The Simplicity Paradox: Designing Transparency in the Age of AI

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ABSTRACT

Artificial Intelligence (AI) has driven a quest for increasingly simple and intuitive user interfaces, often grounded in John Maeda's Laws of Simplicity. However, this pursuit of functional simplicity clashes with the ethical and regulatory necessity for transparency and explainability in "black-box" AI systems. This paper explores the Simplicity Paradox: the tension between simplifying the interface (reducing cognitive load and user effort) and revealing the underlying model complexity (ensuring user trust and autonomy). Through a comparative analysis of AI interfaces (Spotify, Google Translate, and ChatGPT) using an Ethical Simplicity Framework, this work proposes that the solution lies in adopting Strategic and Transparent Simplicity (Maeda, Law 10 - The One). In this approach, complexity is intentionally revealed where it is meaningful (Seamful Design), rather than merely concealed. The resulting framework offers a roadmap for designers to implement transparency without sacrificing user adoption.

Keywords: AI transparency, XAI (Explainable AI), Simplicity, Seamful design, Trust, Design ethics

INTRODUCTION

The User Experience (UX) of Artificial Intelligence (AI) is marked by duality: the predictive and generative power of AI systems is wrapped in interfaces that strive to be minimally intrusive and maximally efficient. The designer, engineer, and thinker John Maeda (2006) proposed universal principles to balance simplicity and complexity. Laws such as Reduce, Organize, Time, and Trust form the foundation of modern AI design, exemplified by ChatGPT's clean interface or Spotify's one-click efficiency.

However, this efficiency conceals a danger. Misapplied simplicity can turn into omission, resulting in a loss of visibility into system operations, which transforms simplicity into **opacity**. The **Simplicity Paradox** is, therefore, the point at which simplification, designed to enhance usability, begins to compromise ethical and cognitive transparency. Classical design authors have long warned of this ambiguity: Donald Norman viewed true simplicity as the result of deep understanding, not concealment, while Herbert Simon reminded us that simplicity is relative to the observer's level of knowledge.

The objective of this paper is to: 1) Define and analyze the Simplicity Paradox in AI systems. 2) Present an Ethical Simplicity Framework for evaluation. 3) Highlight the results of applying this Framework to three categories of high-use AI applications, classifying the type of simplicity

adopted and identifying transparency failures. 4) Propose design guidelines that integrate transparency (Seamful Design) without sacrificing usability.

THEORETICAL AND CONCEPTUAL FRAMEWORK

Simplicity vs. Complexity in Systems

The desire for simplicity in complex systems refers to Ockham's Razor, which postulates that the simplest explanation should be preferred, provided it is sufficient. However, the reality of Deep Learning models and Large Language Models (LLMs) is that predictive efficiency often requires structural complexity. The attempt to apply simplicity as a universal doctrine is criticized for potentially limiting expressiveness and cultural diversity. Sarkar (2023) argues that different users have different needs for complexity and control. Maeda responds to this with Law 5 - Differences: simplicity and complexity need each other. Good design does not eliminate complexity; it balances it.

The Triad of Cognitive Simplicity

Beyond aesthetics, simplicity must be understood through the lens of human cognition:

- **Cognitive Economy:** Systems must minimize effort. In AI, Law 1 (Reduce) and Law 2 (Organize) translate into interfaces that limit options and structure information volume.
- **Learning and Predictability:** Simplicity is facilitated by knowledge. Law 8 (Trust) states that trust emerges when design is predictable. In AI, this is achieved through Explanatory Transparency (XAI).
- **Control and Autonomy:** Simplicity must keep the user in control. Systems that hide decisions ("black boxes") violate this law, reducing user autonomy (NNGroup, 2025b).

Conscious Transparency: Seamful Design

The concept of Seamful Design argues that the "seams" of AI systems—failures, uncertainties, and limitations—should not be hidden but revealed instructively. This contrasts with Seamless Design, which seeks to hide complexity at all costs. By showing the "seams" (limits, errors, uncertainties), a system becomes more trustworthy, even if it appears less "clean."

METHODOLOGY AND APPLIED ANALYSIS

Methodology: Expert Evaluation

The analysis of the AI interfaces (Spotify, Google Translate, and ChatGPT) was conducted by a group of five experts in Systems Engineering, Interaction Design, and AI Ethics. The methodological approach used was **Expert Consensus Heuristic Evaluation.** Each expert conducted an in-depth evaluation focusing on identifying how each application applied or violated Maeda's ten Laws of Simplicity. Experts scored each application across three dimensions: Organizational, Cognitive, and Ethical/Transparency. A

data confrontation session was held to align qualitative and quantitative perceptions.

Table 1: Summary of heuristic analysis findings.

