offer informative feedback
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- Prevent errors
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- Keep users in control
- Reduce short-term memory load

- Similar situations should lead to similar sequences of actions
- Same terminology in prompts, menus, help
- Color, layout, capitalization, fonts, ...
- Exceptions should be comprehensive and limited
  - E.g., delete, password echo

# Internal Consistency



# Consistency with mental models



<https://twitter.com/grmcall/status/1182586857814659073?s=20>

# Consistency of Interpretation

---

**Order Timing:**



- Which one is the selected one?
  - Color codes are ambiguous
  - No further internal clues
  - No external clues
- Does it represent the current status?
- Does it represent the status that we want to achieve?

# Inconsistency for Drawing Attention

The border color and button text color in the “danger zone” are deliberately different than the rest of the page

## Merge button

When merging pull requests, you can allow any combination of merge commits, squashing, or rebasing. At least one option must be enabled.

- Allow merge commits**  
Add all commits from the head branch to the base branch with a merge commit.
- Allow squash merging**  
Combine all commits from the head branch into a single commit in the base branch.
- Allow rebase merging**  
Add all commits from the head branch onto the base branch individually.

After pull requests are merged, you can have head branches deleted automatically.

- Automatically delete head branches**  
Deleted branches will still be able to be restored.

## GitHub Pages

GitHub Pages is designed to host your personal, organization, or project pages from a GitHub repository.

- Source**  
GitHub Pages is currently disabled. Select a source below to enable GitHub Pages for this repository. [Learn more.](#)
- None ▾
- Theme Chooser**  
Select a theme to publish your site with a Jekyll theme using the `master` branch. [Learn more.](#)
- Choose a theme

## Danger Zone

- Make this repository private**  
Please [upgrade TdP-prove-finali](#)
- Transfer ownership**  
Transfer this repository to another user or to an organization where you have the ability to create repositories. [Transfer](#)
- Archive this repository**  
Mark this repository as archived and read-only. [Archive this repository](#)
- Delete this repository**  
Once you delete a repository, there is no going back. Please be certain. [Delete this repository](#)

# The 8 Golden Rules of Interface Design

- Strive for consistency
- **Cater to universal usability**
- Offer informative feedback
- Design dialogs to yield closure
- Prevent errors
- Permit easy reversal of actions
- Keep users in control
- Reduce short-term memory load
- Users with different needs: let the interface *adapt*, let content be *transformed*
- Novices vs. experts. Young vs elderly. Web vs. mobile. Users with disabilities (→Accessibility)
- **Responsive** design
- International (and cultural) variations



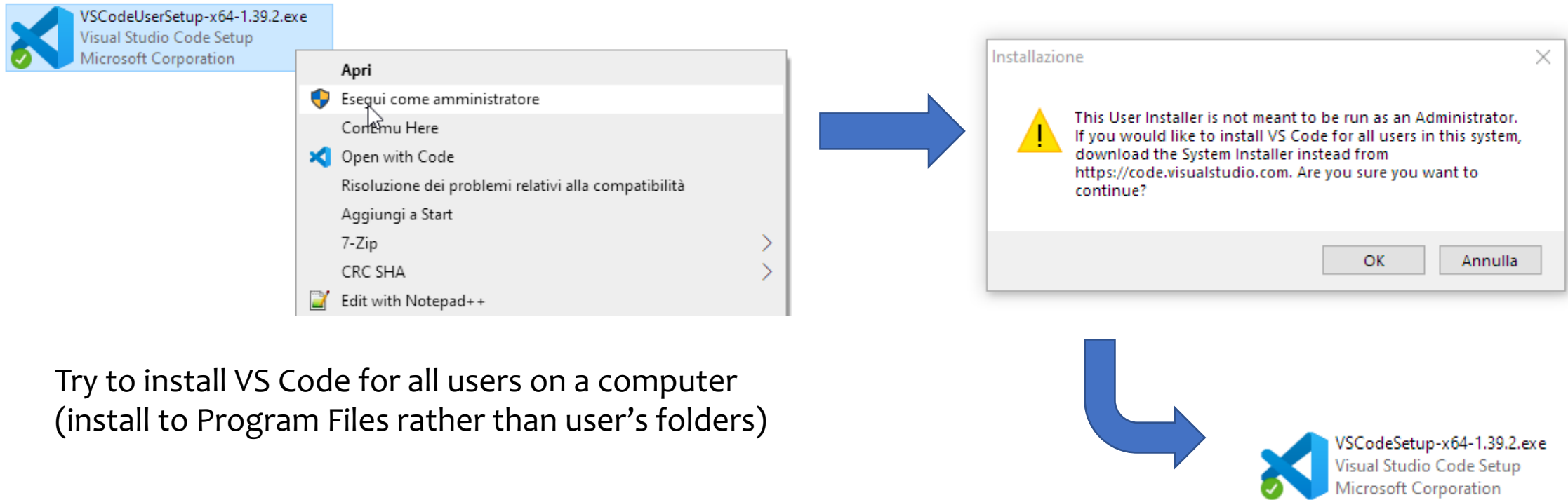
# The 8 Golden Rules of Interface Design

- Strive for consistency
  - Cater to universal usability
  - **Offer informative feedback**
  - Design dialogs to yield closure
  - Prevent errors
  - Permit easy reversal of actions
  - Keep users in control
  - Reduce short-term memory load
- For **\*every\*** human action, there should be an interface feedback
  - Frequent and minor actions: light feedback
  - Infrequent and major actions: stronger feedback
  - Visual presentation of objects helps showing the changes (e.g., dim, highlight, grey out, ...)

# Example



# Example



Try to install VS Code for all users on a computer  
(install to Program Files rather than user's folders)

# We Went a Long Way From...

```
GW-BASIC 3.23
(C) Copyright Microsoft 1983,1984,1985,1986,1987,1988
60300 Bytes free
Ok
10 INPUT X

RUN
? Fulvio
?Redo from start
? _
```

1LIST 2RUN← 3LOAD" 4SAVE" 5CONT← 6,"LPT1 7TRON← 8TROFF← 9KEY 0SCREEN

# The 8 Golden Rules of Interface Design

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- **Design dialogs to yield closure**
- Prevent errors
- Permit easy reversal of actions
- Keep users in control
- Reduce short-term memory load
- Every sequence of actions should have
  - Beginning
  - Development
  - End
- Provide clear feedback at end
  - Satisfy users
  - 'Delete' current task from their working memory, prepare for the next

# Clear Dialog Sequence



**smat**  
gruppo

**COME ACQUISTARE L'ACQUA FRIZZANTE CON LA PROPRIA CARTA DI PAGAMENTO**

**Dal 16 settembre** sarà funzionante la nuova modalità di pagamento tramite POS che consentirà, registrando la propria carta bancaria, postale, di debito, di credito o prepagata (dotata di lettura "contact-less"), il pagamento dell'acqua potabile frizzante, trattata e refrigerata prelevabile da tutti i Punti Acqua SMAT.

