CS-639 — Interaction Design Studio

Intelligence as Design Material*

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Week 7: The Bridge

— **Weeks 1–6:** Design foundations + intelligence as an annotation layer (P1–P10)

— **This week:** Intelligence as a **core design element** — not a layer, but the material itself

— **Weeks 8–11:** Deep dive into intelligence material properties

Today we bring everything together and change how you think about intelligence in design.

A1 Status

Assignment 1: Foundations Portfolio — due Monday, March 9

— Polish your analog screens, Figma translation, and reflection **independently** this week

— Class time this week is dedicated to **new material** — practicing the bridge concept

— Wednesday: In-class redesign exercise (replaces this week's reflection)

What We've Built

Six weeks of design foundations

Your Design Toolkit

Every skill you've learned is a tool you'll keep using. Here's what you can now do.

Week	Foundation	What You Learned
W02	Visual Design	Hierarchy, contrast, balance, Gestalt grouping
W03	Typography & Icons	Type scale, affordances, intelligent signaling (P1, P2)
W04	Color & Grids	Accessible palettes, 8pt grid, spacing scale, adaptive surfaces (P3–P5)
W05	Composition & Flow	Focal point, scan patterns, task flows, intervention timing (P6–P8)
W06	Navigation & IA	Nav models, wayfinding, adaptive paths, user correction (P9, P10)

You Can Now Design Excellent Interfaces

You have the skills to create:

— Clear visual hierarchies that guide attention

— Consistent type systems and accessible color palettes

— Systematic grids with disciplined spacing

— Logical flows with proper notation

— Navigation structures that support wayfinding

These are real, professional skills. Everything that follows builds on them.

But Every Design You've Made Has Something in Common

The Traditional Design Paradigm

Every interface you've designed so far assumes:

— **The user controls every action** — nothing happens without explicit input

— **The interface responds but never initiates** — it waits for the user

— **Structure is static** — the same screens, same layout, same navigation for everyone

— **Direct manipulation** — the user specifies what and how

This is how most interfaces work. And it's a good foundation. But it's not the only way.

From Layer to Core Element

In Weeks 3–6, you treated intelligence as an **annotation layer**:

— Design the interface first
— Then ask: "Where could intelligence appear?"
— Add P-tags with a different colored marker
— Test: "Remove the annotations — does the design still work?"

That was the right starting point. You needed strong fundamentals before intelligence could take center stage.

Now the shift: What if intelligence isn't a layer you add — but a material that **reshapes the design itself?**

Two Ways to Think About Intelligence in Design

	Intelligence as Layer (Weeks 3–6)	Intelligence as Core Element (Week 7+)
When it enters	After the design is done	From the beginning
What it changes	Adds annotations, suggestions, overlays	Reshapes flows, screens, navigation
The test	Remove intelligence — design still works	Remove intelligence — design is fundamentally different
P1–P10 role	Labels on specific UI moments	Embedded in every design decision
Designer's question	"Where could AI help?"	"How does intelligence change what's possible?"

Both approaches are valid. But designing WITH intelligence as a core element opens possibilities that annotation can't reach.

Intelligence as Design Material

What becomes possible when systems can think?

What If Your Interface Could...

— **Adapt** to each user over time?

— **Anticipate** what the user needs next?

— **Collaborate** on tasks as a partner?

— **Understand** the user's context and situation?

— **Take initiative** when the moment is right?

These aren't hypothetical. These are design possibilities that intelligence enables — right now.

