UX-LAWS-S11E04-ARC-2

UX Laws and Principles: S11E04

How People Understand and Remember: Familiarity, Cues and Unfinished Tasks

S11E03 established how we perceive—using Gestalt grouping, focal restraint, and semantic DOM hierarchy to parse the present. S11E04 bridges into Arc 2, exploring how we encode, hold, and resume tasks using the external UI as a cognitive prosthetic.

Clinical Engineering Reference | Monochromatic Base with Semantic Data Markers

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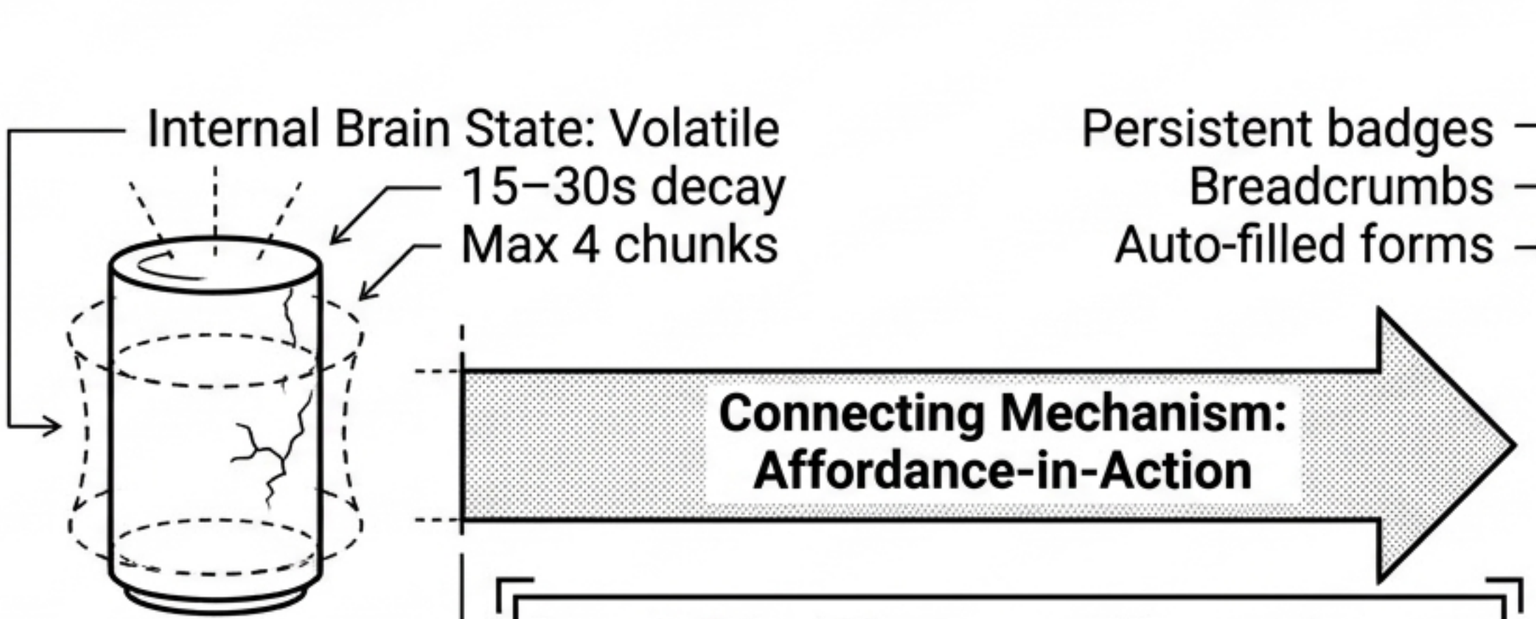
Section 1: The S11E04 Epistemic Toolkit

Cognitive Models (Internal)	Empirical Effects (Behavioral)	Design Heuristics (Applied)
Mental Models: Compressed internal representations based on past system interactions.	Ebbinghaus Serial-Position: Primacy and Recency curves in list processing.	Jakob’s Law: Transferring expectations from familiar platforms.
Cowan’s Working Memory: The severe 4 ± 1 chunk bottleneck.	Zeigarnik vs. Ovsiankina: Task recall vs. Task resumption behaviors.	Recognition over Recall: Minimizing internal cognitive retrieval via external visual cues.