➔ **Registrare la propria carta bancaria, postale, di debito, di credito o prepagata**  
Inserisci la carta di pagamento nel POS  
Le carte accettate sono: Pagobancomat, VISA, Maestro, Mastercard (dotate di lettura "contact-less")  
Premi "START" (pulsante verde) per registrare la carta  
Se l'operazione non viene effettuata entro 15 secondi viene annullata. A registrazione avvenuta sul display comparirà il messaggio "credito 0,00"

➔ **Caricare o ricaricare con una carta già registrata**  
Inserisci la carta di pagamento nel POS  
Premi "START" (pulsante verde): se il credito è inferiore a 1 euro apparirà sul display il messaggio "vuoi ricaricare?" A questo punto occorrerà estrarre la carta ed avvicinarla per consentire la lettura "contact-less" e trasferire il credito di 5,00 euro sul tuo "borsellino virtuale". Al termine dell'operazione di ricarica comparirà il messaggio "ricarica eseguita correttamente"

➔ **Attivare l'erogazione**  
Inserisci la carta e attendi il riconoscimento  
Premi "START" (pulsante verde) ed estrai la carta dal POS  
Per ottenere l'erogazione premi il pulsante presente sul chiosco  
Per terminare l'erogazione premere il pulsante STOP

**Utilizzare il POS conviene dopo 5 ricariche ne riceverai 1 in omaggio**

**N.B.** La nuova modalità di pagamento non sostituisce l'attuale tessera *Smat* ma è un ulteriore strumento a disposizione dell'utenza.

In caso di anomalie di funzionamento è a disposizione il Servizio Assistenza Utenti

Numero Verde  
**800 010 010**

# Clear Dialog Sequence

**SPORTELLO ON LINE**

ID STUDENTE: 447623

LA TUA RICHIESTA SCADRA' TRA **66:23:52:23** BANDO DI CONCORSO

gg hh mm ss

## Integrazione

**ATTENZIONE:**

Dal momento che hai dichiarato di esserti immatricolato nell'a.a. 2017/2018 e stai richiedendo i benefici EDISU per il settimo semestre puoi aggiungere la richiesta anche per il primo anno di laurea magistrale. Sei interessato?

SI  NO

REGIONALE PER IL DIRITTO ALLO STUDIO UNIVERSITARIO DEL PIEMONTE

Human-Computer Interaction

OK

Submit

Confirm

Next

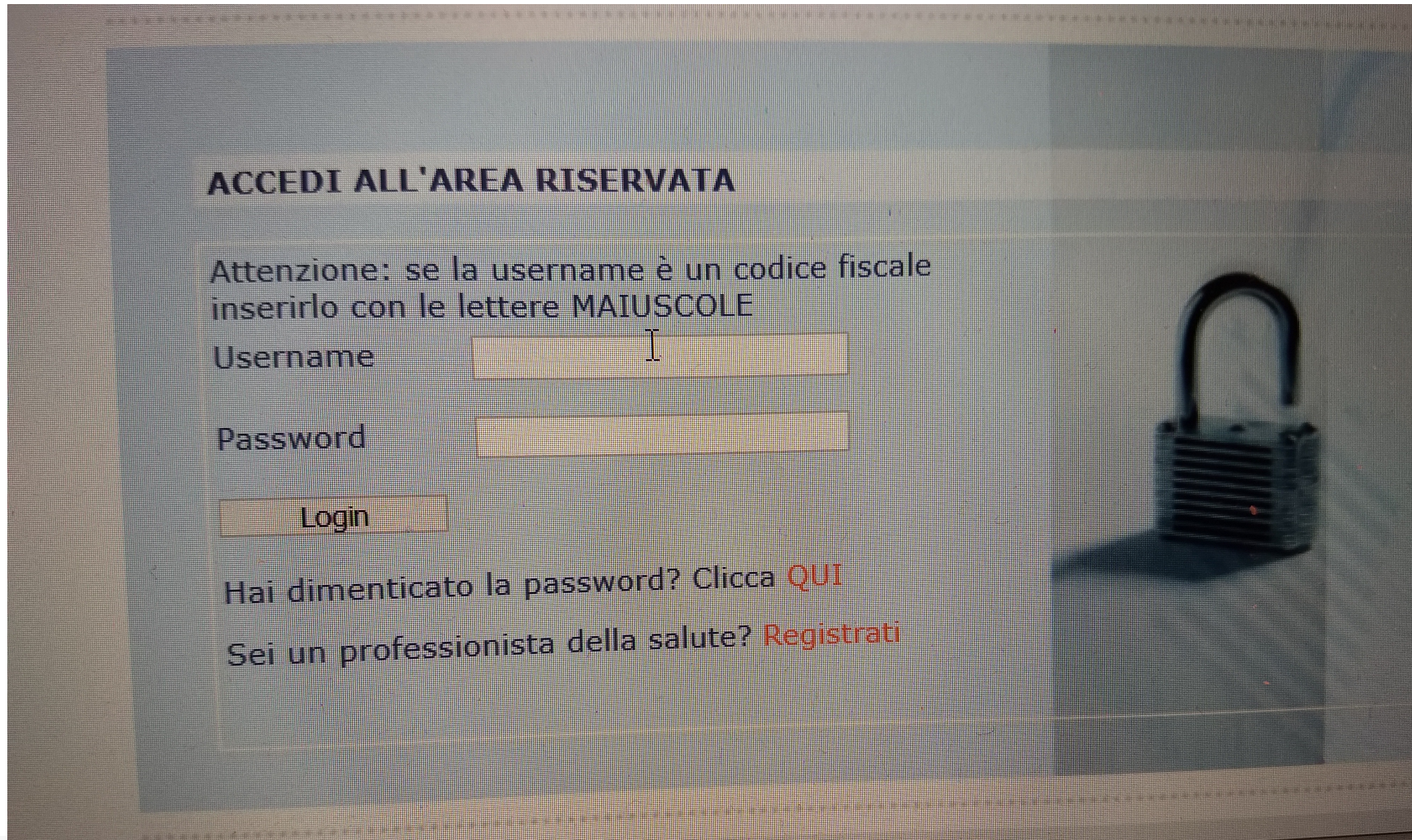
...?

# The 8 Golden Rules of Interface Design

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- Design dialogs to yield closure
- **Prevent errors**
  - Permit easy reversal of actions
  - Keep users in control
  - Reduce short-term memory load
  - Avoid the possibility of making errors
  - Disable menu items, buttons, links, ... that are not applicable
  - Prevent entering illegal characters
  - Offer simple, constructive and specific instructions for recovery
    - Repair only the faulty part
  - Errors should not alter application state (or make it easy to restore)



# Error Prevention



# The 8 Golden Rules of Interface Design

- Strive for consistency
  - Cater to universal usability
  - Offer informative feedback
  - Design dialogs to yield closure
  - Prevent errors
  - **Permit easy reversal of actions**
  - Keep users in control
  - Reduce short-term memory load
- Actions should be reversible (at the cost of extra development effort)
    - Relieves anxiety
    - Encourages exploration
  - Different levels of reversibility
    - A single action
    - A data-entry task
    - A complete group of actions

# The 8 Golden Rules of Interface Design

- Strive for consistency
- Cater to universal usability
- Offer informative feedback
- Design dialogs to yield closure
- Prevent errors
- Permit easy reversal of actions
- **Keep users in control**
- Reduce short-term memory load
- The interface should *always* respond to user actions
- Minimize the tedious and lengthy tasks
- Avoid surprises or changes in familiar behavior
- Provide undo/redo, cancel/confirm

# Example

\*Come docente, quali problemi hai avuto nello svolgimento degli esami?