A New Design Material

Think of intelligence like other materials you've learned:

— **Color** expanded design beyond grayscale — new ways to signal, group, and guide

— **Motion** expanded design beyond static — new ways to show change and continuity

— **Intelligence** expands design beyond reactive — new ways to adapt, anticipate, and collaborate

[2] Based on Holmquist (2017), "Intelligence on Tap: Artificial Intelligence as a New Design Material"

Six Material Properties of Intelligence[3]

Property	What It Means	Example
Adaptivity	Changes behavior based on experience	Duolingo adjusting lessons to how you learn
Initiative	Acts without explicit commands	Grammarly suggesting inline corrections
Inference	Derives implicit needs from explicit actions	Google Search predicting your query
Delegation	Accepts high-level goals, determines how	"Schedule book club Tuesday at noon"
Collaboration	Participates as a partner in problem-solving	GitHub Copilot co-writing code
Contextuality	Understands and responds to situation	iOS Driving Focus activating on the road

[3] Horvitz (1999), Mixed-initiative principles · Amershi et al. (2019), G1–G18

Adaptivity

The system changes behavior based on experience and context.

— Learns from user actions over time

— Evolves to match individual patterns

— Gets better the more it's used

Adaptivity transforms static interfaces into living systems that grow with each user.

Adaptivity — Example

Duolingo's adaptive lessons — adjusts difficulty, pacing, and review based on performance.

— Struggled with a word? It reappears more often

— Mastered a concept? The app moves on faster

— Two users at the same level see different exercises

How does Duolingo signal personalization — and let you override it?

11 IN A ROW

HARD EXERCISE

Translate this sentence

Do you understand me?