Ref: Norman (1988); Cowan (2010); Ebbinghaus (1885)

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The UI as a Cognitive Prosthetic



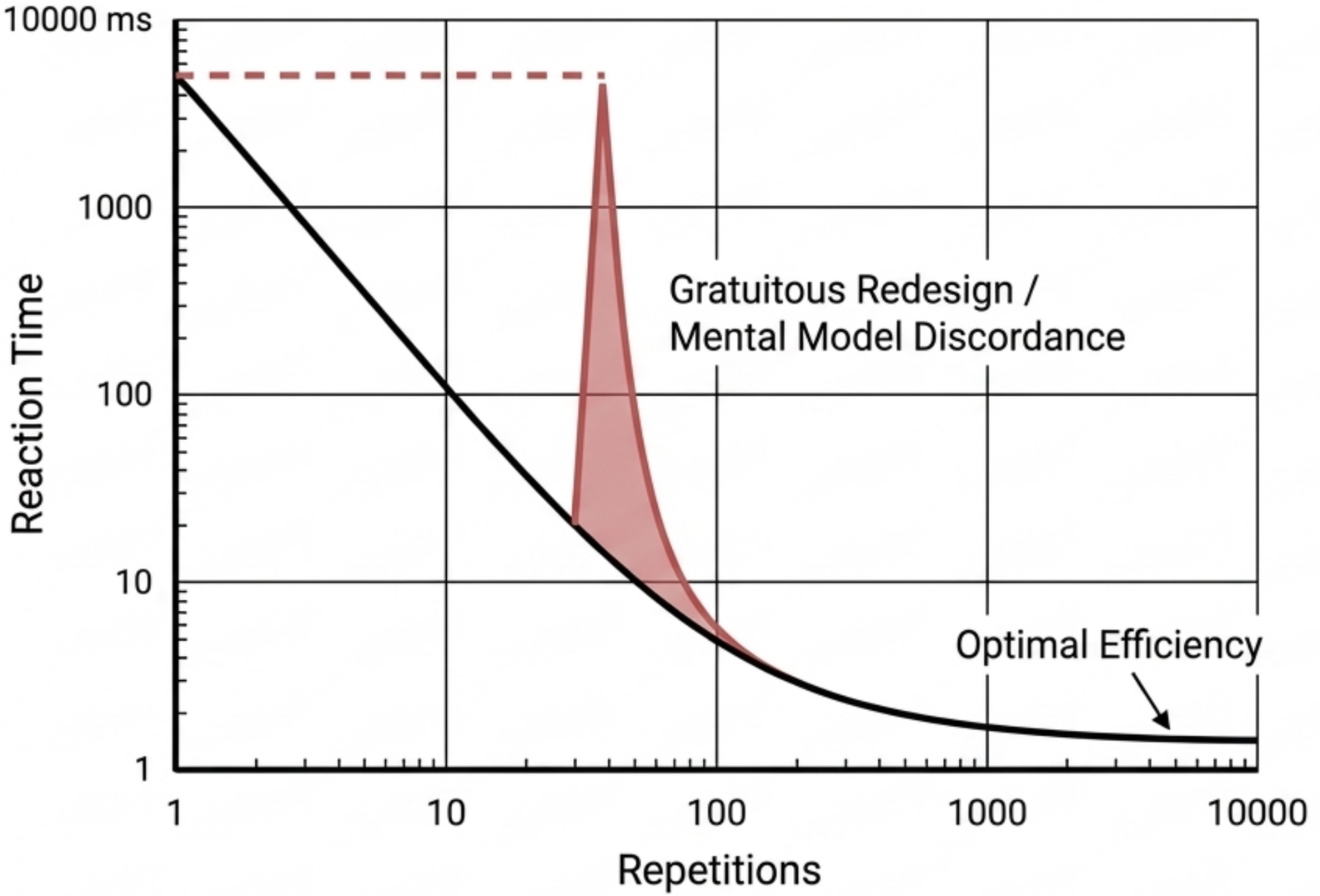
Perceivable Affordances: UI cues that directly link perception to action possibilities (e.g.,recognizable buttons).

Relational Reality: Affordances emerge dynamically through user interaction, contextual values, and social norms (The Mechanisms & Conditions Framework).

