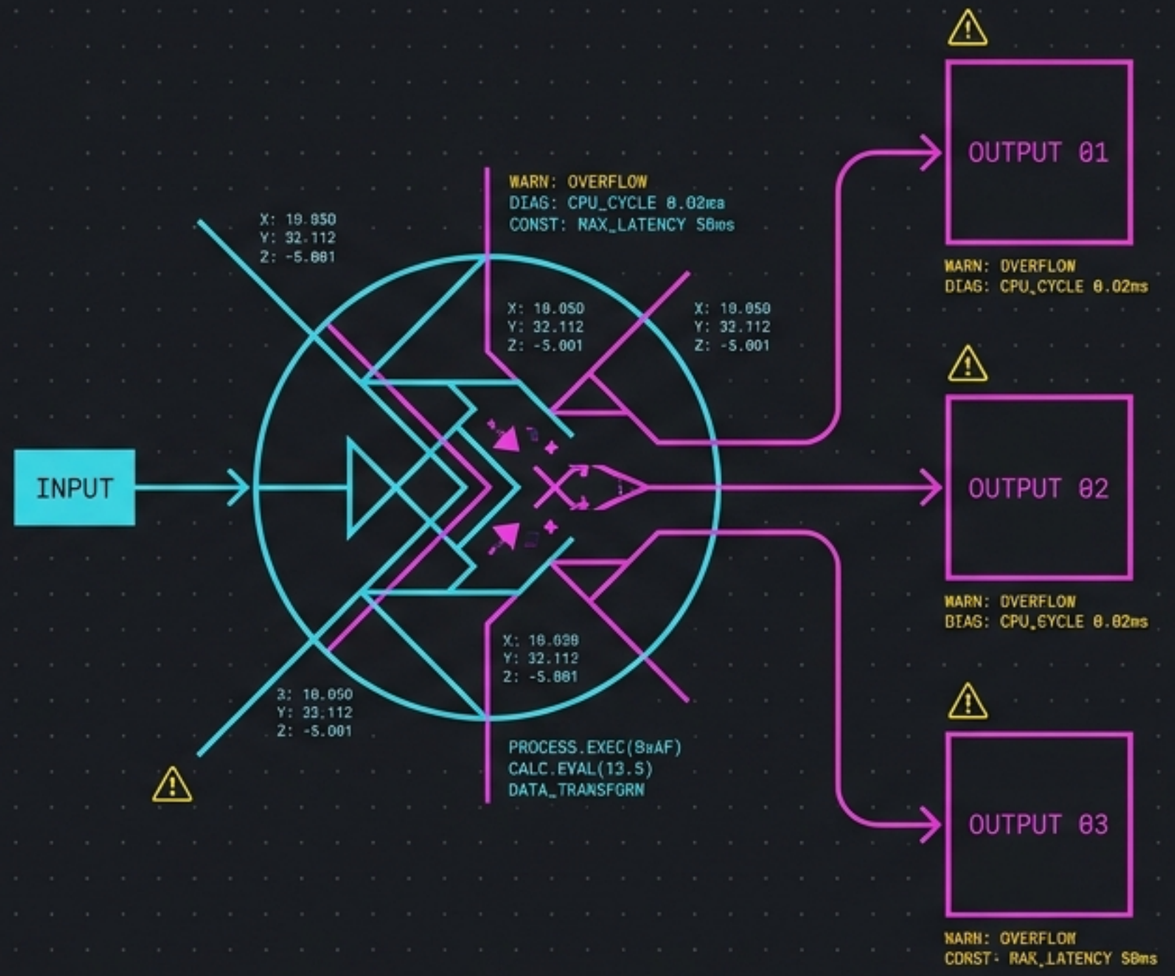
SEASON 11 / EPISODE 00

UX Laws and Principles: Why Interfaces Feel Easy or Difficult

The Engineering Blueprint of Human-Computer Interaction



Target Audience: Product Designers / Front-End & Mobile Engineers / PMs / UX Researchers / AI-Assisted Builders.

Document Type: Standalone Reference Manual.

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The Continuum of UX

S09 + S10 = Prerequisites. Establishing visual order and baseline compliance.

S11 = The Mechanics. Moving beyond aesthetics and checklists into the rigorous, quantitative, and psychological mechanics of Human-Computer Interaction (HCI). Interfaces are bounded by human motor and cognitive physics.



S09: Visual Design for the Web

S10: Digital Accessibility

S11: Quantitative & Psychological HCI

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ISO 9241-11: Usability in Context

Usability = (Effectiveness + Efficiency + Satisfaction) × (Specific User + Specific Goal + Context of Use)

Effectiveness:
Success/failure rate of completing a task accurately.

Efficiency:
Resource cost (time, mental effort, motor friction) to complete.

Satisfaction:
User's attitude, comfort, and lack of cognitive stress (SUS scores).

The Multiplier (Context):
Why 'intuitive' does not exist in a vacuum. A system perfectly usable for a 20-year-old on a 27-inch monitor (Context A) may have zero usability for a 60-year-old on a mobile device in glaring sunlight (Context B).