Vous me comprenez?
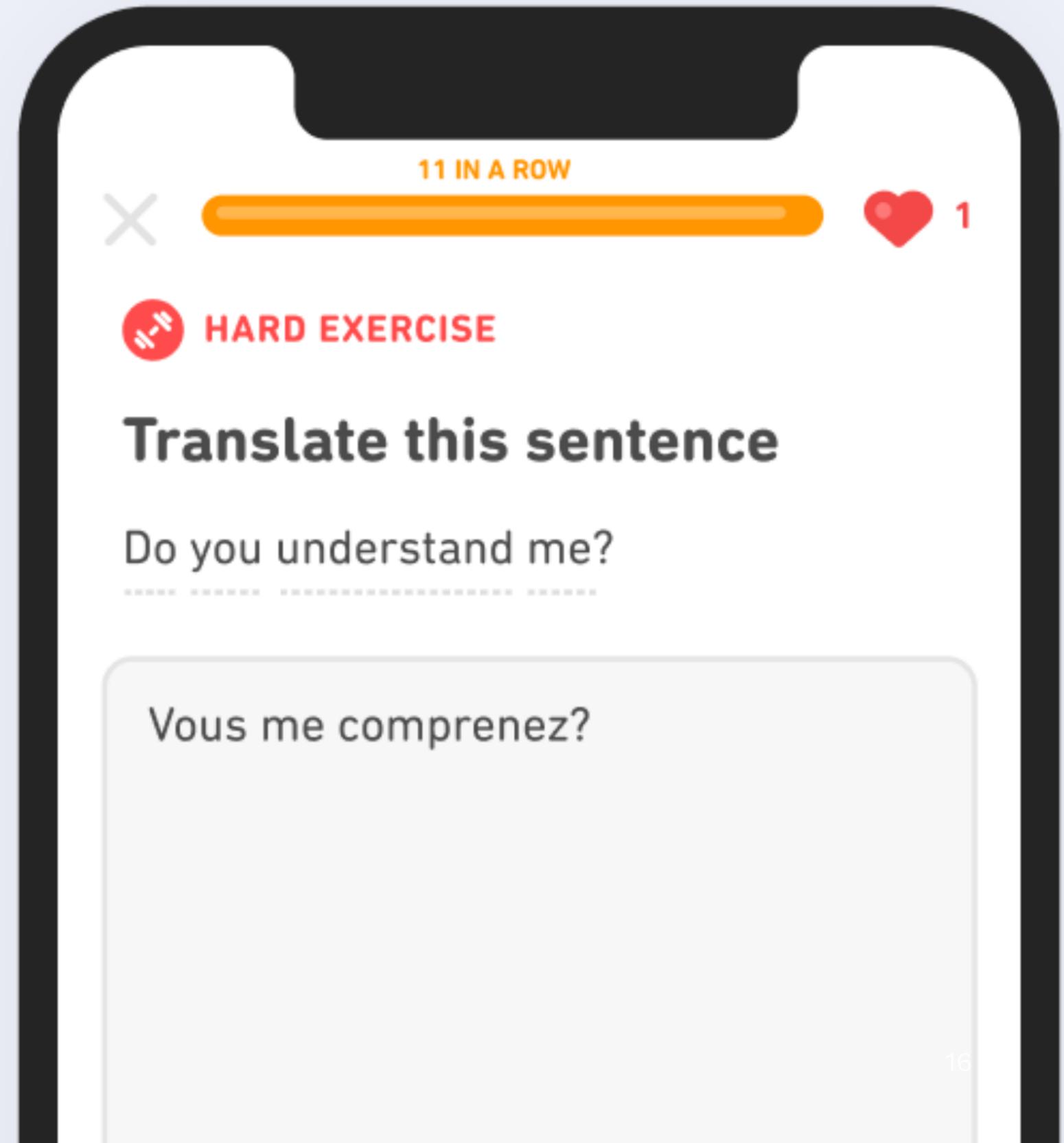
Initiative

The system acts without explicit user commands.

— Proactive rather than reactive

— Suggests, recommends, or prompts at the right moment

— Ranges from subtle (autocomplete) to bold (autonomous action)

Initiative shifts the interaction from "user commands, system responds" to "system proposes, user decides."

Initiative — Example

Grammarly — underlines issues and suggests corrections as you write, from spelling to full paragraph rewrites.

— Suggestions appear inline, visually subordinate (P1)

— Ranges from subtle (comma fix) to bold (tone rewrite)

— Dismissal is effortless: ignore or click away (P2)

When should the system propose — and how does it stay helpful without becoming annoying?

★ Pro

I think our team might be helped to reach peek performance with better communication.
Can you take a look at this project porposal.

● Rephrase

Better communication can help our team reach peak performance. Can you take a look at this project proposal?

Use this version   Dismiss

Inference

The system derives implicit needs from explicit actions.

— Understands intent beyond literal input

— Fills gaps in what the user expresses

— Reduces effort by anticipating meaning

Inference means the user specifies less and the system understands more.

Inference — Example

Google Search — you type "best res" and the system infers "best restaurants near me open now."

— Combines partial input with location, time, and history

— Suggestions update with each keystroke

— Wrong inference? Just keep typing — it adapts instantly

How does the system show what it inferred — and make correction effortless?

Delegation

The user specifies goals; the system determines how to achieve them.

— User says what, not how

— System handles implementation details

— Shifts interaction from manipulation to direction

Delegation transforms interaction from step-by-step instructions to goal-level communication.

Delegation — Example

"Hey Siri, schedule book club Tuesday at noon with Louisa Lopez" — one sentence, multi-step workflow.

— Siri checks calendars, creates the event, and sends the invite

— User said what — the system handled all the how

— Conflict found? Siri reports back and asks for guidance

How does the user know what the system did — and correct it if something went wrong?