Ref: Davis, J.L. 2020 (How Artifacts Afford); Nguyen, Q.N. 2022 (Affordance-in-Action)

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Section 2: Jakob's Law & The Power Law of Learning



1. **The Power Law:** Task time decreases predictably with repetitions.

2. **Jakob's Law in Action:** Users accumulate practice repetitions across OTHER sites.

3. **Mental-Model Discordance:** Forcing novel patterns discards accumulated user fluency, demanding a heavy working-memory tax.

Ref: Newell, A. & Rosenbloom, P. 1980 (Mechanisms of Skill Acquisition);
Nielsen Norman Group (Power Law of Learning)

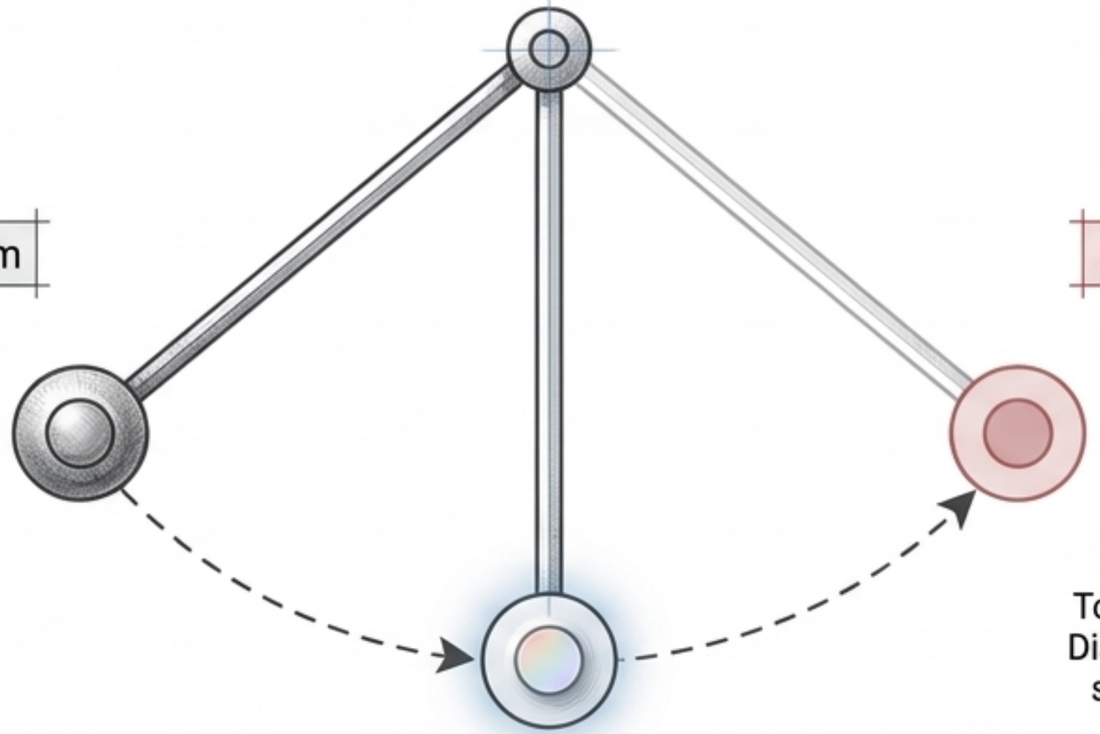
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The Signifier Pendulum: Skeuomorphism → Flat 2.0

Past: Tactile Skeuomorphism



Heavy reliance on physical-world metaphors. High learnability, but clunky.



Past: Ultra-Minimalist Flat UI

Link Here

Total removal of textures/shadows. Diagnostic Fail: Ambiguity and weak signifiers cause click uncertainty.

Present: Flat 2.0 / Neumorphism



The functional compromise. Subtle elevation, persistent drop shadows on action elements.

Safe Transition Protocol

When introducing a novel interaction pattern, embed an **optional bridge** (e.g., YouTube's 2017 Material Design opt-in) preventing mental-model discordance.