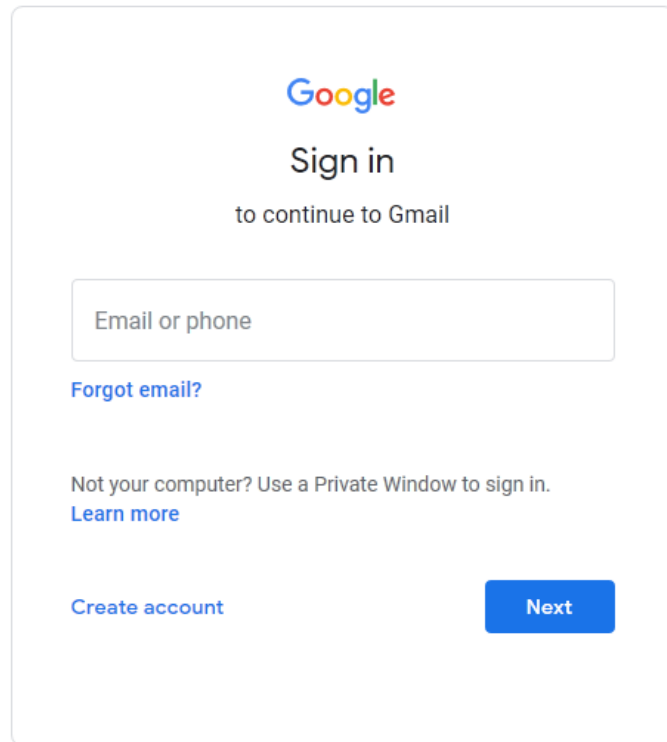
! Scegliere una o più delle seguenti opzioni

- Non ho avuto problemi
- Organizzazione dell'esame (poca chiarezza nella spiegazione delle modalità, sovrapposizione di date, procedure troppo confuse, deposito e consultazione documentazione complesso, ecc.)
- Dispongo di hardware/software inadeguato
- La connessione che uso è lenta/non continua
- Problemi ambientali (troppo rumore, confusione, scarsa possibilità di concentrazione)

# The 8 Golden Rules of Interface Design

- Strive for consistency
  - Cater to universal usability
  - Offer informative feedback
  - Design dialogs to yield closure
  - Prevent errors
  - Permit easy reversal of actions
  - Keep users in control
  - **Reduce short-term memory load**
- Rule of thumb:
    - People can remember  $7 \pm 2$  chunks of information
  - Information on a screen should not be needed (remembered) in the next screen
  - No entry of phone numbers (collect from addressbook), show website location, fit long forms in a single page, ...

# Discussion – An Exception?



Google

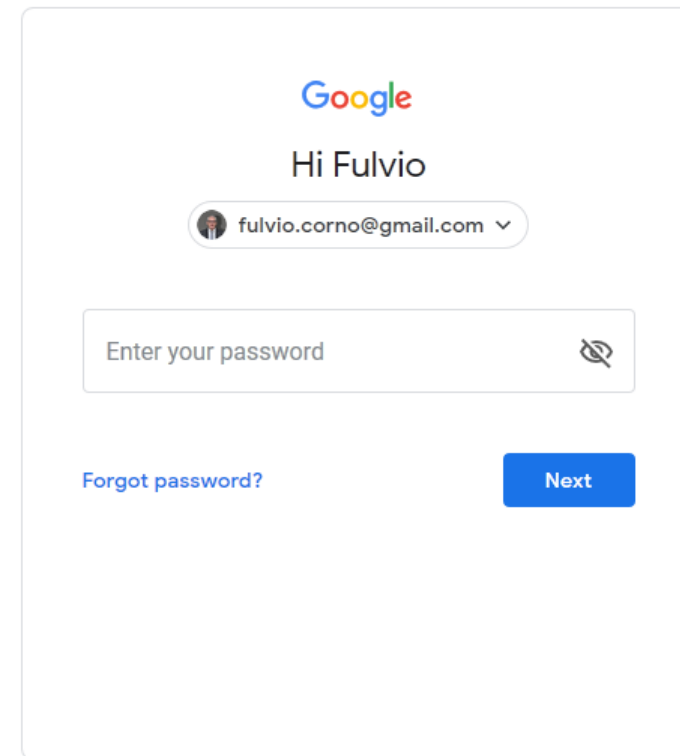
Sign in  
to continue to Gmail

[Forgot email?](#)

Not your computer? Use a Private Window to sign in.  
[Learn more](#)


[Create account](#)


English (United States) ▾ [Help](#) [Privacy](#) [Terms](#)