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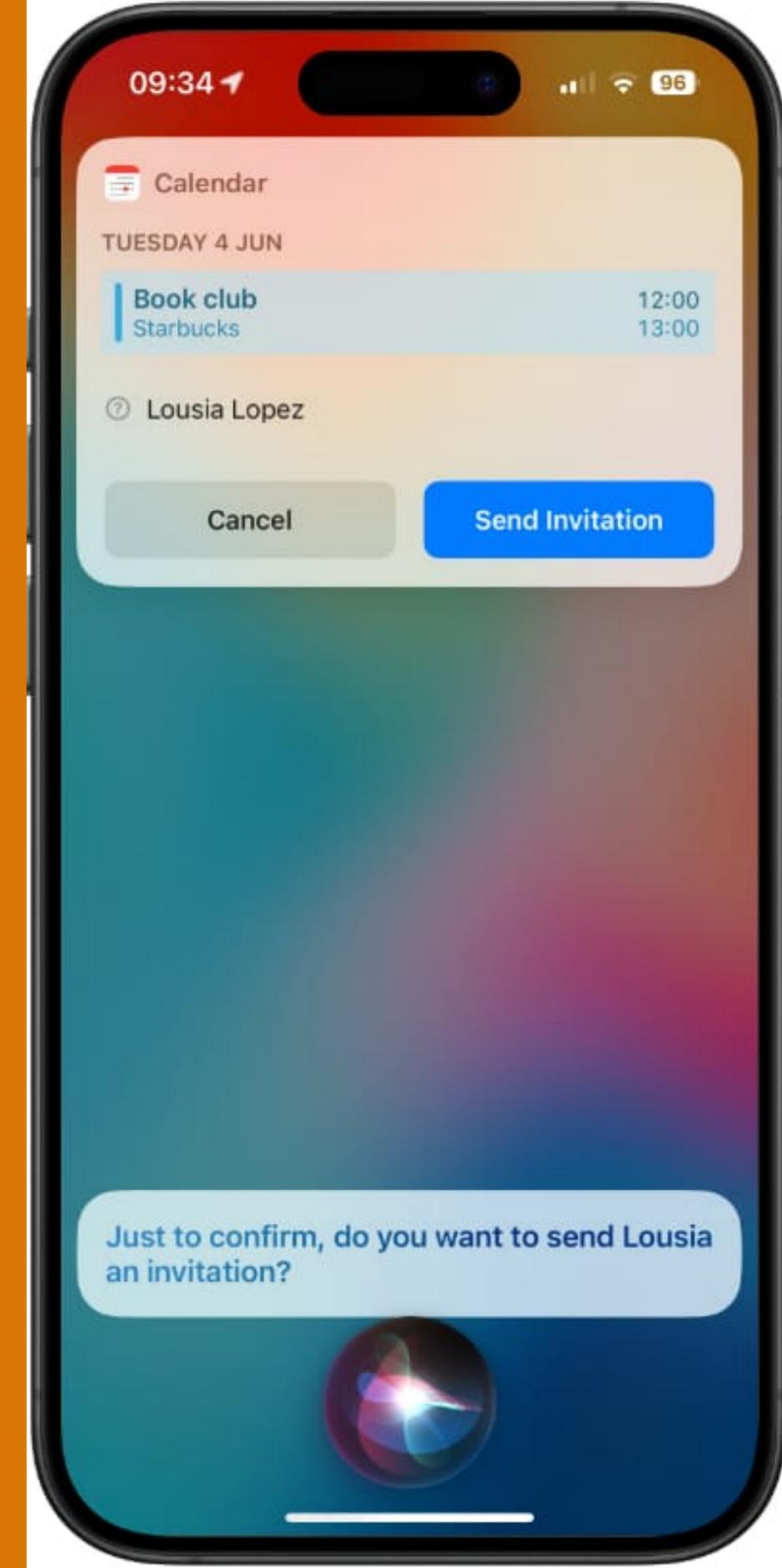
Collaboration

The system participates as a partner in problem-solving.

— Back-and-forth refinement between human and AI

— Mixed-initiative: both propose, both evaluate

— Neither party works alone

**Collaboration means neither the user nor the system has complete control — they build something together.**[4]

[4] Horvitz (1999), Mixed-initiative principles · Google PAIR Guidebook, Collaboration patterns

Collaboration — Example

GitHub Copilot — you describe intent, AI drafts code, you accept or edit, AI adapts. Back and forth.