Ref: Nielsen Norman Group 2015 (Flat 2.0 Better for Users)

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Section 3: Empirical Myth-Busting #1 — Miller vs. Cowan

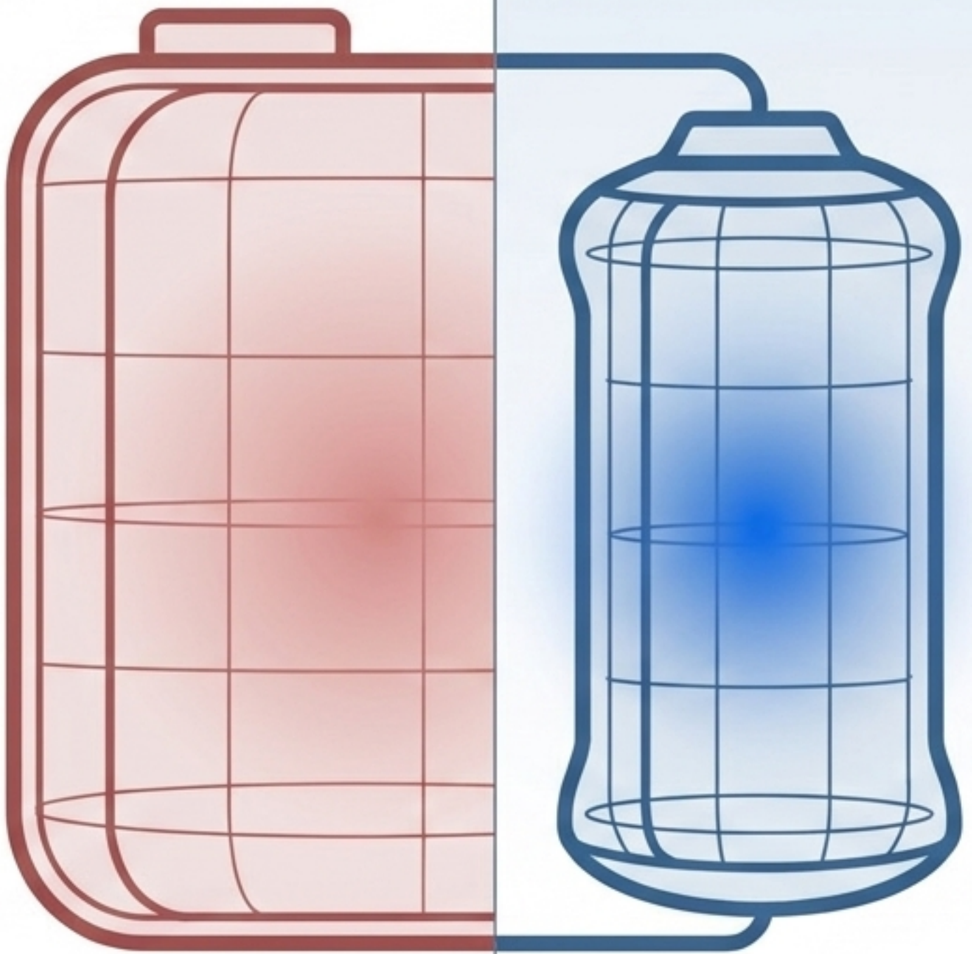
The Myth

Miller's 7 ± 2 (1956)

1D information-channel capacity (~2.5 bits).

Rehearsed verbal span, not functional visual working memory.

Design Error:
Using 7 to justify maximum navigation menu items.



The Empirical Reality

Cowan's 4 ± 1 (2010)

The true chunk working-memory bottleneck.

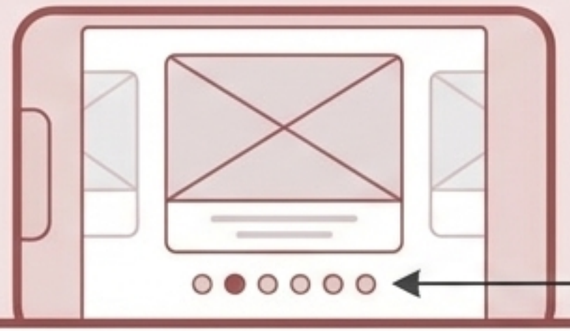
Strict 15–30 second decay rate without rehearsal.

Design Imperative:
Grouping data (e.g., formatting 16-digit cards into 4x4 clusters).

Ref: Miller, G. 1956; Cowan, N. 2010 (PMC2864034, 'The Magical Mystery Four')

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Recognition over Recall in Action



The 6-Card Onboarding Carousel (Fail)

Analysis: Demands users hold upfront instructions for >30s. Exceeds Cowan's decay limit. Complete failure rate.



