Unlocking the User Experience of Generative AI Applications: Design Patterns and Principles

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As generative AI technology gains traction in enterprise settings, it is critical to design user experiences that harness its capabilities and mitigates potential drawbacks. While researchers have established initial design principles for generative AI products [8], we still need user validation and the creation of reusable design patterns to further their practical application. In 2023, we conducted extensive user research to understand users' mental models and interaction preferences with generative AI applications. This paper presents key findings and recommendations to support the development of effective and engaging generative AI end-user experiences in enterprise contexts. Our investigation combined a UX workshop combined with UX design challenge to generate innovative microinteraction [4] patterns, followed by prototyping and evaluating three generative AI application scenarios which yielded qualitative insights into user perceptions and behaviors. We present core design guidelines derived from this research, along with associated design patterns, offering practical guidance for development of generative AI applications.

CCS Concepts: • **Human-centered computing** → *Empirical studies in HCI*; **User studies**.

Additional Key Words and Phrases: Generative Artificial Intelligence, Design patterns, Microinteractions

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1 INTRODUCTION

The generative AI revolution is in full swing, compelling enterprises to rapidly develop and deploy generative AI applications to maintain a competitive edge. To ensure this technology delivers optimal user experiences, a thorough understanding of user perceptions, mental models, and user interactions with generative AI applications is critical. Previously, Weisz et. al. [8] identified seven design principles for generative AI applications through literature review, but the principles were not validated with users. Liu and Chilton [5] evaluated design concepts and provided design recommendations for end-user interactions, however, their work focused on effective prompt engineering for text-to-image models. Others focused on suggestions and ideas for one-shot prompt engineering for text generation. [2, 3, 7].

In this paper, we describe a comprehensive effort conducted within our organization to create a collection of user-tested microinteraction patterns for engaging with generative AI applications, and research-backed guidance for using those design patterns in generative AI applications.

Our UX team works closely with our company's Cloud enterprise customers to help them design and deploy generative AI applications for their customers (or "end-users"). These enterprise customers are often looking for guidance on how to design the end-user experience of the generative AI applications they are developing. In order to

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provide this guidance, we decided to explore the design space of end-user interactions with generative AI applications through a three-step approach. First, we launched a "design challenge" within our UX organization to solicit a variety of microinteraction designs, guided by generative AI design principles from literature [8]. Microinteraction designs were submitted by a variety of UX roles, like UX designers, UX researchers, content strategists, and UX engineers. Next, we created three different prototypes of fictitious chat-based generative AI applications that incorporated the top designs submitted. And finally, we collected qualitative feedback from 5 users on each of these prototypes (with a total of 15 participants) through unmoderated and moderated user research sessions. In this paper we will focus on the user research methods and findings.

2 METHODS

The research goals of this project were to — a) Explore and evaluate existing design guidelines for generative AI products and applications; b) Understand how users interact with generative AI applications; c) Evaluate design principles and microinteractions needed to support the user experience. To develop effective microinteractions for generative AI applications, we began with a UX workshop. Designers and researchers collaborated and identified four key phases in the user journey of any generative AI applications:

- Before state / Zero state: The initial experience prior to user input
- During question / Entering prompt: The core interaction of providing input and receiving AI-generated output
- After question / Follow-up state: User actions refining or expanding the AI response
- Resolution state: The point where the user's goal is achieved or the interaction ends

Next, we launched a design challenge within the same group, leveraging generative AI design principles [8] to guide the generation of microinteractions within the above-mentioned four states. Using the microinteractions, we developed three different generative AI application prototypes. The prototypes were of a social messaging app, a generative AI chatbot for a travel website, and a generative AI search app for a travel website.

The first prototype was evaluated through unmoderated user sessions on UserTesting [6] platform with 5 participants, providing qualitative audio and video feedback. We soon realized that unmoderated user research was not ideal as it didn't allow us to probe participants with follow-up questions; asking follow-up questions would provide deeper insights on the users' interactions with the prototypes. So, we evaluated the next two prototypes using moderated structured interviews on UserTesting to collect detailed qualitative feedback.

The participants self-identified as having used various consumer generative AI tools (e.g. ChatGPT, Bard, DaLL-E) and had recent experience in tasks related to the ones we were evaluating (e.g. trip planning).

3 OUTCOME

We identified four key insights from this research: 1) Help users explore generative variability; 2) Help users build trust; 3) Give users control over generated responses; 4) Improve results through user feedback. These insights validate the design guidelines from Weisz et, al. [8]. We additionally highlight top microinteractions that can be used while developing user-friendly generative AI applications.

3.1 Help users explore generative variability

Generative variability is a key feature of generative AI applications. Understanding that generative AI produces varied outputs unlocks its full potential for exploration and creativity.