— You lead with intent, the system drafts, you refine

— Suggestions change based on what you accept or reject

— The result emerges from the exchange — neither works alone

How does the system signal "your turn" vs. "its turn"?
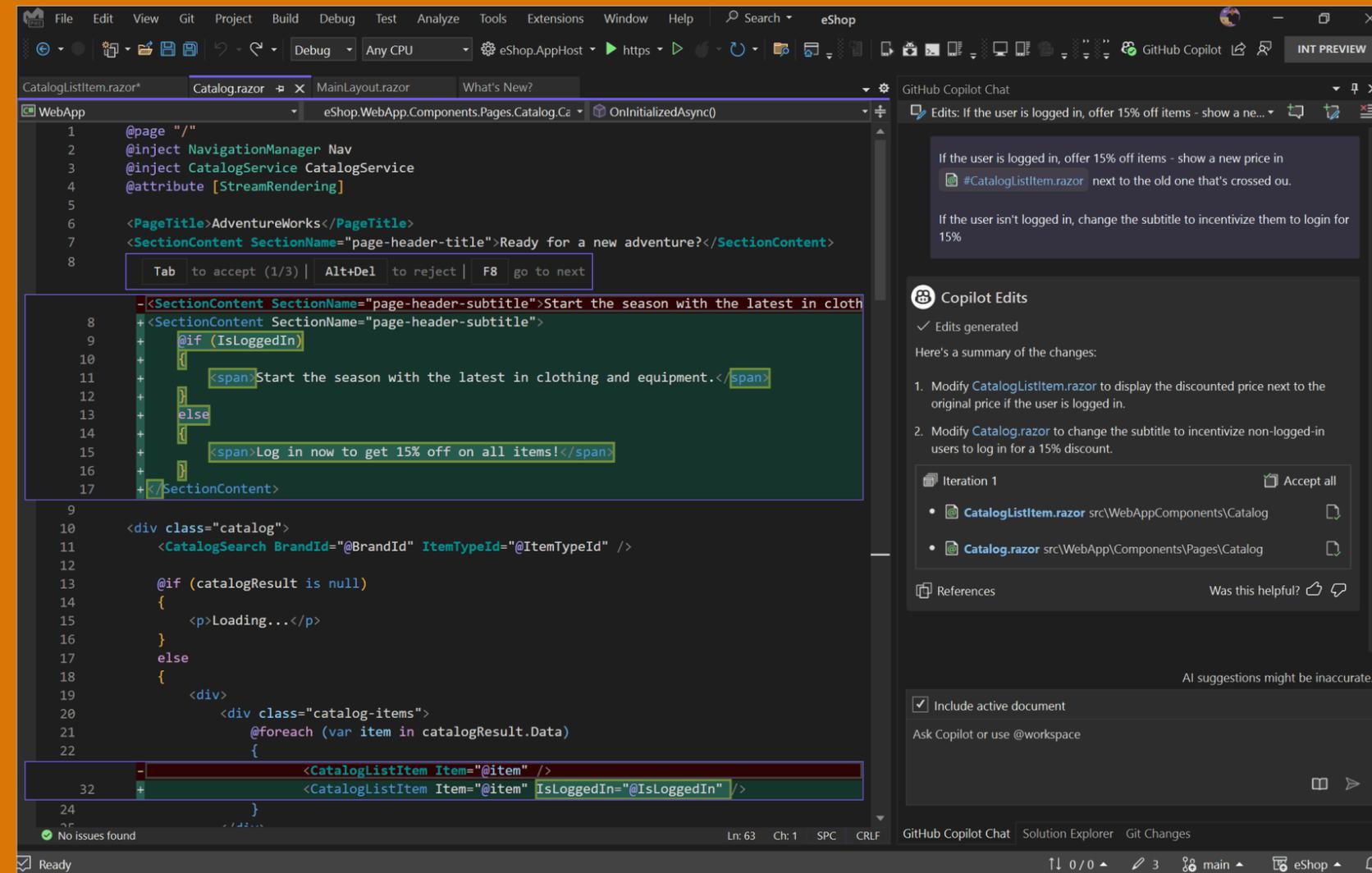
Contextuality

The system understands and responds to the user's situation.