The Hamburger Menu (Fail)

Analysis: Hiding scannable links cuts discoverability by ~50%. Zero information scent. High interaction cost.



Explicit labels enable recognition

- **Chunked Content**: Broken into 3–4 digestible units.
- **Explicit Labels**: No guesswork required.
- **Clear Navigation**: Reduces cognitive load.

Optimized for cognitive limits

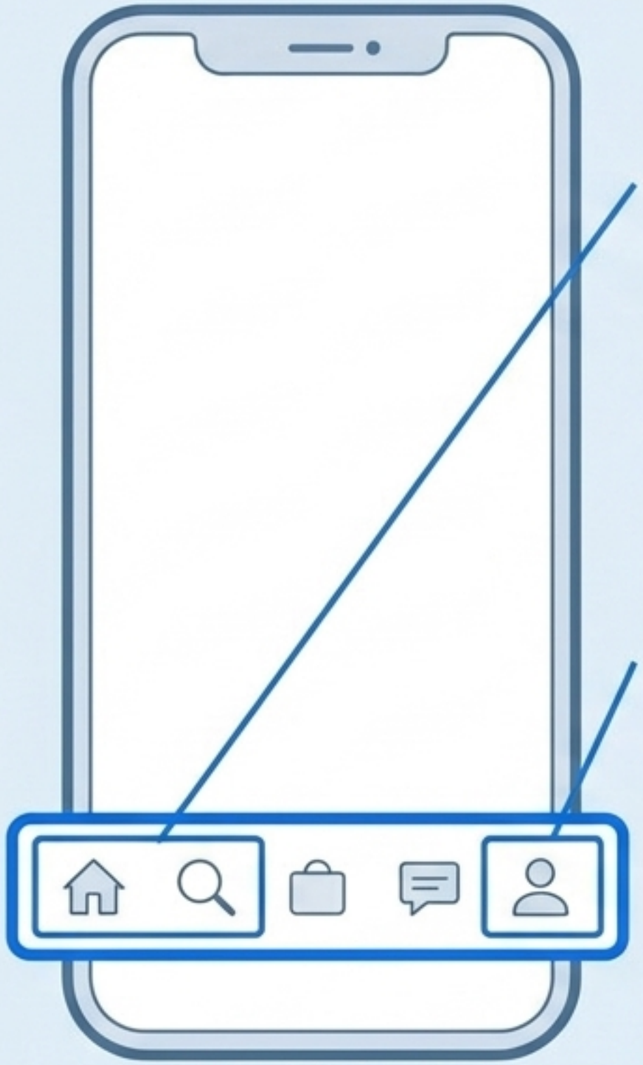
Labeled Iconography & Chunking (Pass)

Analysis: Visible icon text labels (crucial for hoverless touchscreens). Content chunked into 3–4 bullet clusters ensures cognitive retention.

Ref: Budiu, R. & Pernice, K. 2016 (NN/G: Hamburger Menus Hurt UX Metrics)

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Section 4: Serial-Position UI Architecture



Primacy Effect (Slots 1–2): Highest recall accuracy. Anchor primary navigational entry points here (e.g., Home, Search).

Recency Effect (Final Slot): High retention due to end-of-list placement. Anchor terminal actions here (e.g., Profile, Cart).



Desktop Non-Linear Scanning

Unlike linear verbal lists, visual web scanning follows spatial F-patterns.

`Engineering Rule`: Place critical wayfinding at the extreme left and right poles of the viewport header.

Ref: Ebbinghaus, H. 1885 (Memory); Wong, E. (Interaction Design Foundation)

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Empirical Myth-Busting #2: Zeigarnik vs. Ovsiankina

The Zeigarnik Myth (1927)

- **Premise:** Unfinished tasks are perfectly recalled.
- **Reality:** 2025 Nature Data meta-analyses prove unassisted recall fails to replicate (natie (ratio ~0.99).
- **Toxic UX:** Relying on unread red-dot notifications to induce anxiety.

The Ovsiankina Reality (1928)

Premise: An interrupted action leaves a quasi-need to resume.

Reality: ~67% behavioral resumption tendency when state is preserved.

