Critique and Redesign of an Everyday Object

Analyze a common physical object to identify usability shortcomings and propose an enhanced redesign incorporating ML-powered or sensor-based features. Develop a concept that bridges the digital and physical to improve user experience.

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1. Object Analysis & Missing Affordances

Select an everyday physical object and critically examine what it doesn't do. Identify gaps where additional capabilities would meaningfully improve the experience.

Consider the following lenses:

- **Awareness Gaps:** Where does the object lack knowledge of its environment, user, or own state that would be useful?
- **Feedback Gaps:** Where do you wish the object communicated more—confirming actions, warning of errors, or surfacing hidden status?
- **Adaptation Gaps:** Where does the object fail to adjust to different users, contexts, or preferences?
- **Anticipation Gaps:** Where could the object act proactively rather than waiting for explicit user input?
- **Social Fit Gaps:** Where does the object create awkwardness, require explanation, or fail to integrate into existing habits and social contexts?

Document the following for each gap you identify:

- **Use Scenario:** The specific context and user goal.
- **The Gap:** What capability is missing and how its absence affects the experience.
- **Opportunity:** What could the object do differently if this gap were filled?
- **Justification:** Why is filling this gap worth the added complexity, cost, and potential failure modes? What's the case for *not* leaving it alone?

Awareness Gap:

Use Scenario

People who spend long hours at their desk. They sit down, start working/ studying, and rarely think about their chair and their gesture again unless something feels uncomfortable.

The Gap

Most of their chairs are basically static. They don't know who is sitting on them, how that person is sitting, or whether their current settings are actually good. The chair also has no awareness of its own state, how the seat height, backrest,or lumber support are configured. Because of this, users usually only realize something is wrong when they already feel discomfort or pain.

Opportunity

If the chair can sense the pressure patterns or posture of the users, it could understand whether its current configuration is supporting the users as well as remind the users of unhealthy sitting behaviors.

Justification

Discomfort builds up gradually and without awareness, the chair stays silent until pain appears. The increase of complexity and cost can bring much more comfortable experience and reduce the risk of diseases like scoliosis, which would benefit many people including kids.

Fig 1. Awareless chair with height adjustment; Fig 2. Me on chair foot on ground with no back support; Fig 3. Me on the chair with good back support but foot on air.

Can't adjust the angle and position of the back/ armrest

Adaptation Gap:

Use Scenario

Multiple people share the same chair at home, or one person uses the same chair for different tasks, from typing on a laptop, writing in a notebook, to working on a large desktop monitor.

The Gap

Even adjustable chairs are very common nowadays, they assume one setup fits all. They don’t adapt when different people use the chair, or when the same person switches activities. Also, most of them are only adjustable on their height and the positions of the armrests. More importantly, users rarely readjust the chair for the task/ user change unless they already feel uncomfortable.

Opportunity

The chair could be added with more adjustable and responsive components, not just the height, to be more supportive. Additionally,the chair could recognize different users or activity contexts and automatically adjust to a personalized configuration to better match the current situation

Justification

Automatic adaptation risks occasional mistakes, but they are reversible and the worst situation could just be needing a manual adjustment, not saying that kind of mistakes can be learned by ML and decrease over time. This does require users to spend some time adjusting things initially, but it's more effective than waiting until you're already feeling uncomfortable.