Google

Hi Fulvio

 fulvio.corno@gmail.com ▾

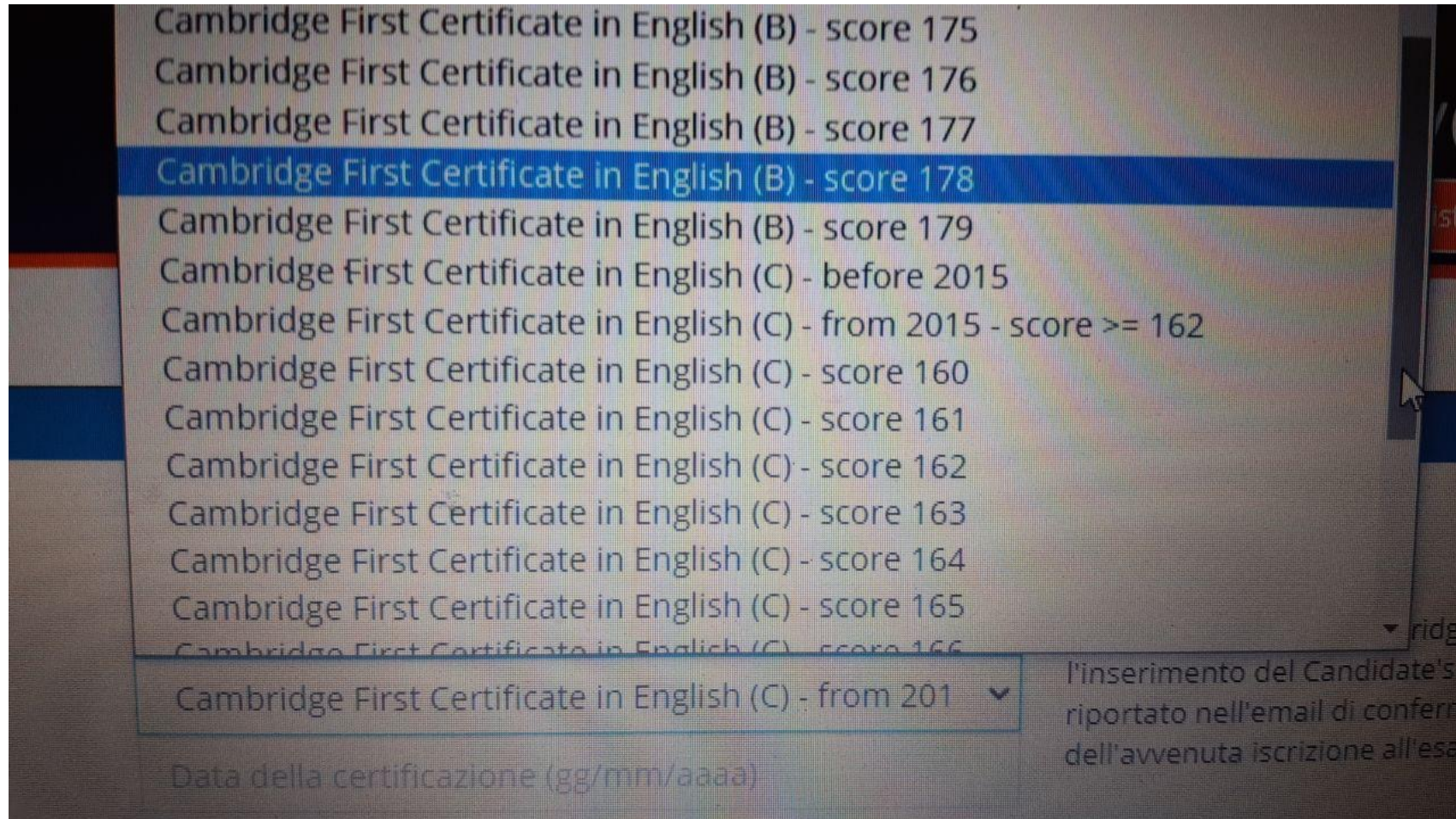
 

[Forgot password?](#)

English (United States) ▾ [Help](#) [Privacy](#) [Terms](#)

# Exceptions...

## sometimes entering is better than selecting



# Design Principles by Benyon (I)

(adapted from Norman, Nielsen and others)

- **Learnability** – helping people access, learn and remember the system
  - *Visibility* – ensure that things are visible, so users can see what functions are available and what the system is currently doing
  - *Consistency* (→above)
  - *Familiarity* – use language and symbols that the intended audience will be familiar with
  - *Affordance* – design things so it is clear what they are for (e.g., buttons should be pushed). Maps the (perceived) properties of the objects with how they can be used



# Affordance



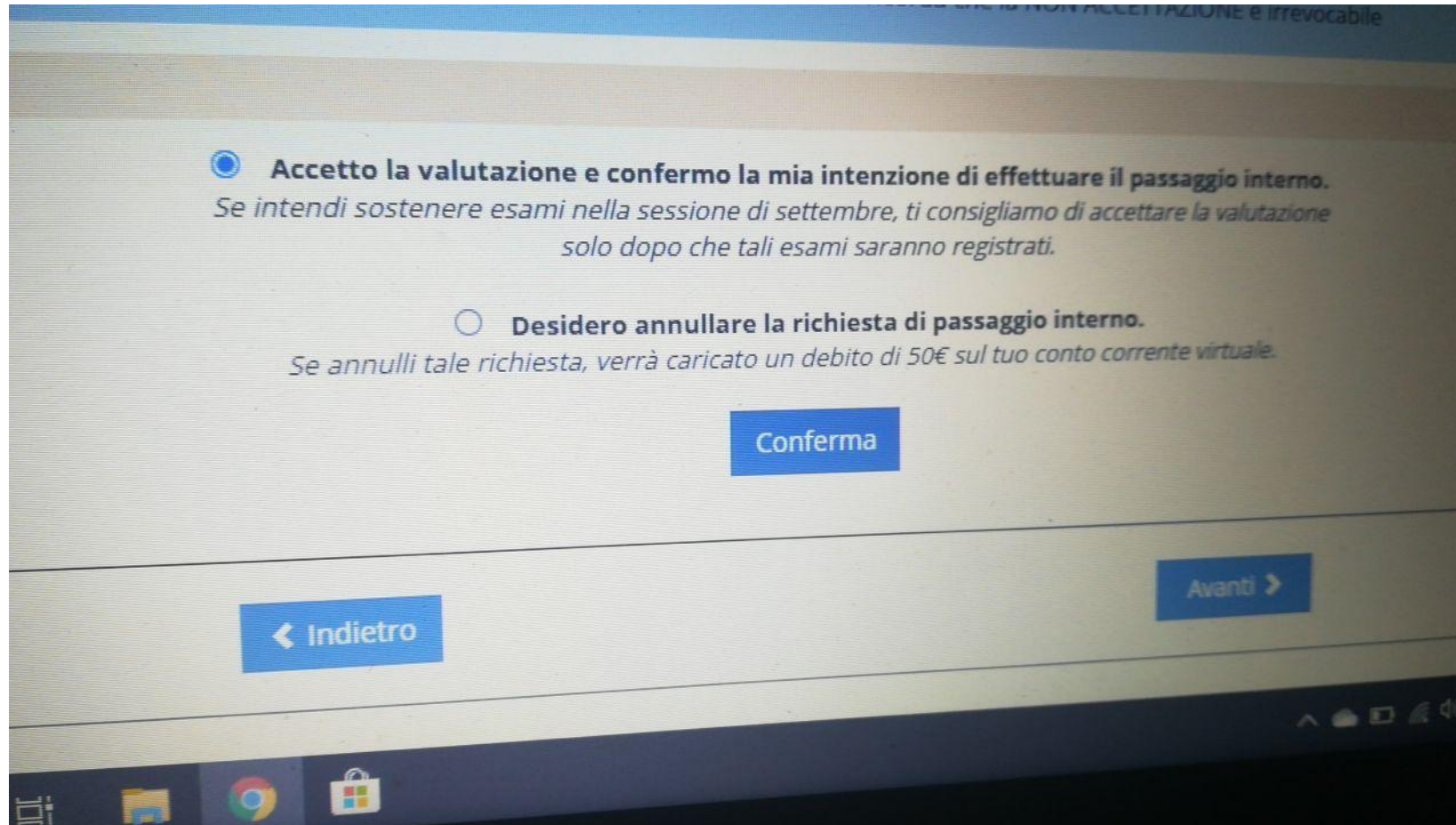


# Design Principles by Benyon (II)

(adapted from Norman, Nielsen and others)

- **Effectiveness** – giving users the sense of being in control, knowing what to do and how to do it
  - *Navigation* – support people in moving around the different sections: maps, directional signs, information signs
  - *Control* – who is in control for the next interaction? Clear and logical mapping between controls and their effect. Relationships with the “side effects” in the real world
  - *Feedback* (→feedback above)