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The Epistemic Taxonomy Matrix

Tier 1: Predictive Mathematical Models	**Tier 2: Descriptive Perceptual & Cognitive Effects**	**Tier 3: Context-Dependent Heuristics & Standards**
Nature: Bounded equations predicting human motor/perceptual time.	**Nature:** Robust directional tendencies with boundary conditions (Psychology).	**Nature:** Evaluative checklists and guardrails (Never an excuse to skip testing).
Examples: Fitts's Law, Accot-Zhai Steering Law, Hick-Hyman Law, GOMS/KLM.	**Examples:** Gestalt Grouping, Von Restorff Effect, Aesthetic-Usability Effect, Sweller's Cognitive Load.	**Examples:** Nielsen's 10 Heuristics, WCAG 2.2, W3C COGA, GOV.UK/USWDS standards.

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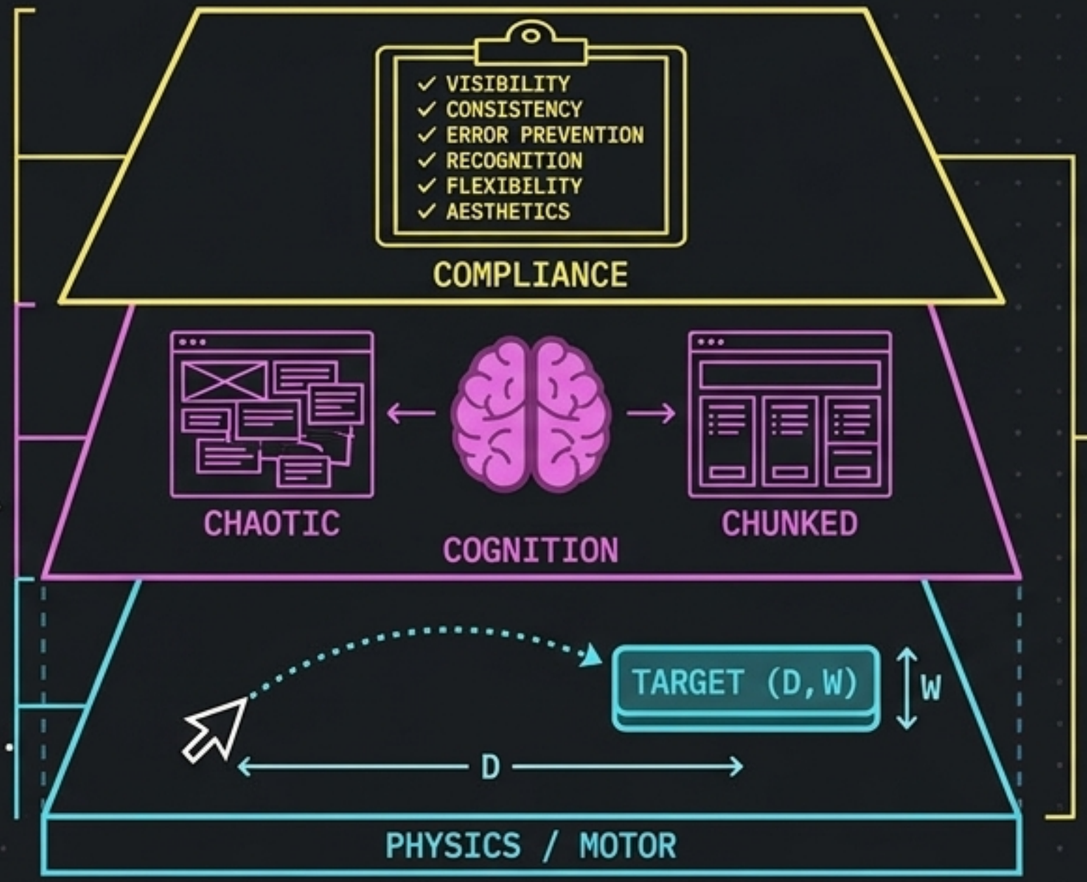
Tier Breakdown: From Physics to Guidelines

Heuristics (Tier 3) tell you WHAT to look for. **Effects** (Tier 2) explain WHY users behave that way. **Models** (Tier 1) calculate EXACTLY HOW LONG it will take.

Tier 3: Broad rules of thumb to prevent known catastrophic failures.

Tier 2: Information processing limits; working memory constraints.

Tier 1: Unbreakable speed-accuracy tradeoffs.





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Card, Moran & Newell’s Keystroke-Level Model (KLM) Constants

K ≈ 0.20s : Keystroke / Button Press. (Varies 0.08s - 1.20s by skill; 0.20s average).

P ≈ 1.10s : Pointing. Mouse to a target on display (Fitts’s Law aggregate).

H ≈ 0.40s : Homing. Moving hands between keyboard and mouse.

M ≈ 1.20s : Mental Preparation. Time to think, decide, or locate information.

R ≈ System: Response Time. Waiting for the computer.

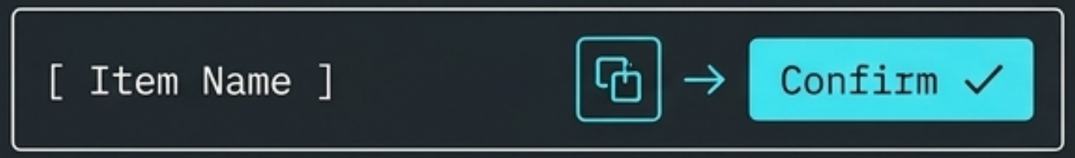
$$T(\text{execute}) = T(K) + T(P) + T(H) + T(M) + T(R)$$

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The Mathematics of Interaction Cost

Forcing extra mental pauses (M ≈ 1.2s) and hand switches (H ≈ 0.4s) slows workflows far more than one extra click (K ≈ 0.2s).

