

The Impact of AI-Assisted Tools on Design Thinking and Skills: Cognitive Offloading, Agency, and the Deskilling of Creative Professionals

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Abstract

This paper is a practitioner reflection on the cognitive consequences of AI-assisted design tools. Drawing on the cognitive offloading literature and on patterns observed across multiple product organizations, it identifies three workflow shifts that designers are currently navigating: the prompt-and-refine workflow, the junior-senior apprenticeship gap, and a widening decoupling between confidence and competence. The usage of AI in the work process is transforming the professional design practice, changing the way designers think, iterate, and create. The present paper is about the way AI-assisted tools create cognitive offloading that jeopardizes the core capabilities of visual reasoning, systems thinking, and empathy towards the user. This paper introduces three phenomena of compounding according to practitioner experiences and the Human-Computer Interaction, cognitive science, and skill development literature: the prompt-and-refine workflow shift, the gap between junior and senior apprenticeship, and the decoupling between confidence and competence. The paper includes forward design implications of fruitful friction and gradual help and demand longitudinal studies of creative-professional deskilling. Design practitioners, who redesign the practice of design practitioners, are able to provide a quite different reflexive group to this question.

Additional Keywords and Phrases: AI-assisted design, cognitive offloading, deskilling, human agency, design thinking, skill sustainability

1 Introduction

Artificial intelligence has quickly been embraced in the professional design process in the last ten years. Scaffolding ideation, synthesizing research, creating layout options, and on-demand animation of prototypes are now scaffolded with generative model-based tools. Where designers used to be required to sketch and repeat their cognition with crude sketches to externalize their cognition and probe their intuition, lots of individuals begin by giving orders and compiling AI-created results. Such a change is well-documented [1, 2]. AI assistance cannot only save time on the execution of the artefact, but also reduce the barriers to the production of refined artefacts, and reduce the time of feedback. However, the same movement does not in any way shun a transfer across the intellectual work which has always been constitutive in the practice of design itself. The designer becomes an editor, and the consequences of a change in terms of the sustainability of skills have been relatively under-systematized.

The thesis of this paper is that AI-enabled design tools are a kind of invisible deskilling: the professionals feel efficient and skilled because the basic skills of visual reasoning, systems thinking, and empathy for the user are slowly eroded. We describe three of the phenomena that practitioners have identified: the prompt-and-refine shift in workflow, the gap between junior and senior apprenticeship, and the confidence-competence decoupling, and provide design and research solutions. We feel that neither can be a fact of productivity and skill decay, in which a designer can be quicker in the output production and at the same time, lose the ability to determine whether the outputs were correct. The design community is one of the important communities that can be of interest in this question. The designers are brought up to the professional level and are to challenge automation and promote human

agency [13]; the self-reflective descriptions they provide are particularly useful since they might be experiencing the described phenomena themselves.

2 Background and Related Work

Intelligent work has long-known dangers of cognitive offloading- relying on external systems to lessen cognitive processing requirements [3]. In design, sketching has traditionally been a productive form of offloading: thought is made visible and tangible, and often knowledge is created through the manipulation of a physical object that cannot be created normally by the brain. The innovation of AI is qualitatively new: it is not merely a document or a report on thought, but a generation of thought. When a designer clicks once and comes up with ten layout variations that are solved, the visual reasoning that would have taken days of hard work gets reduced to seconds. The other portion of the cognitive work selection, critique, and timely refinement is structurally distinct from the generative work that it replaces, and the metamemory research demonstrates that this difference can degrade the quality of the metacognitive self-evaluation itself [4]: the practitioner may feel knowledgeable without having done an adequate job of exploring the work itself.

The concept of automation bias, which is the over-trust in algorithmic suggestions, has been extensively reported in medicine, aviation, and the administration of people [5, 6, 14]. It is more evident in the design: AI-generated solutions can be preferred by designers not because they are the best, but because they seem plausible and can be accessed immediately. Through time, this trend re-tunes the designer's internal frame of reference; what good looks like starts to be determined by what AI would tend to create, not necessarily the designer's crafted sense of what is good. Morandini and others [1] record how the AI implementation in the professional world causes more output at a quicker rate, yet in the undertaking discourages the deliberative capabilities, on which the independent judgment is based. The deskilling, with a long tradition in the labour economics literature, has had a new empirical foothold in the field of AI-assisted knowledge work. The authors of the research on AI-based writing, coding, and medical diagnosis also found the same tendency: first, people perform better, and then the performance of more advanced skills that enabled professionals to be useful in the first place slows down [8, 9].

