Automation and inspiration: Understanding the value of artificial intelligence in user experience design tools

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ABSTRACT

Recently, artificial intelligence (AI) has been introduced into a variety of software platforms aimed at supporting creative endeavors. While AI-driven features in design tooling are nascent, we view AI as having the potential for positive impact on user experience and product designer workflows. We conducted a series of studies to investigate how designers perceive AI-driven experiences in design tooling. The findings suggest that designers view AI as suited to identifying and correcting errors and as agents for inspiring creativity. However, trust and explainability are key to acceptance. Our goal is to inform the future of design tooling through further development of these initial inclinations.

CCS CONCEPTS

• **Human-centered computing → User interface toolkits**.

KEYWORDS

Human-centered computing, user experience design tools, artificial intelligence

1 INTRODUCTION

Modern design tools are rapidly changing as smart technologies such as artificial intelligence (AI) become commonplace in software systems. In design tooling, AI-driven experiences are still nascent, e.g., "auto-layout" re-sizing features in tools such as Figma[1], yet progress in this area means that product and user experience designers (hereforth, "users") will be increasingly exposed to AI-driven features. As such, tensions have arisen for designers around the perceived usefulness of AI to support their design workflows and overreach of AI into personal creative design territory. We believe

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[1]https://www.figma.com/

that the future of design tools will be AI-powered, and these tensions will need to be resolved. Therefore, we need to consider how AI fits within design tools that support knowledge work, i.e., those intended to support the user's creative processes, and how AI can inspire designers to create new experiences for their users without eroding trust in AI-driven systems.

While prior research on the role of AI on user experience (UX) tools has been somewhat limited, we can draw insight from research on the role of AI in other creative contexts. For example, research on artists partnering with AI-powered drawing tools revealed that creatives preferred a certain amount of agency and a desire to "check" the work produced by AI [4]. Another study found that AI can serve as inspiration for new artistic experiences. Researchers created a deep neural network that learned to transfer artistic styles to other images, e.g., an algorithmic exploration developed in 2016 that transferred the style of Vincent Van Gogh's *Starry Starry Night* onto a painting of ducks. This exploration, in turn, spawned a series of artistic explorations in visual art and video [1]. In the same vein, researchers trained an AI model to function as a more objective 'third eye' that helps art historians to identify and explain works of art with confidence [6]. For more complex creative processes such as creative writing, tools to assist the creative writing process have utilized crowd workers as "automators" to generate story ideas to help unblock writers [3]. Similarly, an AI-powered drawing tool for visual artists found that the artists were willing to delegate certain menial tasks to the AI but less willing to allow the AI to "drive" the creative process [4]. While these existing works are examples of how AI-driven systems or quasi-systems in the case of creative writing can complement existing creative practices, it is yet unknown how user experience designers perceive AI-driven tools intended to support their creative processes.

As we learn more about opportunities to bring automation into the design process, we have begun to uncover use cases where AI is helpful for designers. We position ourselves as advocates for AI that supports designers by automating away tedious tasks and / or providing inspiration as an assistant to the user's creative process. Our findings support this notion, in that automation must be explainable to the user; i.e., designers should be able to discover what actions factor into AI-driven experiences in design tools, and should have the ability to review the work produced by AI systems [5]. While these ideas are emerging, the general concept of trust in AI has been explored as crucial for user uptake of AI-driven systems [2].

1.1 Unpacking future opportunities

Our team, Material Experience Research, conducts research on Google's design system, Material Design, as well as design tools

for creating digital experiences and improving designer-developer collaboration. Over time, we have begun to investigate novel experiences for the future of tooling including tools to address the hand-off problem between designers and developers, [2] tools to manage design systems, and the role of AI in the design process. We are interested in partnering with other researchers and practitioners who are interested in this space to further develop some of our initial inclinations. In the remainder of this paper, we introduce several studies which explore the value of adding "micro-assists", or small, AI-powered experiences into design tools, which cumulatively suggest that many designers hold a level of mistrust of AI-driven suggestions and corrections in design tools.