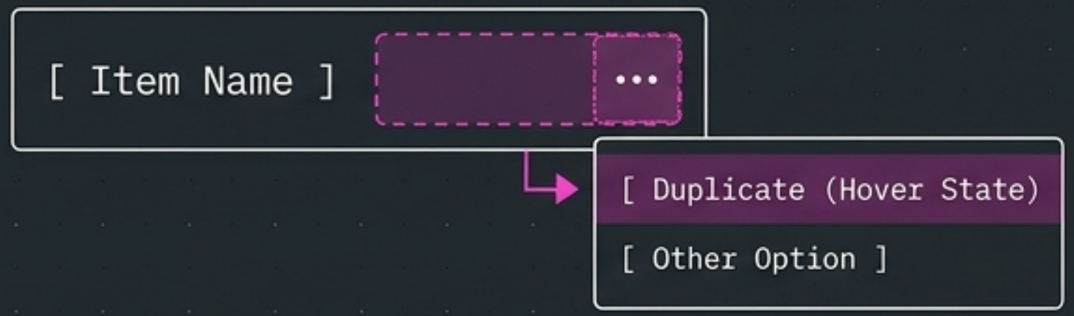
Denser, Visible Controls



Equation:
M (perceive) + P (point) + K (click) + K (click)

Math:
1.2s + 1.1s + 0.2s + 0.2s = **2.7 seconds.**

Hover-Menu "Clean" UI

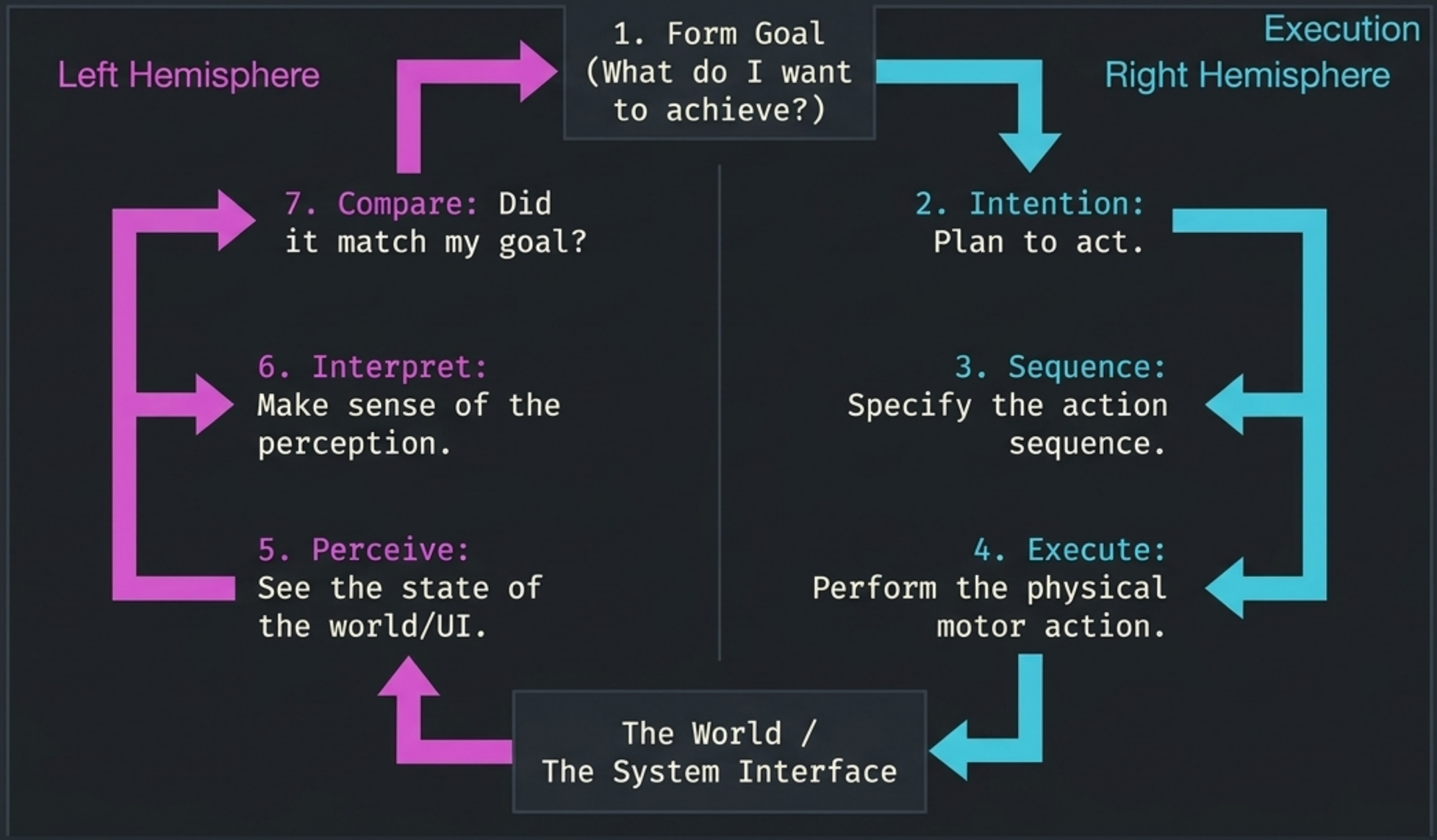


Equation:
M (find menu) + P (point) + K (click) + M (scan list) + P (point) + K (click)