There is another aspect of the design scholarship. The generative dialogue between the maker and the artefact in which design competence is put together, reflection-in-action, is founded on making acts [10]. By making the attribution to an AI, this feedback loop is broken. The designers do not even have a clue what process they are involved in at this point, as it has gone on without them. This has specific implications for the creative areas because, as it was revealed in an empirical study conducted by Wadinambiarachchi and others [2], when exposed to AI-created content at the ideation phase, the design fixation and the decrease in the fluency, diversity, and novelty of their own outputs of the participants are significantly higher in comparison with a control group.

3 Impact on Design Thinking And Skills

3.1 Visual and Spatial Reasoning

Repeated practice is how designers build the visual and spatial reasoning that underpins compositional judgment, typographic choice, and the perception of spatial relationships between elements on a page. What happens is that these activities are not incidental to expertise but, on the contrary, they are it [12]. Visual artefacts that are generated on demand by AI tools decrease or eradicate the practice by which perceptual vocabulary is constructed. It takes years of active producing and not passively analyzing to be able to perceive an incongruent grid or a disjointed rhythm to a typographic hierarchy. Practitioners I have worked with had difficulties in characterizing how an AI-generated layout was off and not something that they would have immediately diagnosed in their own work- and this is reflective of impaired perceptual fluency that is not directly perceived until an aspect of critical assessment becomes aware of it.

3.2 Systems Thinking and Decision Reasoning

In order to design effectively, one has to think over systems: consider the needs of the users, technical constraints, business needs, and contextual issues simultaneously. This argument is put to practice in the process of design, wherein every choice poses one with a tradeoff. The solutions suggested by AI-generated solutions appear to be solved, but in fact, they may be hiding them, instead

of showing them. In AI-first processes, designers are willing to accept solutions where the lack of considering the systemic implications of the solutions, the deliberative friction that would bring the implications to the fore is eliminated. It is not that designers are more inclined to make poor decisions, but that they do it more rapidly and are unaware of what they have not considered. Doshi and Hauser [11] affirm that there is a symbiotic relationship between generative AI and creative work wherein the quality of a single piece of work is improved by generative AI, but the number of solutions generated by a group of practitioners is reduced because everyone converges on the ideas generated by AI as opposed to brainstorming.

3.3 Shallow User Research Engagement

AI research synthesis tools, such as automated thematic analysis, AI-generated affinity diagrams, and insight extraction of large corpora, run the risk of abstraction of the user experience in a way that is exhaustive of empathic understanding. Being in close proximity to raw user information increases the ability to embrace complexity and ambiguity and avoid premature conclusions. Taping interviews, writing in field notes, or physically moving affinity groups around are not only forms of efficiency that can be automated, but also generative processes, wherein designers can form an opinion of what is important. Automated synthesis can prove statistically valid tendencies, as well as eliminate the human peculiarities that can make the tendencies pragmatic. This produces an empathy which is one mile wide and a nickel thick: a wide range and shallow content, and little ability to apply knowledge to important design action.

4 A Practitioner's Lens: Socio-Cognitive and Agency Implications

4.1 The Prompt-and-Refine Workflow Shift

The most common shift that can be witnessed among practitioners is between a generative and an editorial workflow. Design now began with fruitful indecision, and was pushed into solution with active production and further investigation. It has even started with the production of AI, and then to the procedure of selection and refinement. The editorial skills involved, such as aesthetic discrimination, critique, and prompt engineering, are distinct and do not seem to be acquired, unlike the generative origination skills. Practitioners describe feeling a step behind in their own process as though the work had moved forward without them.

4.2 The Junior–Senior Asymmetry (Apprenticeship Gap)

The implications of workflows supported by AI are significantly uneven at different levels of careers. The heuristics, knowledge of failures, and aesthetic knowledge experienced by the designers enable them to critically analyze the AI output. Otherwise, there are high chances of the junior designers just accepting the AI-generated propositions as they are without ever having learnt to generate the proposals in the first place, with the view to being able to determine their limitations. This poses a crisis of apprenticeship: the tacit knowledge once transferred through shared practice and critique has fewer natural occasions to surface [15]. Even where tools like AI might support explicit knowledge transfer [20], the embodied, judgment-based knowledge that develops through making remains difficult to transmit when the making itself is automated.