— Physical context: location, time, device, environment

— Social context: who's nearby, what's appropriate

— Task context: what the user is doing, what they need next

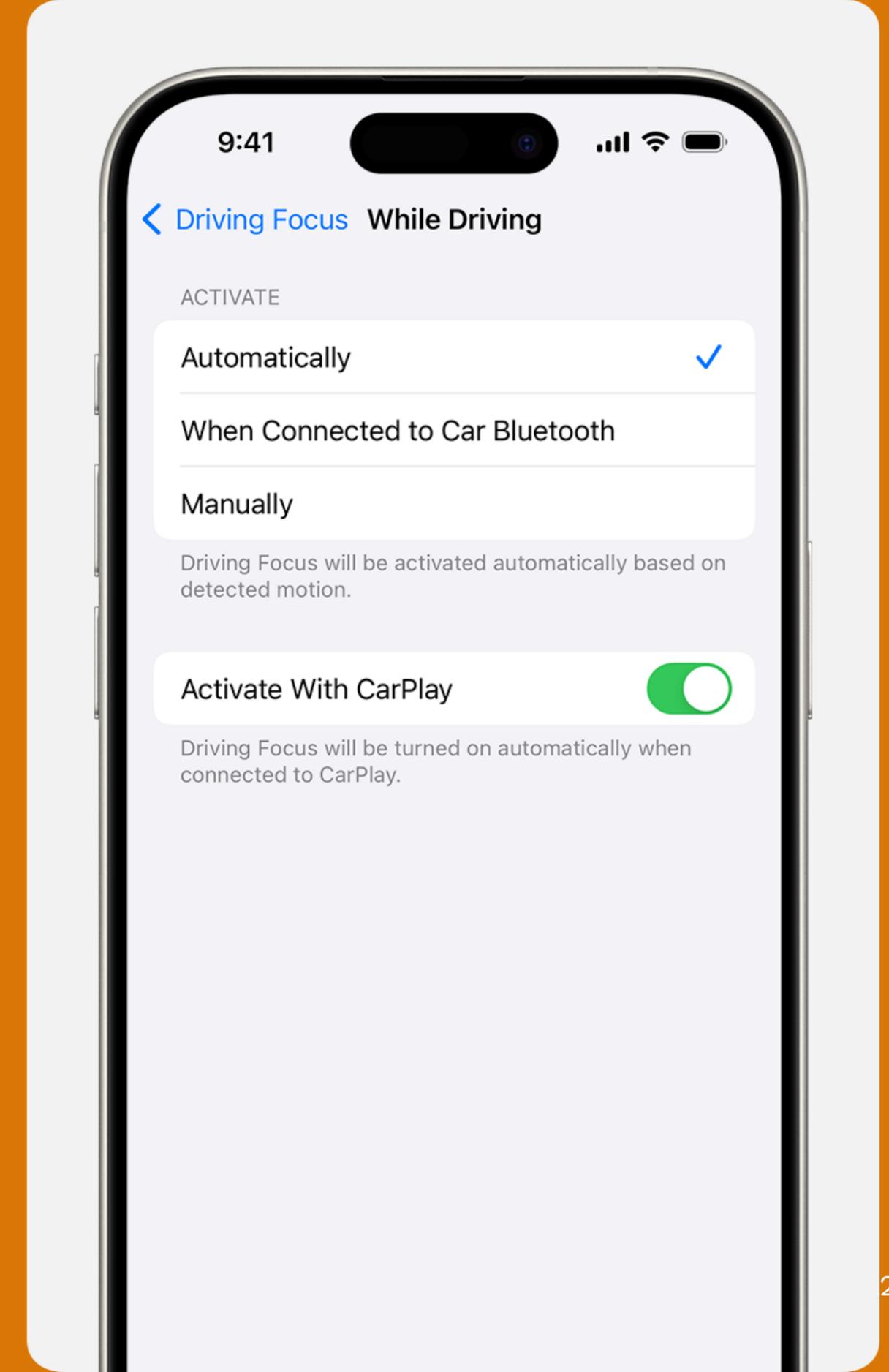— Cognitive context: how busy, how focused, how experienced

Contextuality means the system adapts not just to what you do, but to where, when, and why you do it.