Math:
1.2s + 1.1s + 0.2s + 1.2s + 1.1s + 0.2s = **5.0 seconds.**

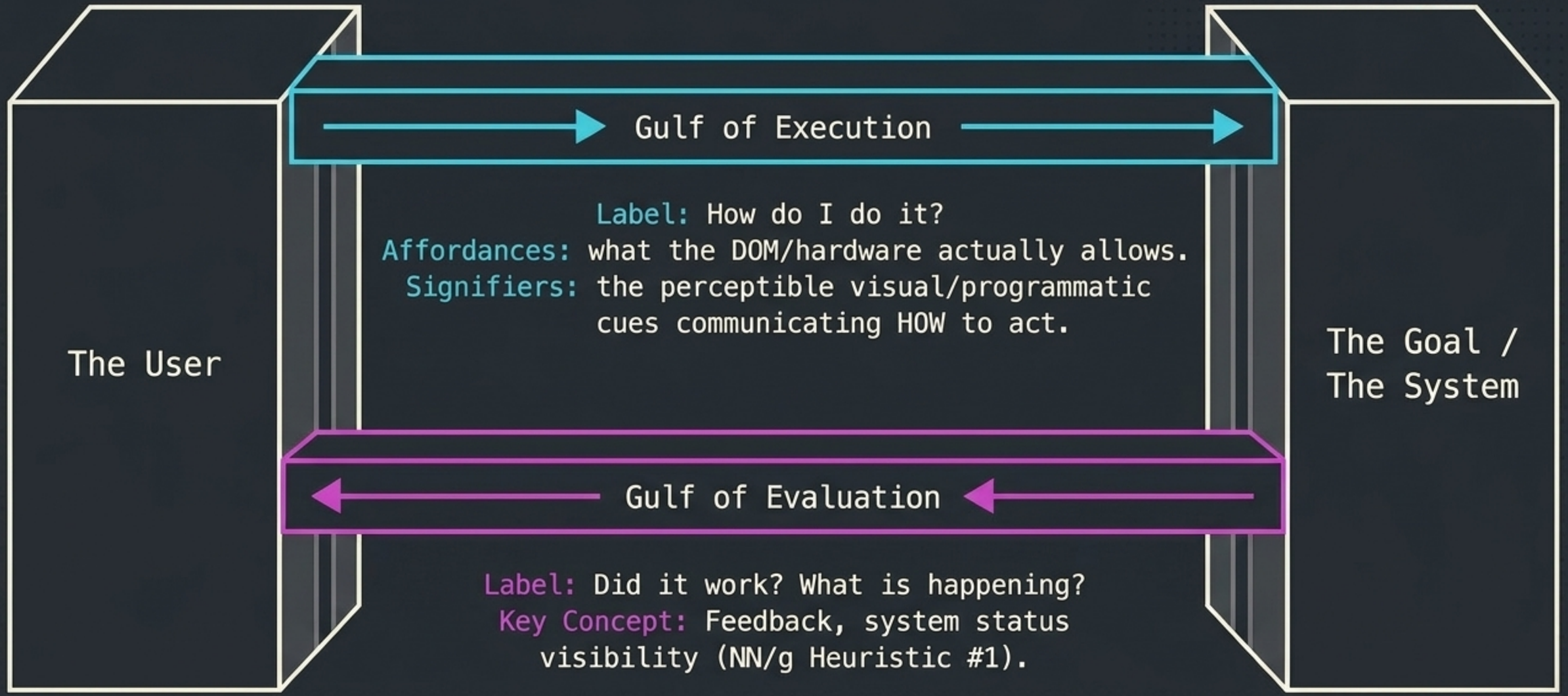
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Norman’s 7-Stage Action Cycle



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The Two Gulfs & The Role of Signifiers