Ethical UX: GOV.UK Task Lists ('Completed', 'In progress', 'Cannot start yet'). Requires persistent Requires persistent server/local draft state, not memory manipulation.

Ref: Zeigarnik, 1927; Ovsiankina, 1928; Ghibellini & Meier 2025 (Nature Data); GOV.UK Design System

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Section 5: Normative Memory Prosthetics (Structural Consistency)

WCAG 3.2.3 Consistent Navigation	
Requirement: Stable cross-page component order.	**Engineering Execution:** Navigation mechanisms that are repeated on multiple Web pages must occur in the same relative order each time they are repeated.
WCAG 3.2.6 Consistent Help	
Requirement: Predictable relative DOM/visual placement of help mechanisms.	**Engineering Execution:** Contact details, human help, or self-help options must remain in a deterministic, unchanging spatial location across the application to bypass working memory search.

Ref: W3C Web Content Accessibility Guidelines (WCAG) 2.2

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Normative Memory Prosthetics (Cognitive Input)

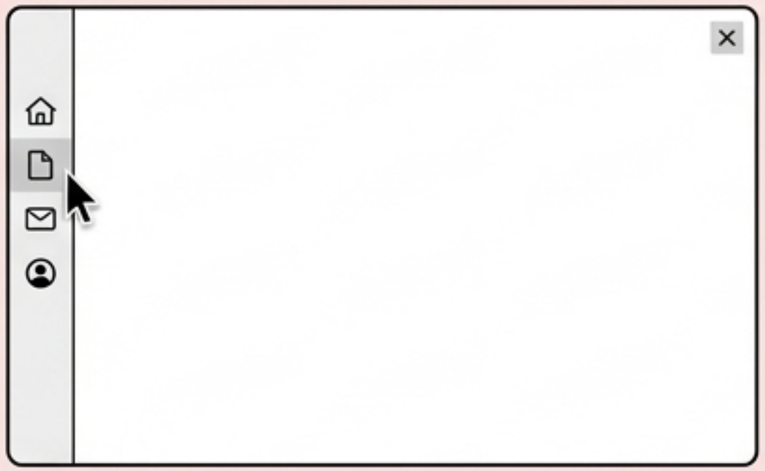
WCAG 3.3.7 Redundant Entry	
Requirement: Auto-populating or selecting previously entered data.	**Engineering Execution:** Ban asking for the same cohort/billing data twice in a session. Use persistent state to auto-fill.
WCAG 3.3.8 Accessible Authentication (Minimum)	
Requirement: Banning cognitive recall/transcription puzzles.	**Engineering Execution:** Must preserve paste functionality for password managers. Must support WebAuthn passkeys or magic links. No required memorization of complex character strings.

Ref: W3C Web Content Accessibility Guidelines (WCAG) 2.2; W3C COGA Task Force

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Section 6: Multi-Modal Walkthrough — Visual & Touch

Broken State (Desktop Pointer & Mobile Thumb)

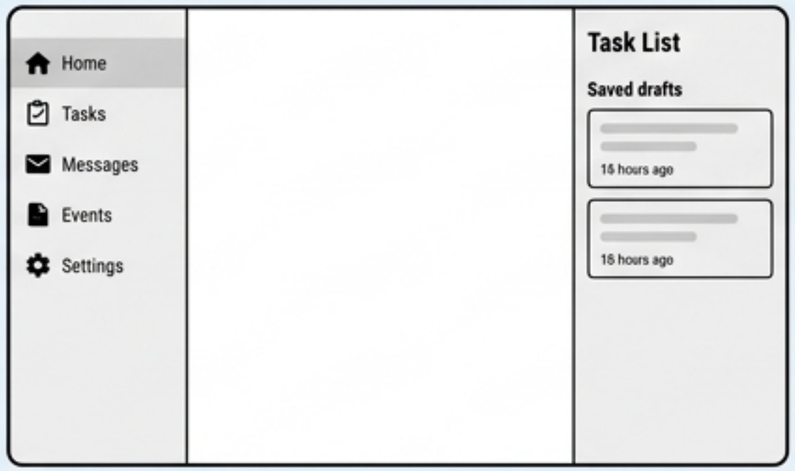




Desktop: Unlabeled icon rail requires hover tooltips (fails Recognition over Recall). Lost draft state upon accidental close.

