The use of Generative AI into User-Centered Design (UCD): Practices in Software Engineering

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Abstract

The rapid adoption of Generative Artificial Intelligence (GenAI) across industries has transformed professional workflows, enhancing productivity and enabling new forms of human–machine collaboration. However, its indiscriminate use raises ethical and methodological challenges, including the risks of hallucination, privacy violations, and overreliance on automated outputs without human supervision. In User-Centered Design (UCD), these risks become even more critical, as the process depends on contextual interpretation, empathy, and evidence-based decisions about user behavior. This study aims to explore how GenAI can be applied in the UCD process and the practices that emerge from its adoption. A qualitative exploratory study was conducted through semi-structured interviews with ten UX Design professionals, followed by closed coding based on UCD stages. The findings are synthesized into practices of GenAI use within UCD, revealing key opportunities for improve the UX Design activies. The contribution of this paper lies in providing an initial structured and perspective on the integration of GenAI in UX Design practice.

Keywords

Generative Artificial Intelligence (GenAI), User-Centered Design (UCD), Qualitative Research, Human–AI Collaboration

1. Introduction

This rapid diffusion of *Generative Artificial Intelligence* (GenAI) has significantly transformed how professionals interact with technology, opening new possibilities for human–machine collaboration [1]. Despite these advances, the indiscriminate use of GenAI has raised ethical and operational concerns. The main risks include content hallucination, privacy and data confidentiality breaches, and excessive dependence on automated responses without human oversight [2]. Furthermore, many professionals are using these tools without clear methodological guidelines, which compromises both the reliability of results and the consistency of team processes [3].

In the context of *User-Centered Design* (UCD), these challenges become even more critical. According to the ISO 9241-210:2019 standard [4], the User-Centered Design (UCD) process comprises four main phases: research, ideation, prototyping, and evaluation. By definition, UCD requires empathy, contextual interpretation, and evidence-based decision-making about user behavior [4]. Therefore, it is necessary to understand how GenAI can be used systematically and effectively in the stages of the UCD process, from research to solution evaluation. In light of this scenario, the research question (RQ) that guides this study is: **How can GenAI be applied in the User-Centered Design process?**

To address this question, a qualitative exploratory study was conducted based on semi-structured interviews with 10 UX Design professionals .The data were analyzed using a closed coding approach, in which categories are established in advance based on theoretical or procedural models [5]. This structured categorization process relies on a *codebook* that defines each code and its application criteria, ensuring consistency and reliability in the analysis [5]. In this study, the stages of the UCD process—research, ideation, prototyping, and evaluation—were used as the codebook.

As a scientific contribution, this article presents an initial view of GenAI use in the UCD process, identifying pratices associated with its application at each stage. The paper is structured as follows:

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Section 2 reviews related work; Section 3 explains the Design Method; Section 4 reports results; Section 5 with discussion about the paper and Section 6 offers conclusions and future work.

2. Related Work

Recent studies have explored the integration of Generative Artificial Intelligence (GenAI) within design practices, particularly focusing on human–AI collaboration and its implications for creativity and productivity. For instance, Koskinen et al. [6] investigate designer–AI collaboration in a co-creation workshop, analyzing cognitive behaviors and how designers exercise agency when interacting with AI-generated suggestions. The authors propose three modes of human–AI interaction, highlighting how AI can actively support creative exploration. However, their findings are primarily concentrated on the Ideation phase, limiting the understanding of AI usage across the broader design process.

In a similar direction, Lai et al. [7] examine the use of AI-based image generation to enhance inspiration and visual communication in collaborative design contexts. Their work introduces a tool that enables designers to generate and refine visual artifacts—such as characters and scenes—even without advanced illustration skills. While this study demonstrates the practical benefits of AI in supporting creative production, it remains focused on specific activities within the Ideation and Prototyping phases, without addressing how such tools integrate into other stages of the User-Centered Design (UCD) process.

Expanding the perspective to user experience evaluation, Raffaghelli and Nascimbeni [8] analyze user feedback from multiple generative AI applications using usability criteria derived from the ISO 9241-210 standard [4], including effectiveness, efficiency, and satisfaction. This work contributes to understanding how end-users perceive AI systems, particularly in terms of usability and interaction quality. Nevertheless, it emphasizes evaluation from the user perspective, rather than examining how design professionals incorporate AI into their workflows.

Taken together, these studies demonstrate the growing interest in applying GenAI within design activities, particularly in supporting creativity, visual production, and usability assessment. However, the literature remains fragmented, with most contributions focusing on isolated phases—especially Ideation and Prototyping—rather than examining the integration of GenAI across the entire UCD process.

3. Design Method

The research design was based on semi-structured interviews, a widely used qualitative method that allows for both depth and flexibility in data collection [5]. Participants were Brazilian UX Design professionals selected through convenience sampling. Initially, a pilot interview with two UX professionals was conducted to test the interview guide, refine the language, and evaluate the clarity of the topics covered. These two interviews were not counted in the final sample.