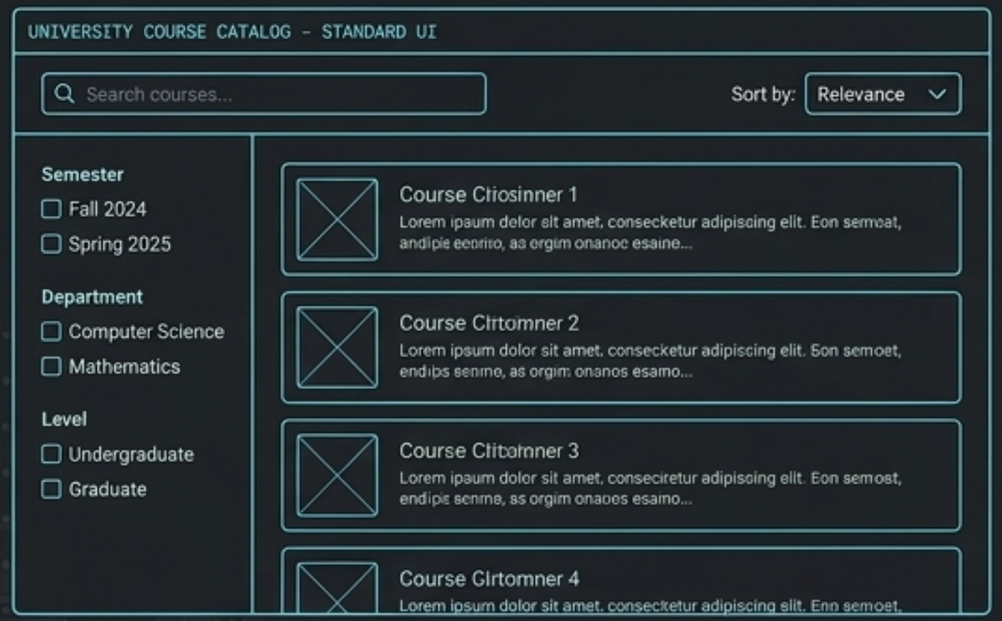


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Jakob's Law & Mental Models

Jakob's Law (User Expectation)

Users spend most of their time on OTHER sites.
They expect your site to work like the others.



CLASH

System Model (Bespoke UI Reality)

The Clash.



Shattering standard web conventions drastically widens the Gulf of Execution. The user must spend high **Mental (M)** operators just to map their existing knowledge to your novel interface.

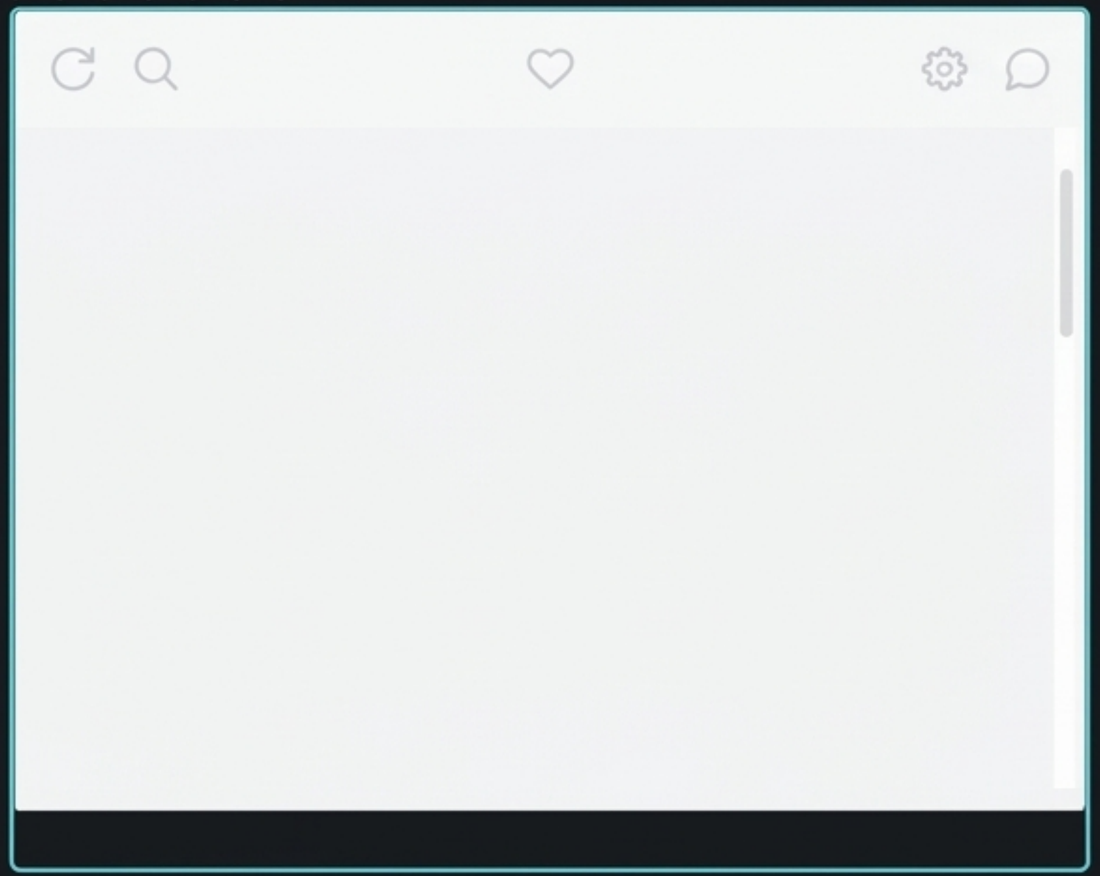
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The “Vibe-Coder” Aesthetic vs. Human Reality

LLM-generated and screenshot-driven UIs over-index on aesthetics, masking complexity by widening both Norman Gulfs.

The Illusion

Looks clean to the designer.