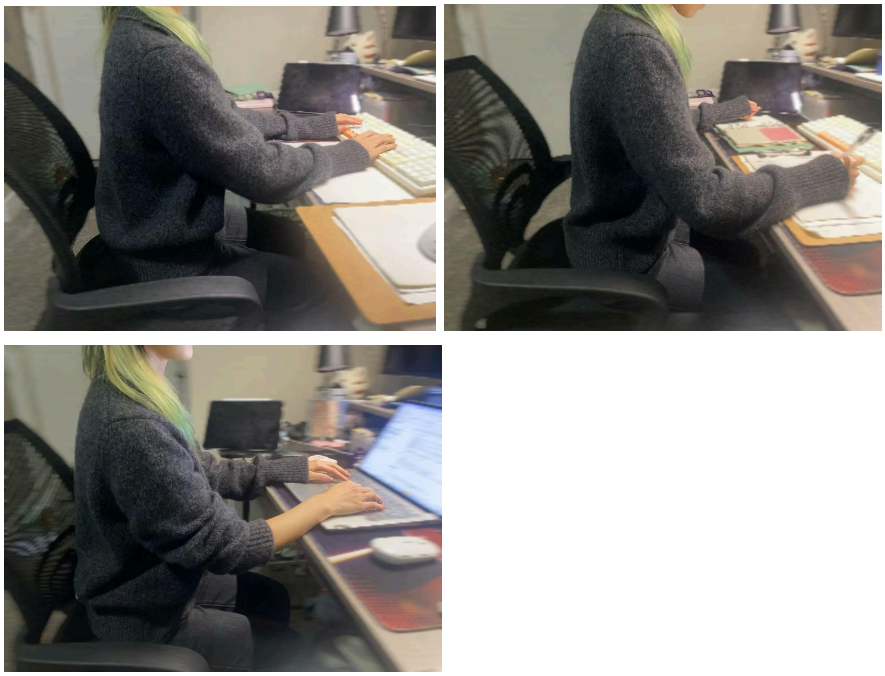

Fig 1. Me facing 27” monitor (prefer higher chair for better view); Fig 2. Me writing (prefer higher chair for better arm support) ; Fig 3. Me using laptop (prefer lower for better view)

But I always forget to adjust the chair when I change my tasks

Anticipation Gap:

Use Scenario

A user sits in one posture that feels comfortable at first (such as crossing one leg) while focusing on work. After a long time, they suddenly notice lower-back discomfort and shift position.

The Gap

Current chairs rely on users to notice the discomfort (could be due to prolonged sitting or poor posture) and adjust the posture or the states of the chairs themselves.There is no support during the long period when posture slowly degrades but still feels acceptable.

Opportunities

By tracking patterns and proactively intervening earlier (subtle adjustments or reminder) before the discomfort becomes noticeable.

Justification

The early intervention may cause false alerts or disruptions, but these can be controlled with ML, and preventing discomfort is more effective than correcting it afterwards.

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2. Propose a Redesign

Develop a redesign concept that addresses your identified gaps using ML-powered or sensor-based features. Your proposal should include:

- **Design Rationale:** A summary of which gaps you're addressing and why they matter. If you identified gaps that you chose *not* to address, briefly explain why.
- **Proposed Features:** Specific sensors, actuators, or ML capabilities integrated into your redesign (e.g., capacitive touch, accelerometers, computer vision, predictive models). If you're proposing ML, explain why threshold-based logic wouldn't suffice.
- **Social Considerations:** How does your redesign perform against the framework from class? Consider: Does it replace an existing habit or require new behavior? Is it invisible/normalized or performative? What's the social cost of using it? Does it require explanation?
- **Tradeoff Analysis:** What new failure modes, costs, or complexities does your redesign introduce?

Design Rationale

This redesign addresses three gaps: awareness, adaptation, and anticipation. Current chairs do not sense user state, adapt to different users or tasks, or intervene before discomfort appears. Addressing these gaps can improve comfort and reduce long-term health risks.

Proposed Features

The chair uses force-sensitive resistors in the seat pan and infrared distance sensors in the backrest to sense pressure distribution and upper-body support. Motorized actuators adjust the backrest, seat height, and armrests. (Inspired by Y. Lee, D. Beck and W. Park, "Human Factors Evaluation of an Ambient Display for Real-Time Posture Feedback to Sedentary Workers," in *IEEE Access*, vol. 8, pp. 223405-223417, 2020, doi: 10.1109/ACCESS.2020.3044316.)