Our studies revealed that users valued microinteractions that enabled them to harness this variability. A simple "Generate new prompts" button (Fig. 1) for regenerating results proved popular. As well as, users appreciated the ability to specify parameters for refining further output. For example, users appreciated a "Generate Again" button as a way to adjust a generated trip itinerary based on price or popularity of the attraction (Fig. 3b). These microinteractions should

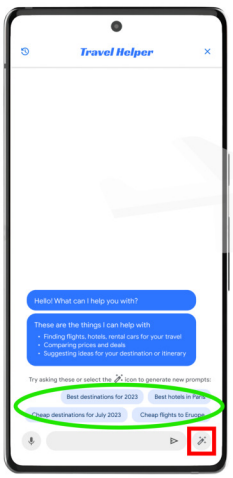

Fig: 1

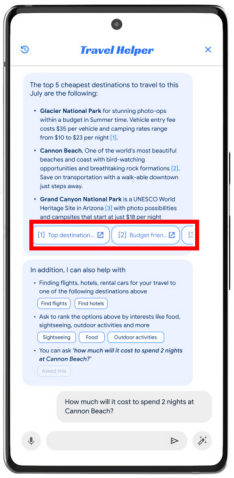

Fig: 2

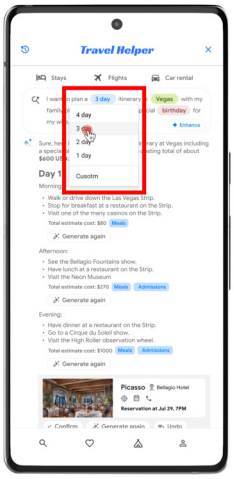

Fig: 3 (a)

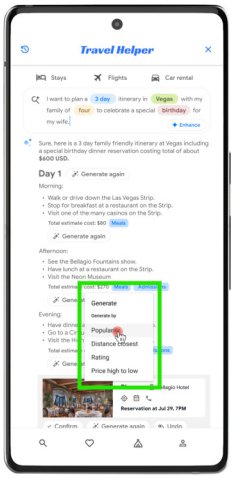

Fig: 3 (b)

Fig. 1. Landing page of generative AI travel chatbot that provides "prompt suggestions" and "generate prompts" option

Fig. 2. Results page of generative AI travel chatbot with citation for the recommendation

Fig. 3. Generative AI travel search application; (3a) Drop-down menu for editing the prompt; (3b) "Generate again" button with a drop-down menu

be leveraged and highlighted to help users understand generative AI's capacity for varied and unexpected results.

While users valued the option to explore variable outputs, they expressed uncertainty about how to end the cycle. For example, when the users were seeing repetitive or irrelevant results, they wanted the app to indicate so. Our suggestion is to provide color-coding or subtle visual designs to indicate when results are becoming less distinct. Additionally, the app can provide notifications when newer suggestions or results are available.

3.2 Help users build trust

Users felt more confident in the generative AI responses when provided with the means to verify the responses. Citations or grounding [1] empowered users to evaluate if the generated response is correct and up-to-date. Examples include access to primary sources used for creating summaries (Fig. 2), or links to hotel websites for checking descriptions and pricing (Fig. 4).

3.3 Give users control over generated responses

User control was another important factor that users cared about while interacting with the prototype. Having control over the generated responses made them feel more confident about using generative AI apps. This can be done by presenting multiple generated responses for the user to select from.

Additionally, guiding users in effective prompt design is crucial. Many users may not grasp the relationship between prompt quality and output. Microinteractions like "suggested prompts" chips (Fig. 1) and drop-downs (Fig. 3a) for editing prompt parameters provide accessible ways to improve users' prompting skills.

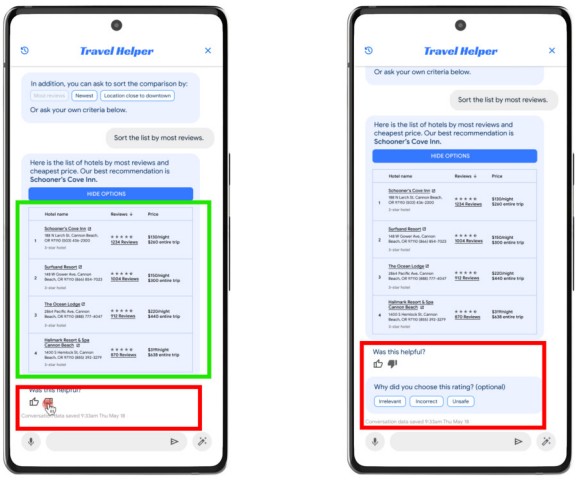

Fig. 4. Generative AI travel chatbot application which allows users to provide feedback on the generated content

3.4 Improve results through user feedback

To refine generated information and ensure its quality aligns with user needs, prioritize strategic collection of user feedback. In our studies, we found that successful feedback integration depends heavily on placement and timing of feedback collection UI elements. Users sometimes misinterpreted feedback requests as an indication to change topics, hindering their user flow.

We recommend crafting an "in-the-moment" approach by directly associating feedback requests with the specific responses for which feedback is sought (Fig. 4). Furthermore, soliciting reasons behind user ratings will uncover actionable insights for improving the quality of generated content.

4 CONCLUSION

Through extensive iterative design and research, we identified possible microinteractions as well as validated existing design guidelines, in the context of generative AI applications. We learned valuable lessons for evaluating interfaces with generative outputs. Moderated user studies yielded greater insights than unmoderated sessions, demonstrating the importance of facilitation, especially for a relatively new domain like generative AI. With respect to designing generative AI interactions, we would like to highlight that users highly valued transparency about the system's workings. Moreover, empowering users through control mechanisms and focused feedback opportunities directly fosters a greater sense of trust in generative AI applications.

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