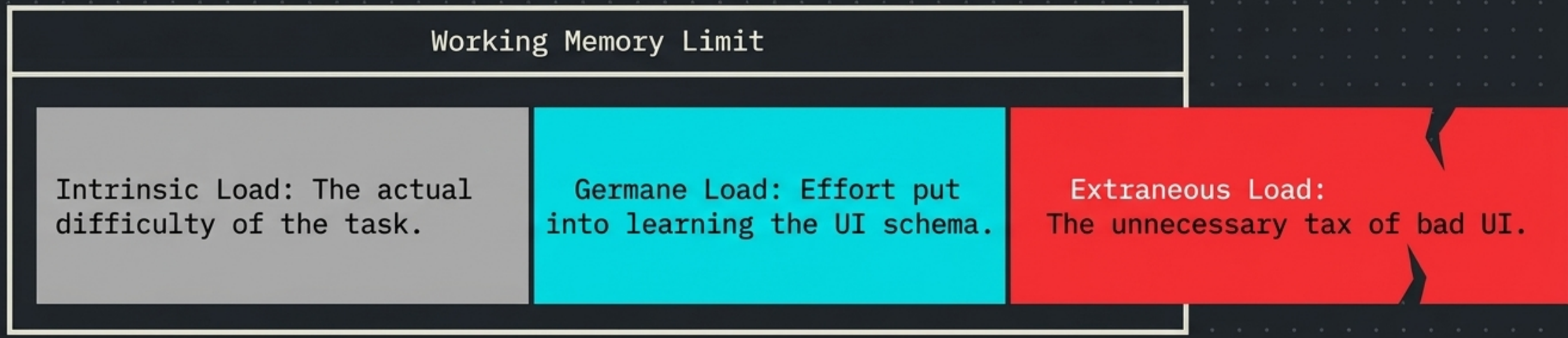
The Reality Trap

FAILURE POINT	DIAGNOSTIC RESULT
Touchscreens: Tiny icon hit areas fail target size guidelines.	⚠️ [WARN] Target Size < 44px. High error rate for finger input. Fails WCAG 2.5.5 (AAA).
Keyboard Scanning: No visible focus states on custom div elements.	⚠️ [WARN] No `tabindex` or `:focus-visible` styles. Navigation impossible for switch access/keyboard users. Fails WCAG 2.4.7 (AA).
Screen Readers: Missing aria-labels on icon-only buttons.	⚠️ [WARN] Icons read as 'unlabeled graphic'. Information not perceivable by assistive technology. Fails WCAG 1.3.1 (A).
400% Zoom (320px): Flat layout breaks when reflowed, hidden hover-menus become impossible to trigger.	⚠️ [WARN] Content overflows viewport, horizontal scrolling required. Hover-based interactions inaccessible. Fails WCAG 1.4.10 (AA) & 1.4.13 (AA).

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Cognitive Overload & W3C COGA Failures

Minimalism maximizes Extraneous Load. Forcing users to remember hidden hover-controls violates NN/g “Recognition over Recall”.

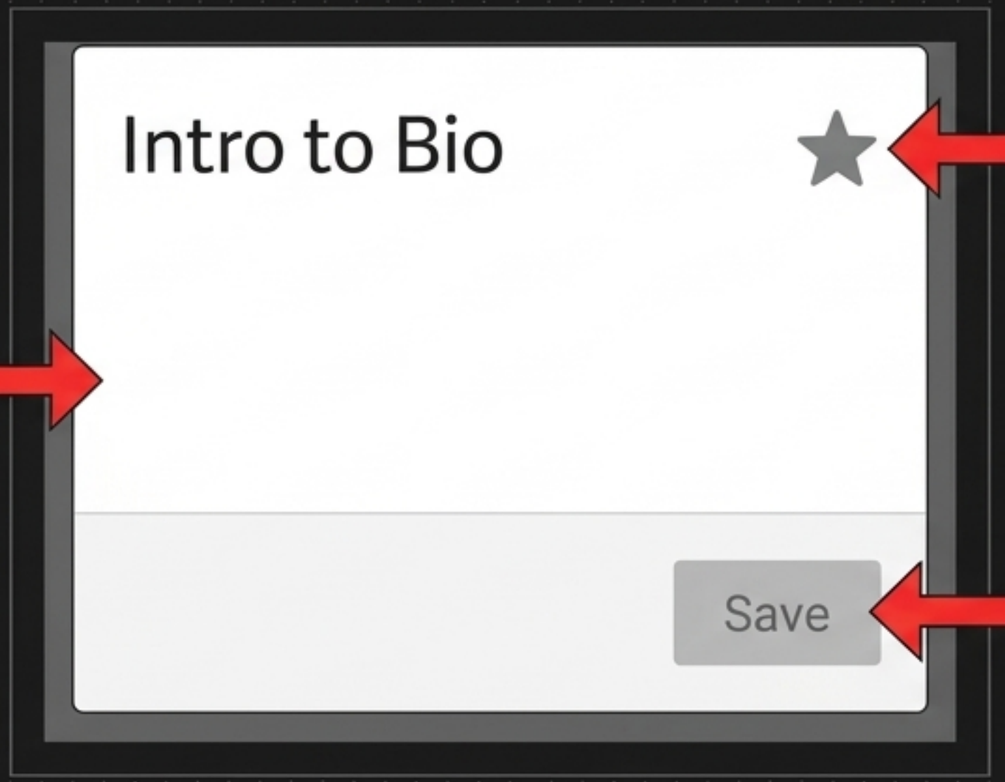


W3C COGA Failures Box

[WARN] 1. Fails ‘Clear Operation’ (Controls not identifiable).
[WARN] 2. Fails ‘Relying on Memory’ (Hidden states).
[WARN] 3. Fails ‘Clear visible labels’.

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Baseline State: The Broken Clean UI



GULF OF EVALUATION

Gulf of Evaluation: Silent save. Clicking Save just slightly darkens the grey. No toast, no `role='status'` change. Did it work?