2 STUDIES INVESTIGATING THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE DESIGN PROCESS

Through our own research, we have identified the importance of explainability and trust in practical applications of AI in user experience design tools. Principally, we are interested in understanding the conditions when AI evokes trust for users of design tools and the design process, what *trustworthy* AI applications could look like, when AI is perceived as unhelpful and / or untrustworthy, and what types of design features support users to trust recommendations or other AI-assistance delivered by a design tool.

2.1 Study design and research questions

Over the last two years, our team conducted a series of studies that examined the effect of AI assistance (i.e., AI-driven experiences) in design tools. Studies consisted of interviews and moderated concept tests with user experience designers and software engineers who work on digital products.

During research sessions we asked participants to evaluate concepts for new interface design tools or features that provided suggestions for improving the usability or accessibility of user interface designs, or features that provided suggestions for new layouts. Additionally, we asked participants to share their experiences using similar assistive functionality in the design tools (or designer-developer collaboration tools) that they were currently using. Examples included Figma's auto-layout, snap-to-grid functionality, image generation tools, or even auto-complete features in code editors. Some of the studies we conducted featured a prototype intended to simulate a novel AI-driven feature, and others simulated more traditional computational experiences––that is, they were not technically "AI-driven."

In all of these studies, we asked participants about their willingness to adopt AI-driven experiences in design tools (be they the tools themselves or individual features), gauging their perceived value and perceived barriers to adoption. Each study focused on one or more concepts. Moreover, participants were asked to describe what they thought the concept did, how they would use it (if at all), the benefits the concept offered, and any concerns they elicited.

In addition, our team conducted 14 unmoderated usability sessions with professional user experience designers and software developers, testing the usability of a tool called the *Material Theme*
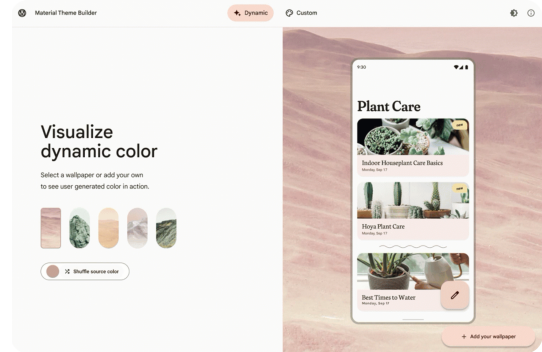

Figure 1: A screenshot of the Material Theme Builder

Builder (Theme Builder), available on Material.io[3], Material Design's website. The Theme Builder gives third party designers and developers the opportunity to explore the Dynamic Color feature from Material You, the latest version of Material Design. The user either uploads an image to the Theme Builder or uses a sample image on the Theme Builder site; the Theme Builder extracts a source color, and then the tool dynamically generates a color palette based on the source color (see Figure 1). This study was intended both to measure the usability of the Theme Builder as well as identify barriers to adoption.

2.2 Findings and discussion

Overall, our studies suggest that AI is likely to improve design tools as a corrective function and as an agent for inspiring new ideas or identifying new opportunities. However, participants emphasized the *importance of maintaining control over the experiences* and raised concerns about explainability and trust. We identified two key opportunities for AI to contribute to novel design tools as well as two considerations, which we outline below.

AI as a tool for corrective functions. Participants looked to AI to catch simple errors (e.g., automatically realigning an object with snap-to-grid functionality) or indicate small mistakes or potential issues (for instance, a design linter that indicates whether color contrast meets accessibility guidance). Participants often described completing manual tasks such as checking contrast as "tedious" and noted that automating them helped avoid "easy to miss mistakes". Moreover, they expressed comfort and familiarity with these tasks because they had clear analogues to assistive functionality in other tools they that used regularly, e.g., a spell check feature in a word processing tool. That said, they expected to be able to undo an automated change at almost all times.