Mobile: Hoverless mystery icons in a floating blob.

Repaired State





Desktop: Explicitly labeled navigation text. Contextual empty states. GOV.UK Task List integration persistently saving drafts.

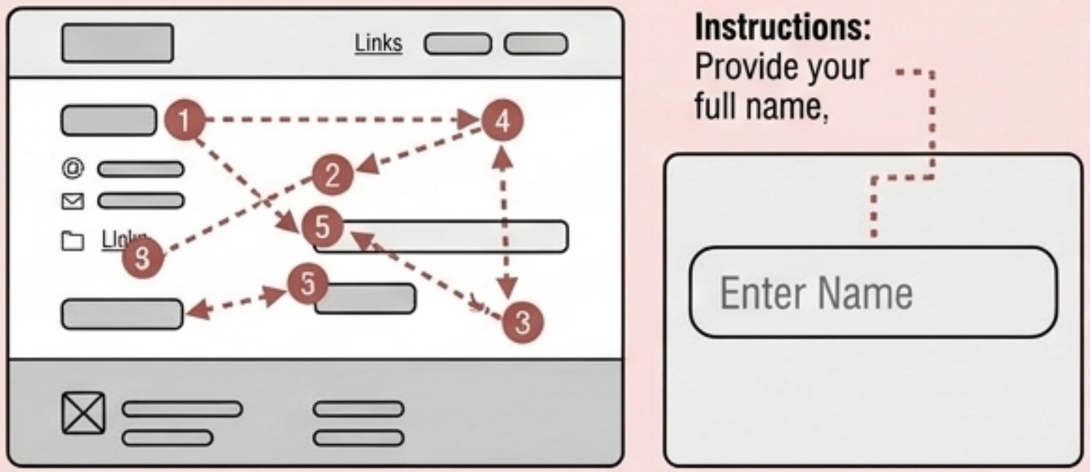
Mobile: 4-slot bottom bar. Labeled. Anchored at primacy (Slot 1) and recency (End Slot) for optimal associative transfer.

Ref: Applied Heuristics: S11E04 Framework

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Multi-Modal Walkthrough — Assistive Navigation

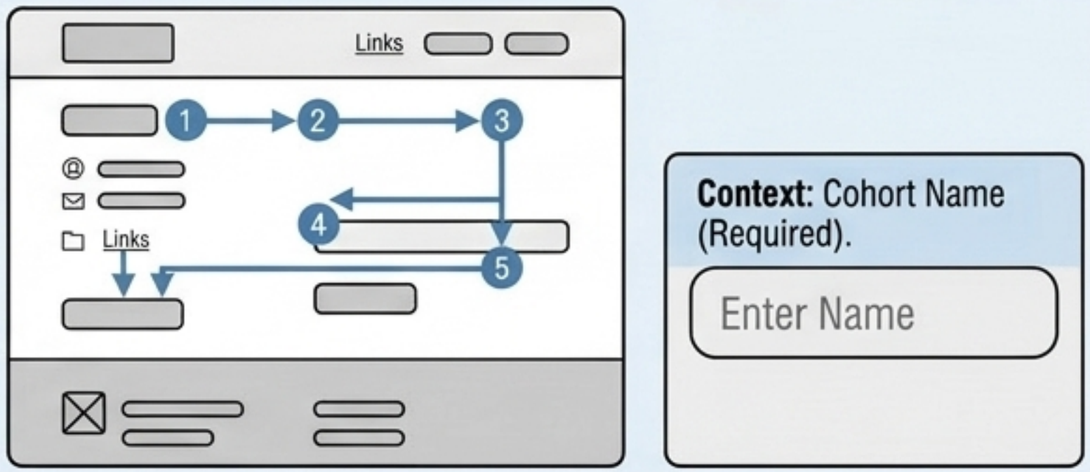
Broken State (Keyboard/Switch & 400% Zoom)



Keyboard: Shifting focus order on secondary pages destroys spatial memory mapping.

Zoom: At 400% (320 CSS px), user must scroll heavily backwards to check cohort context, exceeding the 15-30s working memory decay window.

Repaired State



Keyboard: SC 3.2.3 & 3.2.6 deterministic Tab paths. The structural DOM order never varies.