# Example: Navigation and Control?



# Design Principles by Benyon (III)

(adapted from Norman, Nielsen and others)

- **Safety and Security**
  - *Recovery* (→error recovery)
  - *Constraints* (→prevent errors)
- **Accommodation** – offer an interaction way that suits the users
  - *Flexibility* (→universal usability)
  - *Style* – stylish, attractive, nice-looking
  - *Conviviality* – polite, friendly, pleasant. No abrupt interruptions

# Norman's Seven Principles for Transforming Difficult Tasks into Simple Ones

- Use both knowledge in the world and knowledge in the head
- Simplify the structure of tasks
- Make things visible
- Get the mappings right
- Exploit the power of constraints, both natural and artificial
- Design for error
- When all else fails, standardize



# First Principles of Interaction Design (Bruce Tognazzini, 2014)

**AskTOG**  
Interaction Design  
Solutions for the  
Real World

Home Interaction Design Section Living Section About Bruce Tognazzini - NN/g

## First Principles of Interaction Design (Revised & Expanded)

5 Mar 2014 in First Principles, HCI Design, Human Computer Interaction (HCI), Principles of HCI Design, Usability Testing

The following principles are fundamental to the design and implementation of effective interfaces, whether for traditional GUI environments, the web, mobile devices, wearables, or Internet-connected smart devices.

**Help!**

This is a huge revision. I expect I have made mistakes. Please leave corrections and suggestions in the Comments at the end. If you have better examples than I'm using, please include them as well, but give me enough information about them, including links or cites, that I can make use of them.

This revision features new examples and discussion involving mobile, wearables, and Internet-connected smart devices. However, the naming and organization remains the same except for three changes: I have shortened the name of one principle to extend its reach: "Color Blindness" is now simply Color and includes more than just color blindness. I've added one new principle, Aesthetics, and brought back two old principles, Discoverability and Simplicity. I dropped them from the list more than a decade ago when they had ceased to be a problem. Problems with Discoverability, in particular, have come roaring back.

What has changed greatly is the level of detail: You will find many new sub-principles within each category, along with far more explanation, case studies, and examples.

**Previous Version & Its Translations.** (Google's machine translator for the latest edition, to your right). I'm continuing access to the original version of First Principles because it is cited in many scientific papers.

- Belarusian
- Dutch
- English
- German
- Italian
- Portuguese
- Spanish
- Russian
- Ukrainian

### Introduction

Effective interfaces are visually apparent and forgiving, instilling in their users a sense of control. Users quickly see the breadth of their options, grasp how to achieve their goals, and can settle down to do their work. Effective interfaces do not concern the user with the inner workings of the system. Work is carefully and continuously saved, with full option for the user to undo any activity at any time. Effective applications and services perform a maximum of work, while requiring a minimum of information from users.

Because an application or service appears on the web or mobile device, the principles do not change. If anything, applying these principles—all these principles—becomes even more important.

**I Love Apple, But It's Not Perfect**

I've used many example drawn from Apple products here, often as examples of bad interface practices. Apple has made many revolutionary breakthroughs in interaction technology, a trend I fully expect will

**First Principles**

- Aesthetics
- Anticipation
- Autonomy
- Color
- Consistency
- Defaults
- Discoverability
- Efficiency of the User
- Explorable Interfaces
- Fitts's Law
- Human-Interface Objects
- Latency Reduction
- Learnability
- Metaphors
- Protect Users' Work
- Readability
- Simplicity
- State: Track it
- Visible Interfaces

**My Upcoming Courses/Conferences**

**My Interaction Design course:** Build a firm foundation in interaction design with this three day course. Spring 2014 schedule:

New York: March 9-11, 2014  
Atlanta: April 28-30, 2014  
Chicago: May 12-14, 2014  
London: June 1-3, 2014  
San Francisco: June 22-24, 2014

You may be coming in cold from engineering, graphic design, psychology, or beyond. You may already be an interaction designer wanting to "fill in the blanks," establishing a more solid theoretical and practical base. You may be taking on the management of a group of HCI designers. I've designed this course for each one of you.

- [Aesthetics](#)
- [Anticipation](#)
- [Autonomy](#)
- [Color](#)
- [Consistency](#)
- [Defaults](#)
- [Discoverability](#)
- [Efficiency of the User](#)
- [Explorable Interfaces](#)
- [Fitts's Law](#)
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- [Learnability](#)
- [Metaphors](#)
- [Protect Users' Work](#)
- [Readability](#)
- [Simplicity](#)
- [State: Track it](#)
- [Visible Interfaces](#)

# Design Guidelines

Shared language to promote **consistency** among multiple designers in terminology usage, appearance, and action sequences

The “How”



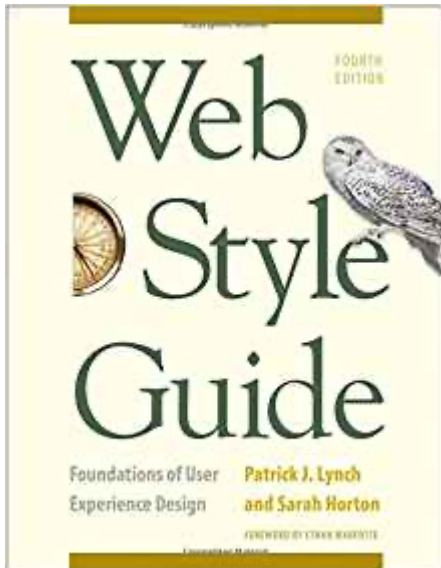
# Design Guidelines

- Concrete suggestions about “How” the Principles may be satisfied
- Often rule-based
- Based on best practices
- Encapsulate experience of expert designers
- Sometimes blessed as «standards»
- But:
  - May be too specific and hard to apply to your situation
  - Difficult to develop a general-purpose guideline

# Web Style Guide



Web Style Guide, 4th Edition: Foundations of User Experience Design (2016)  
<https://webstyleguide.com/>



Web Style Guide by Patrick J. Lynch and Sarah Horton

## Contents

- [Front Matter](#)
- [Chapter 1: Strategy](#)
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- [Chapter 5: Site Structure](#)
- [Chapter 6: Page Structure](#)
- [Chapter 7: Interface Design](#)
- [Chapter 8: Graphic Design](#)
- [Chapter 9: Typography](#)
- [Chapter 10: Editorial Style](#)
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## About the authors

Patrick J. Lynch and Sarah Horton have been working together on award-winning interface and graphic design projects since 1991. They began collaborating on *Web Style Guide* in 1997, moving from a web-only version to print and web in 1999. The book is in its 4th edition and has been translated into more than eight languages.