GULF OF EXECUTION

Gulf of Execution: Icon-only star. What does this do? (Favorite? Required? Rating?). High (M) mental operator to guess.

GULF OF EXECUTION

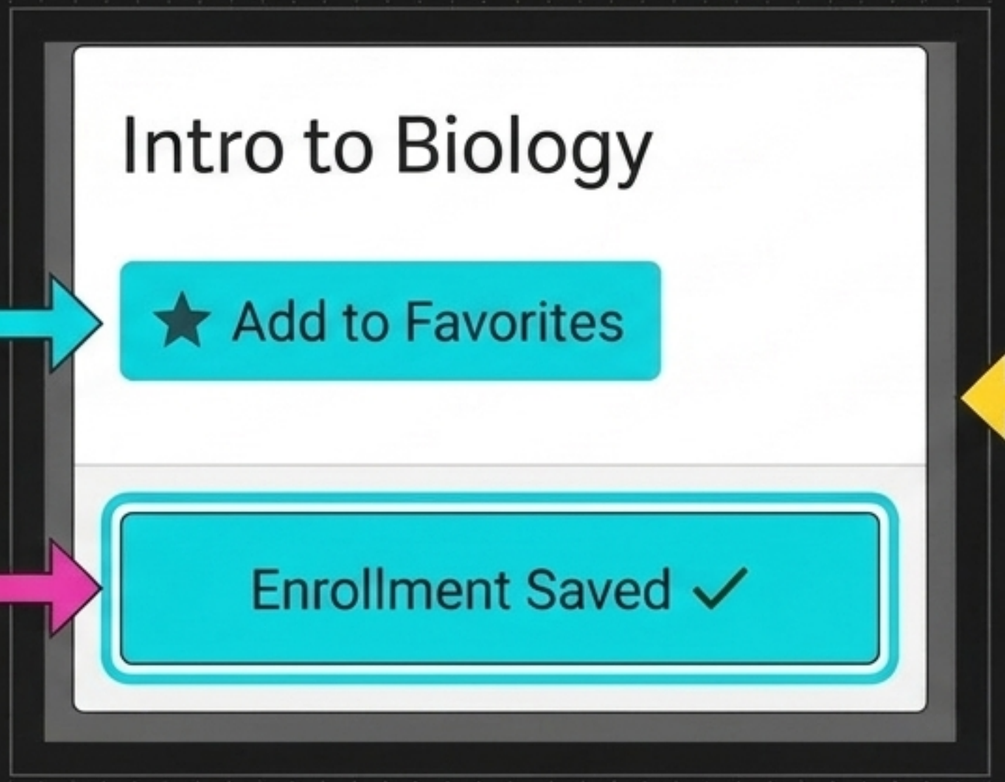
Gulf of Execution: `<div class='btn'>Save</div>` — Not a semantic button. Fails keyboard activation (`Space/Enter`). No `role='button'` or `tabindex`.

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Repaired State: The Semantic Pathway

Execution Repaired:
Native <button> used. Clear plain-language labels ('Add to Favorites' reduces M operator).

Evaluation Repaired:
Clear success state. Programmatic feedback via role='status' telling screen reader 'Course Saved'.



W3C COGA:
High contrast, clear visible boundaries, unambiguous language.

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The 5-Modality Parity Stress Test

	Broken State	Repaired State
Desktop Pointer	Relies on hover discovery.	Visible persistent cues; larger Fitts's Law target.
Mobile Thumb	Tiny icon hit area < 44px.	Full-width button, minimum 44x44px target.
Keyboard / Switch	Div cannot receive focus; breaks Tab order.	Native focus management, visible focus indicator.
400% Zoom (320 CSS px)	Fixed width overflows viewport.	Reflows into a single vertical column.
Screen Reader	`'Clickable, star'.`	`'Add to Favorites, button. Region updated: Enrollment Saved'.`

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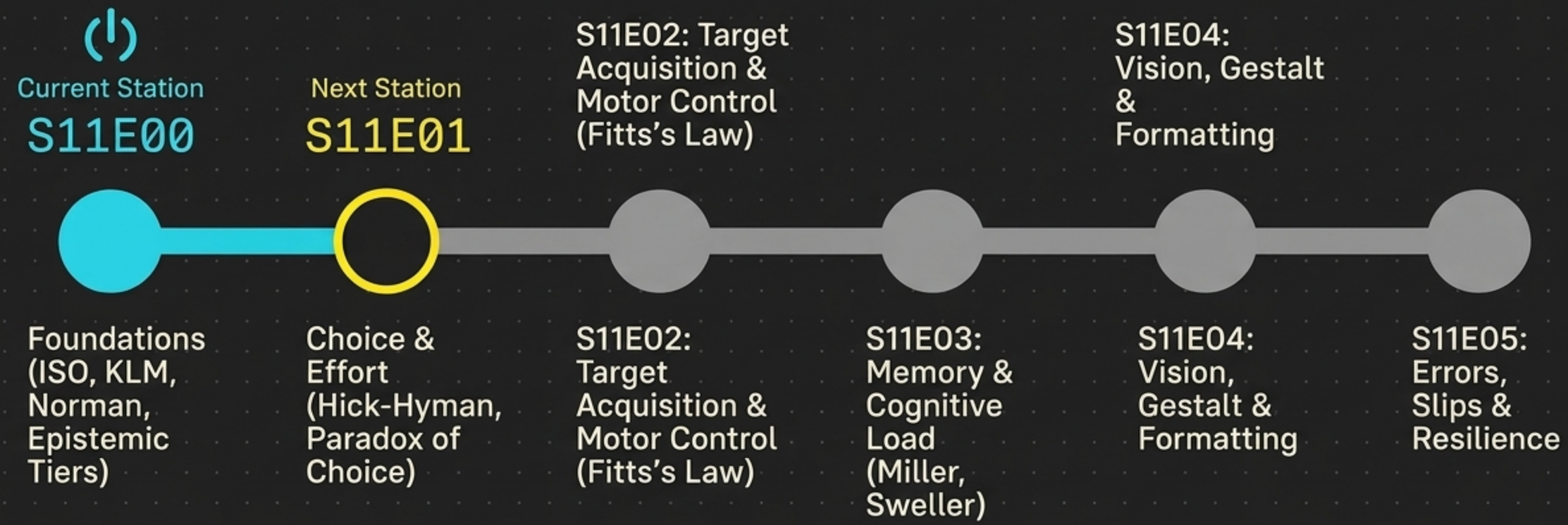
The 4-Lens Baseline Diagnostic Scorecard