Category / Theme	Key Findings	Evidence / Representative Excerpts	Observed Impacts	Opportunities for Improvement / Recommendations
Organizational Simplicity (Reduce/ Organize)	Initial information overload (Spotify); minimalist excellence (Google Translate, ChatGPT).	"The home screen is cluttered..." (Spotify); "Interface prioritizes the essential: input and output fields..." (Google Translate).	Risk of cognitive overload and increased learning curve in dense interfaces.	Reevaluate information density on the home screen to maximize the Law of Reduction.
Cognitive Simplicity (Learn/ Context)	Unguided learning flow (Spotify); instant pattern-based learning (Google Translate, ChatGPT).	"The app does not provide prior explanation about its functionality" (Spotify); "Use is immediate, no tutorials needed" (Google Translate).	Full usability becomes dependent on the user's experience level and time of use.	Implement light contextual tutorials or onboarding features for non-obvious functionalities (e.g., "add to queue").
Algorithmic Transparency (Revealed Complexity)	Opacity in recommendation criteria and internal processing (Spotify, Google Translate, ChatGPT).	"Absence of algorithmic clarity ('mysterious' suggestions)" (Spotify); "does not explain how translations are generated..." (Google Translate); "no transparency regarding internal algorithmic functioning" (ChatGPT).	Creation of "algorithmic mysticism," making it difficult to develop accurate mental models about the AI system.	Establish "Optional Transparency" with an explainability section, such as "Why this song?".
Trust and Prevention of Dependency	Low indication of uncertainty and sources; risk of blind trust in suggestions.	"Rarely encourages external validation" (ChatGPT); "system does not inform the origin nor the degree of reliability of translations" (Google Translate).	Fosters excessive dependency and inhibits the development of critical thinking and digital literacy.	Insert visual reliability indicators (confidence scores) or "approximate translation" alerts in ambiguous cases.

(Continued)

Table 1: Continued.

Category / Theme	Key Findings	Evidence / Representative Excerpts	Observed Impacts	Opportunities for Improvement / Recommendations
User Education on AI	Failure to explicitly instruct on the role and learning of Artificial Intelligence.	"App does not inform users about the role of AI" (Spotify); "does not directly instruct on ethical use or technical functioning" (ChatGPT).	Impairs AI Literacy and the formation of realistic expectations about system capabilities and biases.	Create concise educational content on "How [Product] learns from you" and the ethical implications of generative AI.
Control and Autonomy	High operational control and reversibility; low control over algorithmic input.	"Spotify provides a strong sense of autonomy and personalization..." (Spotify); "User controls history, selects regional dialects..." (Google Translate).	Perception of control is strong at the interface level (granular controls), but weak at the level of data governability and AI.	Provide a more prominent manual discovery method and semantic adjustments for translation context.
Inclusion and Accessibility	High degree of cultural adaptation and accessibility (Spotify, Google Translate); technical accessibility limitations (ChatGPT).	"High cultural integration and accessibility for all" (Spotify); "requires technical improvements to fully serve people with disabilities" (ChatGPT).	Inconsistency in technical accessibility implementation creates access barriers in highly successful market products.	Improve ChatGPT's technical compatibility with screen readers and assistive technologies.

Analysis of Results

The analysis demonstrated that successful AI interfaces achieved high scores in Organizational and Cognitive Simplicity but consistently failed in the Ethical/Transparency dimension. Spotify achieves clarity at the cost of algorithmic visibility (Strategic Simplicity). Google Translate provides functional simplicity but opaque model cognition. ChatGPT uses conversational fluency to hide probabilistic uncertainty, creating a dilemma of blind trust.

RESULTS AND DISCUSSION: SOLVING THE PARADOX

The results confirm the trade-off between usability and transparency. The applications prioritize **Cognitive Simplicity**, which frequently leads to a low score in **Ethical Simplicity**.

Guidelines for Ethical Design of Transparency

Overcoming this paradox requires transparency to be integrated as a design requirement.

1. **Hierarchy of Explanations:** Transparency should be offered in layers. *Level 1* focuses on simple counterfactual explanations. *Level 3* offers technical details on model architecture (Law 5 - Differences).
2. **Managing Uncertainty:** Generative interfaces should offer visual trust indicators (e.g., probability bars) to prevent over-reliance.
3. **AI Literacy:** The interface must contribute to AI literacy (Law 4 - Learn), explicitly informing users that they are interacting with an AI to correct mental models.

REGULATORY IMPLICATIONS AND THE FUTURE OF TRANSPARENCY

Designing simplicity in AI is also a matter of legal compliance. Increasing global regulation, such as the EU AI Act, establishes rigorous transparency requirements. Systems that use Strategic Simplicity to hide algorithms may face auditing challenges. Design must consider the Regulator as a key audience, allowing UI simplicity to coexist with the depth required for auditing (Law 6 - Context).

CONCLUSION

Artificial Intelligence systems challenge the traditional understanding of simplicity in design. The solution to the Simplicity Paradox is Transparent and Strategic Simplicity. It requires design to go beyond surface usability, incorporating intentional interpretability and Seamful Design to reveal complexity where it is ethically meaningful. As Maeda (2006) summarizes, "simplicity is about subtracting the obvious and adding the meaningful." In the AI age, this means not hiding complexity, but guiding it with ethics and empathy.

ACKNOWLEDGMENT

REFERENCES

Banovic, N. et al. (2023). Being Trustworthy is Not Enough: How Untrustworthy Artificial Intelligence (AI) Can Deceive the End-Users and Gain Their Trust. Proceedings of the ACM on Human-Computer Interaction.

Google Design. (2024). Control and Simplicity in AI Systems. Mountain View, CA: Google Design.

Karran, A. et al. (2022). Designing for Confidence: The Impact of Visualizing Artificial Intelligence Decisions. Frontiers in Neuroscience, v. 16.

Liao, Q. V. et al. (2023). Designerly Understanding: Information Needs for Model Transparency to Support Design Ideation for AI-Powered User Experience. Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems.

Maeda, J. (2006). The Laws of Simplicity. Cambridge: MIT Press.

Nielsen Norman Group. (2025a). AI for UX: Getting Started. Fremont, CA: NN/g.

Norman, D. (2013). The Design of Everyday Things. Revised Edition. New York: Basic Books.

Sarkar, A. (2023). Should Computers Be Easy To Use? Questioning the Doctrine of Simplicity in User Interface Design. Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems.

Simon, H. (1969). The Sciences of the Artificial. MIT Press.