Contextuality — Example

iOS Driving Focus — your phone detects you're driving and automatically silences notifications, hides messages, and simplifies the lock screen.

— Senses motion, Bluetooth, and CarPlay — no user action needed

— Reshapes the entire interface based on one context signal

— Texts get auto-replied: "I'm driving, I'll see this later"

What context should the system sense — and what's the line between helpful and intrusive?

9:41

< Driving Focus **While Driving**

ACTIVATE

Automatically ✓

When Connected to Car Bluetooth

Manually

Driving Focus will be activated automatically based on detected motion.

Activate With CarPlay ⬤

Driving Focus will be turned on automatically when connected to CarPlay.

Three Design Dimensions

Intelligence creates new dimensions that traditional interfaces don't have.[5]

Every intelligent system sits somewhere on each dimension. Your job as a designer: choose the right position for each context.
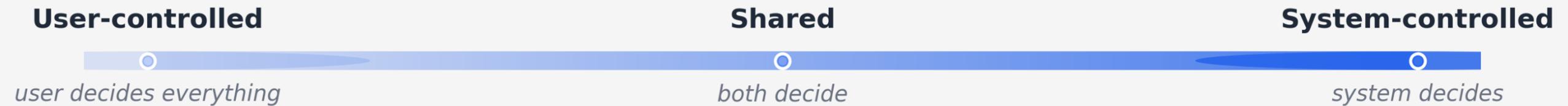
[5] Based on Horvitz (1999) and Parasuraman et al. (2000), "A Model for Types and Levels of Human Interaction with Automation"
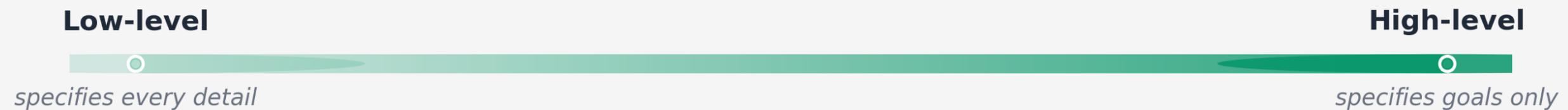
Three Design Dimensions

Initiative Spectrum

Passive   **Proactive**   **Autonomous**

waits for commands   *anticipates needs*   *acts independently*

Control Distribution

User-controlled   **Shared**   **System-controlled**

user decides everything   *both decide*   *system decides*

Interaction Abstraction

Low-level   **High-level**

specifies every detail   *specifies goals only*

How Intelligence Transforms Your Foundations

Same skills. New possibilities. Let's revisit each week through the intelligence lens.

Transformation 1: Visual Design (Week 2)

Traditional: Static hierarchy — the designer decides emphasis, and it stays fixed for every user.

With intelligence as core element:

— **Dynamic hierarchy** — the system emphasizes what matters to this user right now
— An email client highlights unread messages from important contacts
— A news feed prioritizes stories matching your interests
— The visual hierarchy itself is the intelligence — not an annotation on top of it

The designer doesn't design one hierarchy. They design the rules for how hierarchy adapts.

Transformation 2: Typography & Affordances (Week 3)

Traditional: Fixed affordances — buttons, links, menus look the same for everyone.

With intelligence as core element:

— **Intelligent affordances** — available actions change based on context
— Smart replies in messaging: the buttons themselves are generated by the system
— Contextual menus that show different options based on what you're doing
— New signifiers needed: "This was suggested by AI" vs. "You chose this"

The interface isn't just showing options — it's choosing which options to show.

Transformation 3: Color & Grids (Week 4)

Traditional: One color scheme, one grid — the same layout for everyone.