4.3 The Confidence–Competence Decoupling

A decoupling between confidence and competence is, perhaps, the most pernicious dynamic that we have seen. The rates of satisfaction and confidence of the workflows that were supported by AI were high, and, at the same time, the designers claimed to have problems with their work because they needed to do it, as it was their job. Work produced by AI is refined to such a degree that it creates a positive feedback among the stakeholders, irrespective of the input by the designer, which, in turn, solidifies a sense of ability that may not be a sign of the real skill level. The problem with this decoupling is that it is poisoning the feedback loop where professionals are supposed to turn their self-evaluation. Since practitioners feel that they are doing a good job, there is no incentive to practice intentionally and keep the degrading skills alive. This decoupling removes the performance feedback cues that would otherwise be used to inform skill development. Designers may not realize that they are losing their competencies until the time they cannot enlist the assistance of AI or find it satisfactory anymore [7].

4.4 Iterative Discipline

Professional design depends on generating many weak ideas before arriving at strong ones the divergence phase. Generative AI collapses divergence by producing visually polished outputs immediately, which the designer is tempted to refine rather than discard. This is the design-fixation mechanism Wadinambiarachchi and colleagues [2] document empirically. At the team level, Doshi and Hauser [11] show that generative AI improves individual outputs while reducing the diversity of solutions across a population practitioner converge on the model's suggestions rather than exploring independently. The skill at risk is the discipline of generating quantity before quality, the foundation on which originality is built.

5 Design Implications and Future Directions

5.1 Friction by Design and Progressive Assistance

Ironically, helpful AI-assisted design tools may need to provide some friction intentionally to deliberately introduce artificial delays to ensure that designers exercise their cognitive skills rather than avoid them [16]. The generative practice of expert judgment can be sustained with tools that prompt a rough drawing and then unlock AI generation or tools that prompt practitioners to provide a rationale for their design before offering AI alternatives. Any tool that would compel the designers to name the problem they are dealing with and any limitations they have would hold on to the diagnostic thinking, which is being excluded, and would demand proposals to be presented first. As with a GPS navigator, which can also impair spatial reasoning in a typical user, an AI design tool that gives the answer every time will also impair the ability of the practitioner to reason to the answer as well. According to Sinha and Kapur, problem-solving before instruction has a long-term learning outcome as compared to a case with direct instruction alone, and this principle can be directly transferred to the design of AI tools [17].

Tools may be used to offer incremental support depending on the interaction exhibited by the designer instead of trying to create AI as much as possible. A practitioner of AI who has created a few divergent sketches and defends his or her thinking may have a more powerful AI support compared to a practitioner who gave a word or two. It is similar to scaffolded learning in education [18], and may still maintain the skill-building stages of design, but still provide efficiency benefits. Divergent thinking tools should also explicitly help in divergent thinking: surprising or out-of-the-box results, revealing tradeoffs inherent in the system, and a disposition against the temptation to stick to original solutions.

5.2 Metrics and Longitudinal Research

Empirical techniques of gauging the sustainability of skills in AI-aided creative work are urgently required in the field. Self-reported competence and quality of output are poor measures, that is, because of the decoupling of confidence and competence, which makes them unreliable. There is a need to conduct longitudinal studies on performance on tasks not available on AI, monitor skills trajectories in cohorts of careers with varying amounts of AI exposure, and establish validated tools to measure design-specific abilities. Research also needs to look beyond the average levels of skill, to the flows of knowledge design-wise across levels of seniority, and whether or not there exist the circumstances under which tacit knowledge transfer [20] is possible in teams augmented with AI. The Human Agency and Skill in AI-Supported Work workshop [19] represents a valuable venue for establishing this common research agenda, and design practice is one of the most approachable and timely areas to establish it.

6 Conclusion

As outlined in this paper, AI design tools are creating a novel form of cognitive offloading that has a significant impact on sustaining skills, human agency, and intergenerational transfer of design knowledge. The prompt-and-refine workflow, the apprenticeship gap, and the confidence-competence decoupling are not independent processes, but are linked, and enable each other, risks that the Human-Computer Interaction community must solve in its tool designs and in the studies, it performs. This situation is positively ironic. Designers are taught to learn automation and overreliance, and to create systems that retain human judgment. The fact that they are possibly undergoing the same dynamics as they are criticizing makes them a vulnerable group, as well as a highly reflective one. The design community and the first-person experience of the shift of the workflow by AI make it a particularly convenient ally to the type of longitudinal, practice-based research that the field requires. The Human-Computer Interaction community needs long-term investigations of creative-professional deskilling, and design practitioners are not only an easy sample, but an essential

partner whose reflexivity and concern about the problem make them an invaluable partner in learning what AI-enhanced work is doing to human competence, and how to retain what is most valuable about them.

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