- [Learn more about Pat and Sarah](#)
- [Web Style Guide, 4th Edition: Foundations of User Experience Design on Amazon](#)

## Praise for the 4th Edition of Web Style Guide

Contents      Search      Front Matter

# Web Content Accessibility Guidelines (WCAG)



<https://www.w3.org/WAI/standards-guidelines/wcag/>

The screenshot shows the W3C Web Accessibility Initiative (WAI) website. The top navigation bar includes links for "Skip to Content", "Change Text Size or Colors", "This page in: English • Español • Français", "All Translations", and "Hide Options". The main header features the W3C logo, "Web Accessibility Initiative WAI", and the tagline "Strategies, standards, resources to make the Web accessible to people with disabilities". A search bar is also present. Below the header is a secondary navigation bar with categories: "Accessibility Fundamentals", "Planning & Policies", "Design & Develop", "Test & Evaluate", "Teach & Advocate", and "Standards/Guidelines". The breadcrumb trail reads "Home / Standards/Guidelines / Web Content - WCAG 2".

The main content area is titled "WCAG 2 Overview". On the left is a sidebar under "Standards/Guidelines" with a sub-section "Web Content - WCAG 2" containing links for "How to Meet WCAG 2 (Quick Reference)", "At a Glance", "The Documents", "Applying to Non-Web ICT", "New in 2.2 Draft", "New in 2.1", "Translations", "Commenting", "Conformance Logos", "FAQ", "WCAG 3 Draft", and "Authoring Tools - ATAG".

The "WCAG 2 Overview" section includes a "Summary" with the following text: "This page introduces the Web Content Accessibility Guidelines (WCAG) international standard, including WCAG 2.0, WCAG 2.1, and WCAG 2.2. WCAG documents explain how to make web content more accessible to people with disabilities. A different page [introduces WCAG 3](#). WCAG is not an introduction to accessibility. For introductions, see [Accessibility Fundamentals Overview](#)." Below this is a "Quick links to resources:" section with a bulleted list: "How to Meet WCAG 2 (Quick Reference)", "WCAG 2.2 Draft, **What's New in WCAG 2.2 Draft with status and timeline**", "WCAG 2.1 Standard", and "WCAG 2.0 Standard".

At the bottom of the main content area is a "Page Contents" section with a bulleted list: "Introduction", "WCAG 2.0, 2.1, 2.2", "Who WCAG is for", and "What is in WCAG 2".

# U.S. Government Mobile User Experience Guidelines



U.S. General Service Administration  
<https://digital.gov/resources/mobile-user-experience-guidelines/>

Previously  
(2016 - 2021)

An official website of the United States government [Here's how you know](#) ▾

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## Mobile User Experience Guidelines

Six user experience guidelines for creating a mobile product.

If your app doesn't have a good user experience, it goes to the [app graveyard](#).

The need for digital products to work better is not new in the federal government. Resources like the [Digital Playbook](#) and [Public Participation Playbook](#) have had impact helping agencies become user-friendly and both of these resources note the importance of developing usable products for mobile users.

As more agencies develop mobile apps and websites, they need quick guidance on mobile user experience Do's and Don'ts. To answer their call, we asked [MobileGov Community of Practice](#) members to choose their top Mobile UX Guidelines from the original group of 42 created in 2013 at community events in late 2014 and early 2015. From that feedback, we have distilled the following six mobile user experience guidelines:

**Guideline 1:** Make sure your content is structured and chunked appropriately for multiple devices

**Guideline 2:** Follow industry user interface guidelines and government regulations (like 508) in the development of your mobile product



**In this page**

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- Mobile
- Web Analytics and Optimization
- Web Managers
- User Experience
- U.S. Web Design System

**Research-Based Web Design & Usability Guidelines**

Forewords by:  
**Michael O. Leavitt**  
Secretary of Health and Human Services  
**Ben Shneiderman**  
Professor of Computer Science, University of Maryland



<https://design-system.service.gov.uk>

# U.K. Government Design System

**GOV.UK** Design System

[Get started](#) [Styles](#) [Components](#) [Patterns](#) [Community](#)

## Design your service using GOV.UK styles, components and patterns

Use this design system to make your service consistent with GOV.UK. Learn from the research and experience of other service teams and avoid repeating work that's already been done.

[Get started >](#)

### What's new

17 October 2022: We've changed our 'Backlog' page into the new '[Upcoming components and patterns](#)' page and chosen 3 priorities that we plan to work on next.

[Sign up to get update emails about the Design System.](#)

[Styles](#) [Components](#) [Patterns](#)



<https://designers.italia.it/linee-guida/>

# Italian Government Guidelines and Design System

Dipartimento per la trasformazione digitale + Agenzia per l'Italia digitale

Piano Triennale Developers Designers Forum Docs GitHub

**it Designers Italia** Seguici su

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## Linee guida e manuale operativo di design

Le regole tecniche da rispettare e le indicazioni operative di design per orientare la progettazione e la realizzazione di siti e servizi digitali della Pubblica Amministrazione

[Le linee guida](#) [Il manuale operativo di design](#)



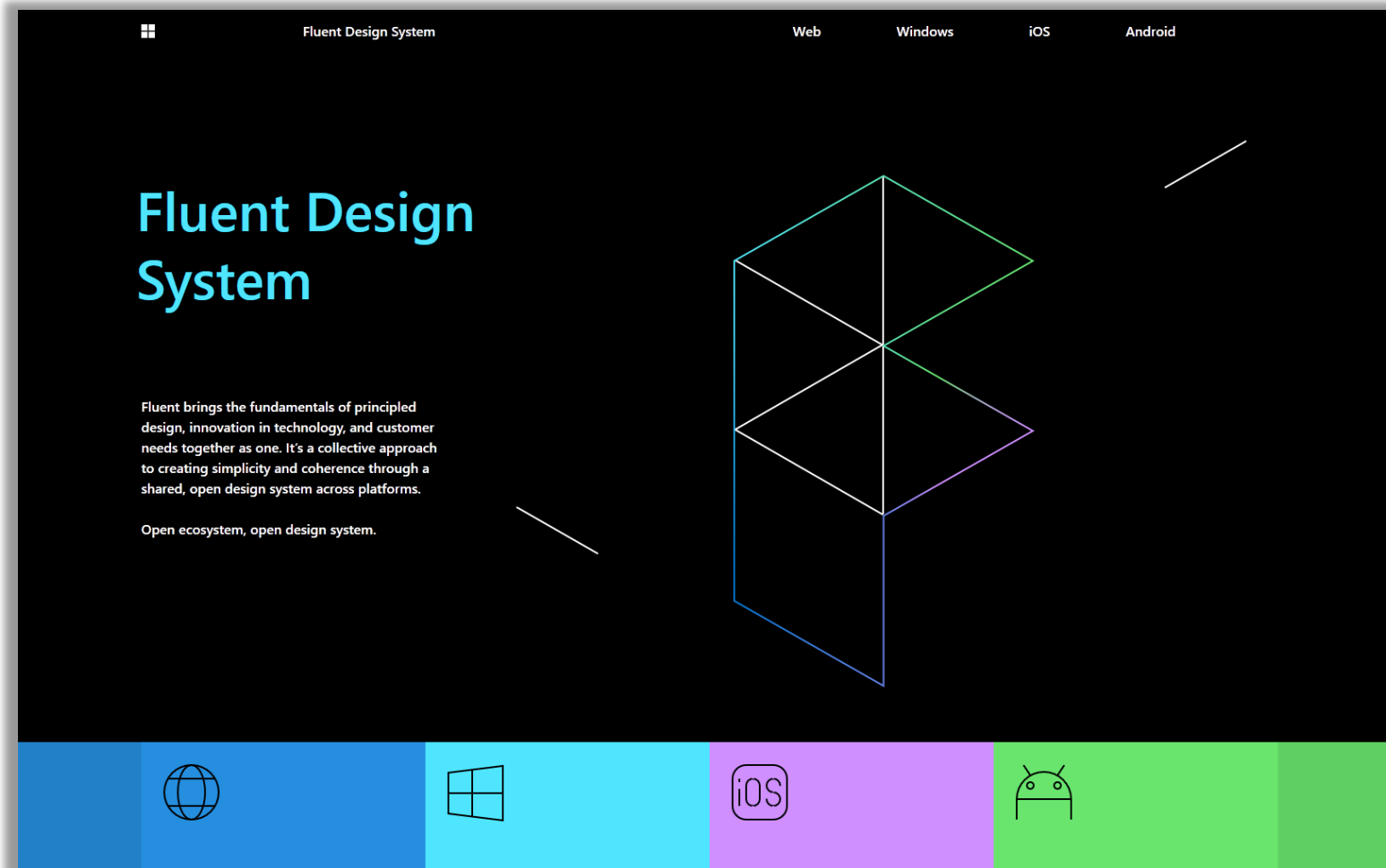
<https://developer.apple.com/design/human-interface-guidelines/>