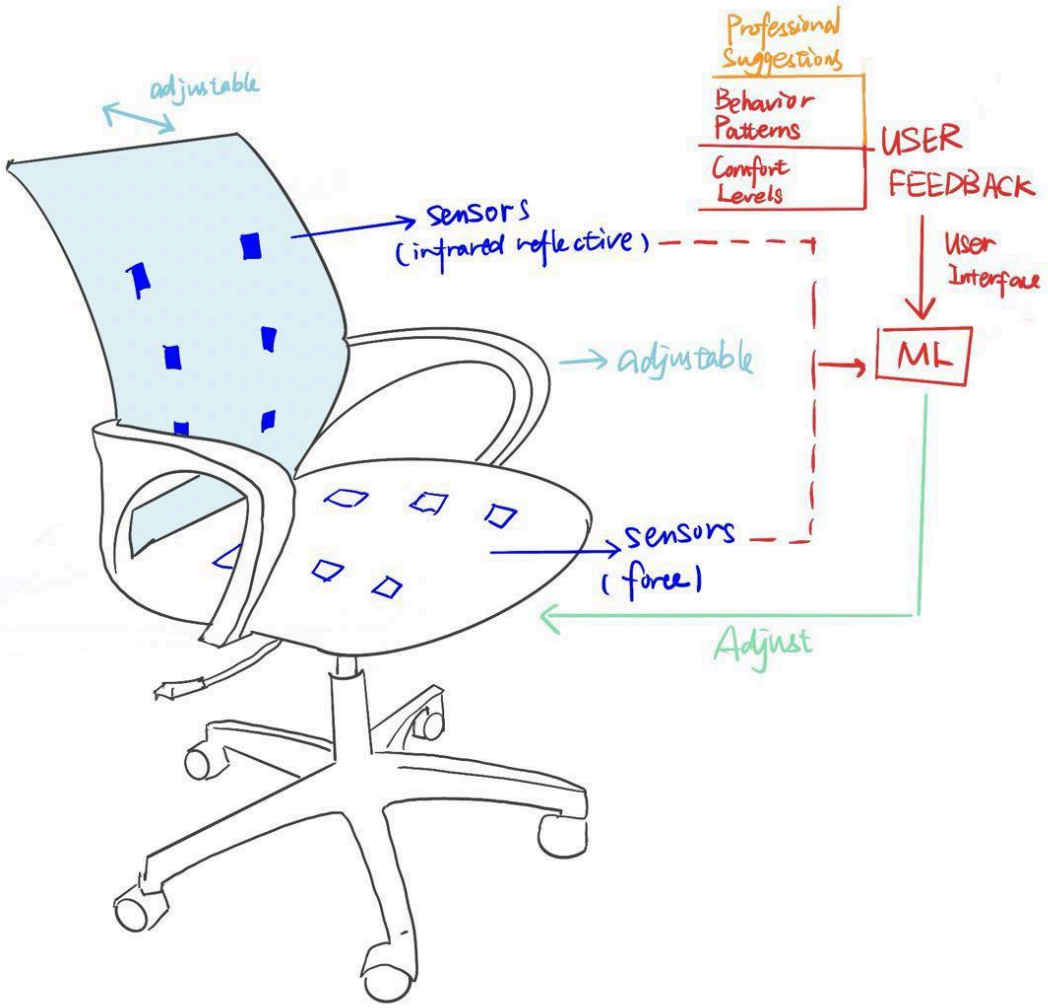
ML is required to personalize interpretation, since comfort and unhealthy patterns vary by body type and activity and cannot be captured with fixed thresholds.

Social Considerations

The system is designed to be mostly invisible and fit existing habits. After a short learning period, it adapts quietly through physical adjustments or subtle reminders, without requiring constant attention or explanation. User feedback is required but will keep concise.

Tradeoff Analysis

The redesign increases cost and system complexity and introduces the risk of sensing or prediction errors. However, leaving the chair static results in delayed feedback and repeated discomfort. The design balances these tradeoffs by keeping interventions reversible, and optional.


adjustable
Professional Suggestions
Behavior Patterns
Comfort Levels
USER FEEDBACK
User Interface
sensors (infrared reflective)
adjustable
ML
sensors (force)
Adjust