1. Claim Classification [☐	2. Norman Gulf Audit [☐
Are you debating a **Tier 1 Model** (Physics), **Tier 2 Effect** (Psych), or **Tier 3 Heuristic** (Checklist)? Stop arguing opinions; classify the constraint.	**Execution**: Do affordances match signifiers? **Evaluation**: Does the system explicitly report its new state?
3. KLM Friction Estimate [☐	**4. 6-Modality Parity Check [☐**
Count the **M's** (Mental pauses) and **H's** (Hand shifts). Does this 'clean' design actually cost more time?	Does the core pathway work equally well for **Pointer**, **Thumb**, **Keyboard**, **Zoom**, **Screen Reader**, and **Cognitive** (**COGA**) needs?

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Season 11 Map: The Road Ahead

"Great design is not art. It is applied psychology and physics."



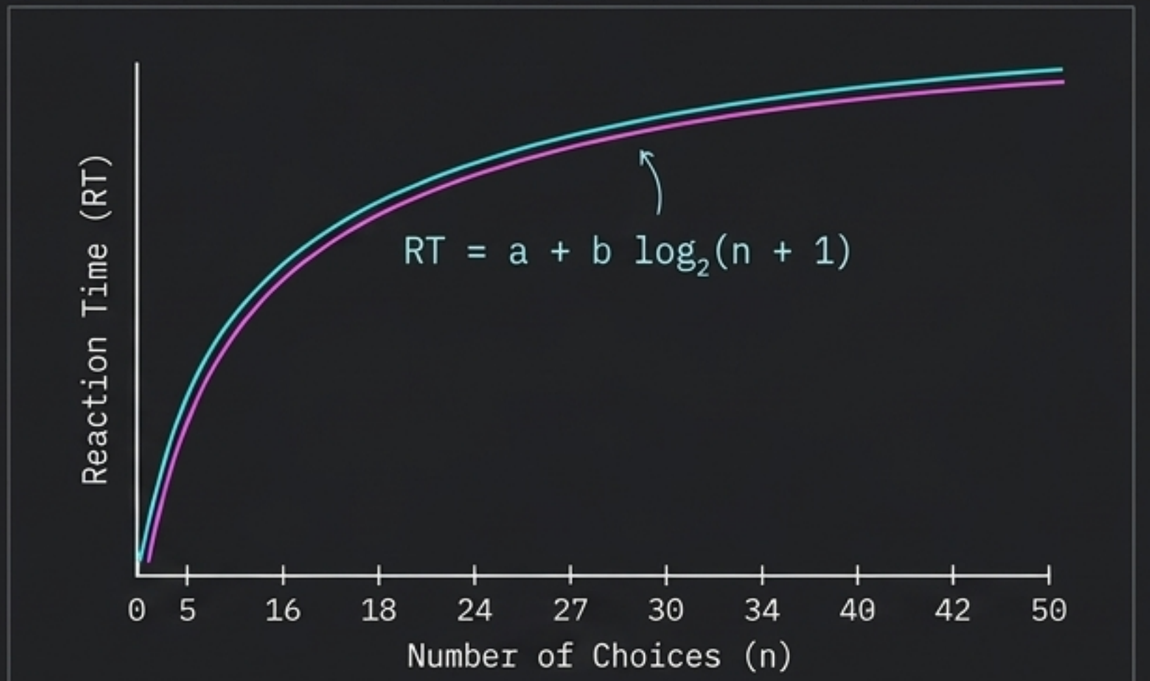
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NEXT ON SEASON 11 / S11E01

How People Choose: Options, Uncertainty, and Mental Effort



Visual Chaos: Ovezwhelming Options



The Problem: Does offering users more features make them happier, or does it paralyze them?

The Mechanics: We will deconstruct the Hick-Hyman Law (RT = a + b log2(n + 1)) and explore how Information Entropy governs human decision time.

Coming up: Chunking, Choice Overload, and why simplicity is actually a mathematical imperative.

[End of S11E00 Reference Document]

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