# Apple HIG

The screenshot shows the Apple Developer website's Human Interface Guidelines page. The top navigation bar includes 'Developer', 'News', 'Discover', 'Design', 'Develop', 'Distribute', 'Support', and 'Account'. Below this, the 'Design' section is highlighted, with sub-links for 'Overview', 'What's new', 'Guidelines', 'Design Awards', 'Videos', and 'Resources'. On the left, a sidebar lists categories: 'Platforms', 'Foundations', 'Patterns', 'Components', 'Inputs', and 'Technologies'. The main content area features the title 'Human Interface Guidelines' and a sub-header 'The HIG contains guidance and best practices that can help you design a great experience for any Apple platform.' Below this, there are three sections: 'New and updated' with three cards for 'Charting data', 'Live Activities', and 'Designing for iPadOS'; and 'Featured' with three cards for 'Secondary/Primary', a hand icon, and a circular arrow icon.



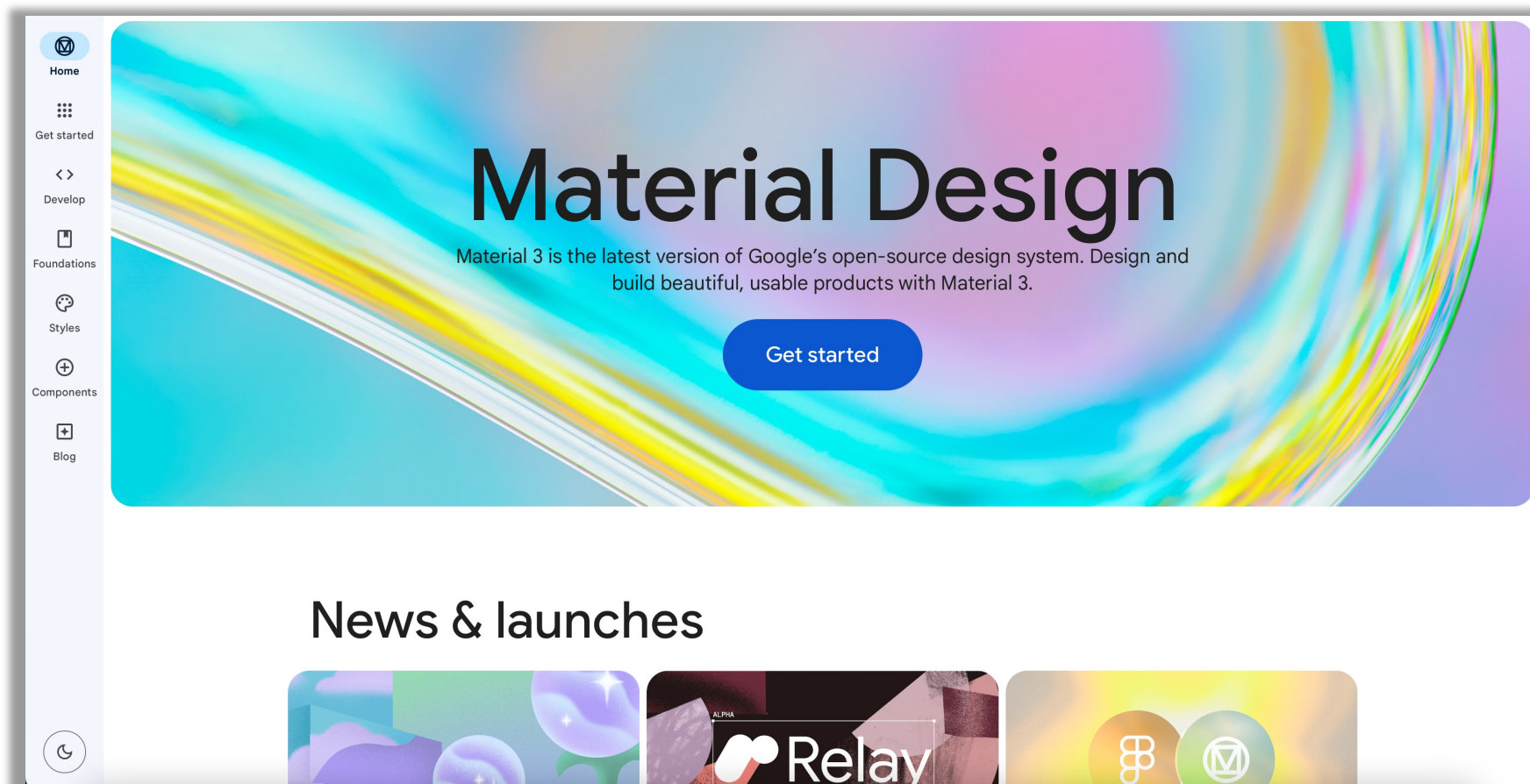
# Microsoft «Fluent» Design





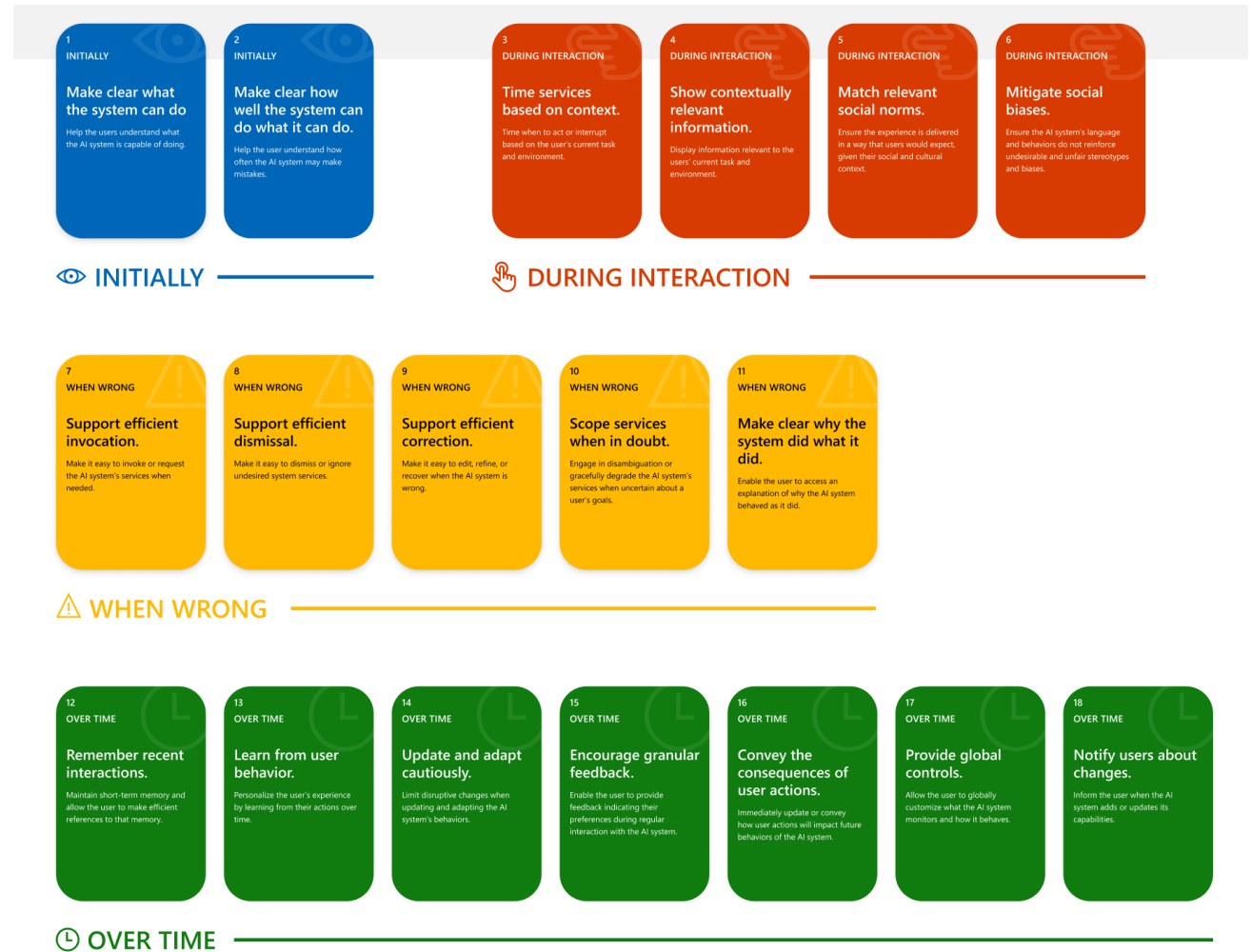


# Google Material Design



# Guidelines for Human-AI Interaction

- By Microsoft Research:
  - <https://www.microsoft.com/en-us/research/project/guidelines-for-human-ai-interaction/>
  - <https://www.microsoft.com/en-us/haxtoolkit/ai-guidelines/>



# Guidelines for Human-AI Interaction: Examples

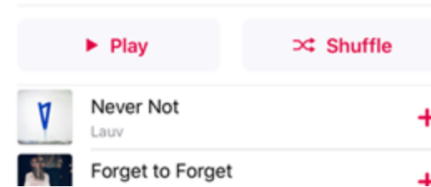
2  
INITIALLY

Make clear how well the system can do what it can do.

Help the user understand how often the AI system may make mistakes.

EXAMPLE IN PRACTICE

Discover new music from artists we think you'll like.  
Refreshed every Friday.



The recommender in **Apple Music** uses language such as "we think you'll like" to communicate uncertainty.

Make clear how well the system can do what it can do. 2

9  
WHEN WRONG

Support efficient correction.

Make it easy to edit, refine, or recover when the AI system is wrong.

EXAMPLE IN PRACTICE



When **Bing** automatically corrects spelling errors in search queries, it provides the option to revert to the query as originally typed with one click.

Support efficient correction. 9

# Guidelines for Augmented Reality

- By Apple Design:

<https://developer.apple.com/design/human-interface-guidelines/technologies/augmented-reality/>