With intelligence as core element:

— **Context-adaptive color** — dark mode, reading mode, focus mode adapt appearance to situation

— **Flexible grid systems** — layout responds to content type, user preference, and device context

— The structural system is designed to support adaptation from the start

— Week 4's principle applies: adapt the surface, preserve the structure (P5)

The grid doesn't change. The content that fills it does — intelligently.

Transformation 4: Composition & Flow (Week 5)

Traditional: User flows — the user does each step, the system responds.

With intelligence as core element:

— **Collaborative flows** — some steps are done by the user, some by the system
— A checkout flow might skip steps the system can handle (auto-fill address, predict payment)
— The flow diagram needs new notation: who does each step? When does control transfer?
— Flow design becomes partnership design

The flow isn't just "what the user does." It's "what the user does, what the system does, and how they hand off."

Transformation 5: Navigation & IA (Week 6)

Traditional: Fixed navigation — every user sees the same structure.

With intelligence as core element:

— **Adaptive navigation** — frequently used paths are promoted, predicted destinations surface as shortcuts

— **Personalized IA** — content organization responds to usage patterns

— The navigation system is designed to learn — not just to organize

— Base structure stays stable (P5); personalization layers on top

Navigation becomes a system that learns where you want to go — while always letting you find your own way.

The Shift: Annotation to Integration

P1–P10 move from labels on your designs to elements embedded in every decision.

Principle	As Annotation (Weeks 3–6)	As Core Element (Week 7+)
P1 Subordinate Intelligence	"AI suggestions use lighter text"	The type system has built-in tiers for human vs. system content
P5 Predictable Adaptation	"Dark mode preserves grid"	The grid system is designed for multiple content states
P8 Timely Intervention	"Suggestion appears after step 3"	The flow includes a system-initiated branch at a natural pause
P9 User Correctability	"Add a 'not interested' button"	Every adaptive element has a built-in correction mechanism

P1–P10 Map to Material Properties

Your principles are the design guidelines for working with each material property.

Material Property	Key Principles	Designer's Question
Adaptivity	P5 Predictable Adaptation, P4 Uncertainty	How does the system change — and does the user understand why?
Initiative	P1 Subordinate, P8 Timely Intervention	When does the system act — and is it welcome?
Inference	P3 Honest Capabilities, P7 Explain When Needed	What did the system assume — and can it show its reasoning?
Delegation	P7 Explain, P9 User Correctability	What did the system decide — and can the user change it?
Collaboration	P10 Smooth Transitions, P2 Efficient Dismissal	Who has control — and how does it shift?
Contextuality	P6 Contextual Awareness, P3 Honest Capabilities	What does the system know — and is it only what's necessary?

What's Ahead: Weeks 8–11

Four weeks, four deep dives — bundling six material properties into focused themes.

Weeks 8–11: Material Properties Deep Dive

Week	Theme	Material Properties
W08	Agency Spectrum	Adaptivity, Delegation
W09	Proactivity & Timing	Initiative, Inference
W10	Collaboration & GenAI	Collaboration + P11, P12
W11	Context-Awareness	Contextuality

— W10 adds two genAI principles — Variability (P11) and Imperfection (P12)

— **Assignment 2** (Weeks 10–11): Intelligent System Design

Starting Week 8, you design with intelligence, not for it.

This Week

— **Monday (today):** The bridge — intelligence as a core design element

— **Wednesday:** In-class redesign exercise (traditional vs. intelligence-as-core)

— **Friday:** Submit redesign on Canvas, then in-class critique

— **Independent:** Finalize Assignment 1 (due Monday, 3/9)

Wednesday's exercise replaces this week's reflection.

Before Wednesday

— **Review** your P1–P10 cards — you'll need them for the redesign exercise

— **Familiarize** yourself with the new **Material Properties cards** (6 cards)

— **Choose a domain** for the exercise: your A1 app, a class exercise from Weeks 1–6, or a simple example (to-do list, email, calendar, music player)

— **Think about** which material property could most change your chosen domain

References

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Media Sources

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