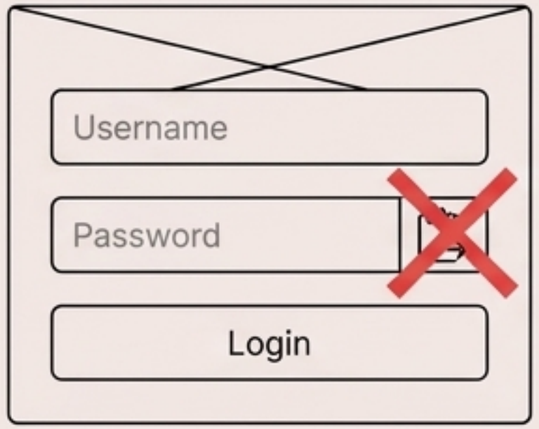
Zoom: Compact inline context summaries injected directly above form inputs to serve as an immediate memory prosthetic, eliminating scroll-back amnesia.

Ref: Applied WCAG 3.2.3, 3.2.6, 1.4.10 (Reflow)

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Multi-Modal Walkthrough — Screen Reader & Auth Forms

Broken State

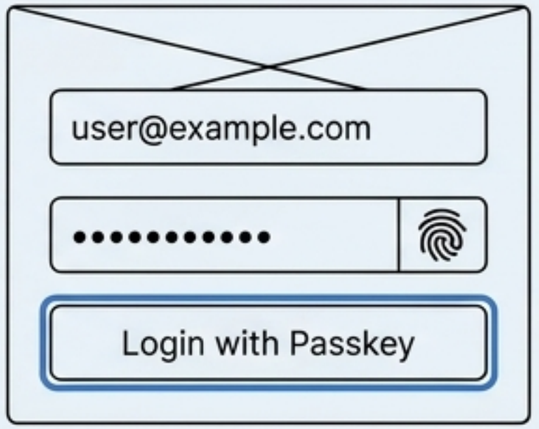



```
<button
  class="icon-btn">
</button>
```

Screen Reader: Generic icon names read aloud ("Icon 42"). No structural context.

Auth/Forms: System blocks password paste. Demands re-typing organization name on step 3.

Repaired State




```
<button
  aria-label="Settings"
  aria-current="step">
</button>
```

Screen Reader: Explicit semantic labels. `aria-current='step'` applied to active task list items to communicate spatial state.

Auth/Forms: Unrestricted paste. `autocomplete='current-password'`. WebAuthn passkeys active. SC 3.3.7 compliant auto-filled cohort data.

Ref: Applied WCAG 3.3.7, 3.3.8, 4.1.2

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Section 7: The 15-Minute Memory & Cognitive Audit

Icon-Recognizability Audit

- [ ] Remove hover states. Can a user instantly identify the icon's function on a touch screen?
- [ ] Does the primary navigation exceed 4 ± 1 chunks?
- [ ] Are labels explicitly visible without interaction?

Tab-Close Resumption Audit

- [ ] Close the browser tab mid-task. Reopen. Is the draft preserved?
- [ ] Does the UI explicitly indicate the status of the resumed task (e.g., "In Progress" badge)?
- [ ] Can the user authenticate without transcription puzzles or blocked pasting?

Ref: S11E04 Synthesis Protocol

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The Quantified Cognitive Cheat Sheet

Capacity & Decay

4 ± 1 Maximum chunk capacity of working memory.

15–30s Unrehearsed working memory decay rate.

Task Resumption Ratios

~0.99 Zeigarnik unassisted recall replication failure (Myth).

~67% Ovsiankina behavioral resumption tendency (Reality).

Structural WCAG

3.2.3 & 3.2.6

Mandates Consistent Navigation order and Consistent Help placement.

Input WCAG

3.3.7 & 3.3.8

Mandates Redundant Entry auto-fill and Accessible Authentication (paste/passkeys).

Ref: S11E04 Reference Parameters

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Synthesis & Next Up (S11E05)



In S11E04, we mapped how to support the user's fragile working memory through persistent state, semantic clarity, and strict WCAG cognitive protocols.
But memory is bound to time...

How People Experience Time: **Responsiveness, Feedback and Waiting.**

Coming in S11E05: We will define the strict latency rules, progress-bar timing thresholds, and the 400ms Doherty threshold that govern flow states.

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