## Creating an engaging, comfortable experience

**Let people use the entire display.** Devote as much of the screen as possible to displaying the physical world and your app's virtual objects. Avoid cluttering the screen with controls and information that diminish the immersive experience.

**Strive for convincing illusions when placing realistic objects.** Design detailed 3D assets with lifelike textures to create objects that appear to inhabit the physical environment in which you place them. Using information from ARKit, you can scale objects properly and position them on detected real-world surfaces, reflect environmental lighting conditions and simulate camera grain, cast top-down diffuse object shadows on real-world surfaces, and update visuals as the camera's position changes. To help avoid breaking the illusion you create, make sure your app updates scenes 60 times per second so objects don't appear to jump or flicker.

**Consider how virtual objects with reflective surfaces show the environment.** Reflections in ARKit are approximations based on the environment captured by the camera. To help maintain the illusion that an AR experience is real, prefer small or coarse reflective surfaces that downplay the effect of these approximations.

**Use audio and haptics to enhance the immersive experience.** A sound effect or bump sensation is a great way to confirm that a virtual object has made contact with a physical surface or other virtual object. Background music can also help envelop people in the virtual world. For guidance, see [Playing audio](#) and [Playing haptics](#).

**Minimize text in the environment.** Display only the information that people need for your app experience.

# References and Acknowledgments

- Ben Shneiderman, Catherine Plaisant, Maxine S. Cohen, Steven M. Jacobs, and Niklas Elmqvist, *Designing the User Interface: Strategies for Effective Human-Computer Interaction*
  - Chapter 3: Guidelines, Principles, and Theories
- David Benyon: *Designing Interactive Systems*, Pearson, 2014
  - Section 4.5: Design Principles
- COGS120/CSE170: Human-Computer Interaction Design, videos by Scott Klemmer, [https://www.youtube.com/playlist?list=PLLsT5z\\_DsK\\_nusHL\\_Mjt87THSTlgrsyJ](https://www.youtube.com/playlist?list=PLLsT5z_DsK_nusHL_Mjt87THSTlgrsyJ)
- Fitts' Law: <https://www.interaction-design.org/literature/topics/fitts-law>
- Thanks to Fulvio Corno, past teacher of the course, for his work on some of these slides



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