AI as a vehicle for inspiration. In some of the concept studies as well as the study on the Theme Builder, participants noted that AI could be a valuable vehicle for inspiration in the design process. For instance, across multiple studies designers expressed enthusiasm about color palette generation tools or even tools that provided

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suggestions for making a design more "creative", noting that these tools could inspire novel patterns. These tools function as *partners* in the creative process; they offer suggestions, but they do not take core creative work away from the designers. And, critically, their output can be overruled. This insight aligns with findings from Oh et al. [4] with visual artists, where participants also emphasized the importance of retaining creative control of output when working with AI-driven experiences.

Importance of maintaining control over the experience. While AI-driven design tools could spur designers' creativity, participants noted that the inability to see into what AI was doing could be a barrier to adoption. For instance, in the Theme Builder study, despite the relative simplicity of the final output––an accessible color palette––participants fixated on *how* the tool was selecting its colors; often pushing back, critiquing the output, or expressing a desire to maintain some choice over the final result.

Throughout the Theme Builder study, participants indicated a lack of trust towards the output because they were unable to validate where the results came from or how the underlying algorithm worked. At the same time, participants voiced that they wanted more control in selecting the final output of the Theme Builder. Moreover, they noted a willingness to complete additional tasks (e.g. manual palette selection) if it meant having a final say, or creative control, over the output. Evidently, explainability, trust, and agency matter here, too. Users want to retain control over their creative decisions and understand and evaluate any suggestions made by AI. As we saw in the studies on hypothetical concepts, introducing AI-driven experiences for inspiration is not enough; when making recommendations, the tools still need to explain the rationale behind their suggestions.

Boundaries of trust and explainability. While most participants indicated they would use AI-driven features, many of them raised concerns about the recommendations these features made. If a feature recommends a change to a design, some participants asked where the recommendations were coming from and if the recommendation could be trusted. Participants explained that they would expect that the tools provide details on the sources or frameworks behind the recommendations (i.e. explainability) in order to be able to trust them. Participants expressed a sentiment that AI was not yet "advanced" enough to provide useful recommendations beyond simple cases such as those that adhered to a known framework such as the Web Content Accessibility Guidelines [4], compared to AI that instructed designers on how to make a design more usable.

At the heart of these concerns are questions about AI's role in the design process. The extent to which users are concerned about the recommendations an AI-driven design tool might surface (given the source of the recommendations and the sophistication of the AI itself) versus the extent to which *AI should take on certain activities in the first place* is tension that needs to be addressed when creating new AI-driven tools. AI-driven experiences could provide valuable additions to design tools, but it is worth conducting further research to understand the boundaries of user comfort in AI-driven tooling. Simultaneously, it will be important to evolve these boundaries into

best practices for explainability and user trust in AI-driven design tools.

2.2.1 These findings apply even when AI is not involved. Lastly, as we introduce AI-driven functionality into design processes, it's worth noting that some functionality perceived as AI-driven is not in fact AI-driven, but end users may treat it the same way. In both the hypothetical and Theme Builder studies, participants described certain features as "smart" or "AI-powered", even when there was no AI or machine learning (ML) actually underpinning the feature. Moreover, we observed that when discussing trust, participants tended to *treat non-AI features that they perceived to be AI-driven similarly to those that were genuinely powered by AI*. This insight is worth exploring further––both in the workshop discussion and in future research.

3 CONCLUSION

We provided an overview of a series of research studies that our team has conducted on AI-driven design tools around designers' perceptions of the value of AI in the design process. We identified two key opportunities and two considerations regarding AI's potential to advance design tools. We note that sometimes it is difficult for users to tell whether or not a "smart" design tool is actually driven by AI, and so we posit that these opportunities and considerations apply even when an experience *appears* to be driven by AI. We advocate that AI-driven experiences can improve design tools and the overall design process, but will need to be explainable to engender user trust.

In this workshop, we hope to evolve our findings into a preliminary framework that describes the types of functionality or use cases that AI-driven design tools could support. Furthermore, we intend to develop and propose guidance on how to integrate explainability and trust into the design tools process.

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