Without any adjustments, the ten official interviews were conducted, recorded, and later transcribed for analysis. In total, ten participants were interviewed between March and April 2025 (see Table 1 for details on City/State, Position, and Seniority). Before participating, all professionals were informed about the study's objectives and signed an informed consent form. All ethical guidelines were followed, ensuring participant confidentiality and anonymity.

Interviews were analyzed through a closed coding procedure [5], in which predefined codes were derived from the stages of the UCD process [4]. Each excerpt from the participants' responses was assigned to one of these stages. The interview questions and extractions can be seen in the Spreadsheet Link. For example, when a participant described using ChatGPT to generate personas or structure questionnaires, the excerpt was coded as **Research**. This approach enabled a systematic and consistent categorization of GenAI usage within the UCD framework, without progressing to open or thematic analysis.

This study presents some threats to validity that should be acknowledged. The use of convenience sampling and the limited number of UX Design professionals may limit the generalizability of the

Table 1
Profile of study participants

ID	City/State	Job Position	Level	Company Category
P1	São Carlos/SP	Product Designer	Senior	Telecommunications — medium
P2	Ribeirão Preto/SP	Product Designer	Mid-level	Management — medium
P3	Campinas/SP	Product Manager	Senior	IT — medium
P4	São Paulo/SP	UX Designer Conversational	Entry-level	Chatbots — small
P5	São Paulo/SP	Product Manager	Senior	Banking — large
P6	Belo Horizonte/MG	Product Designer	Senior	Beauty — large
P7	Feira de Santana/BA	Product Manager	Senior	Retail — medium
P8	São Paulo/SP	Product Designer	Entry-level	Consulting — small
P9	Ribeirão Preto/SP	Product Manager	Mid-level	HR — medium
P10	Sorocaba/SP	Product Manager	Senior	Banking — small

Note: Company size classification follows the criteria established by SEBRAE: **Small-sized** – up to 99 employees in industry or up to 49 in commerce/services; **Medium-sized** – 100–499 in industry or 50–99 in commerce/services; **Large-sized** – over 500 in industry or over 100 in commerce/services [9].

results. However, given the exploratory nature of this research, the focus was on depth rather than breadth. The research is limited to closed coding, without extending to thematic or statistical analyzes, which aligns with its descriptive purpose but may be necessary for more in-depth analyzes.

4. Preliminary Results

A total of 23 valid excerpts were extracted from the interviewees' responses. Table 2 presents an overview of the results and one example of an excerpt for each code. The following paragraphs summarize the main findings for each code.

Table 2
Integration of Codebook and Excerpt Distribution across UCD Phases

UCD Phase	Description of Code	% of Excerpts	Example from the excerpts
Research	Understanding user needs and data collection through interviews, surveys, or desk research.	30.4% (7/23)	"I use ChatGPT to: generate flow ideas, conduct competitor research, and refine texts." (ID2-14)
Ideation	Generating and refining ideas, including brainstorming and concept synthesis.	8.7% (2/23)	"Those who do not learn to use AI may fall behind... knowing how to create good prompts." (ID1-16)
Prototyping	Creating low- or high-fidelity prototypes representing design concepts.	8.7% (2/23)	"I use it for: graph and funnel analysis, spreadsheet construction, and pitch preparation." (ID8-14)
Evaluation	Assessing usability, accessibility, or user satisfaction.	52.2% (12/23)	"A/B testing was the best way to demonstrate the impact of UX on business outcomes." (ID8-12)

In the **Research** phase, the excerpts indicate that generative AI supports the collection, organization, and synthesis of information, enhancing the designer's investigative capacity. One participant stated: "*I use ChatGPT to: Generate flow ideas, Competitor research, Text refinement*" (ID2-14), highlighting its use to explore contexts and initial data. Another reinforced the integration between analysis and research — "*Main uses: Story writing, Interpretation of metrics and KPIs, Research and idea validation*" (ID3-13) — emphasizing the combination of data gathering and hypothesis validation. Taken together, the evidence points to AI as part of the initial research process, making it more agile and systematic.

In the **Ideation** phase, the excerpts show the use of AI as a creative stimulus and a support tool for structuring ideas. One interviewee stated: "*Those who don't learn to use AI may fall behind... knowing how to craft good prompts to get good ideas*" (ID1-16), emphasizing prompt design as a new creative skill. Another added: "*AI is a productivity tool, not a replacement... develop critical thinking and know*

how to craft good prompts for ideation" (ID9-10), reinforcing AI's role as a cognitive partner. Thus, AI-mediated ideation combines automation and critical thinking, repositioning the designer as a curator of the creative process.

The results from the **Prototyping** phase reveal the use of AI to accelerate practical and experimental tasks. One participant reported: "*I mainly use Copilot... results were similar — but AI did in minutes what took weeks*" (ID1-15), demonstrating clear efficiency gains. Another described: "*I use it for: Graph and funnel analysis, Spreadsheet building, Pitch creation*" (ID8-14), associating AI with the creation and analysis of design materials. In this way, AI is perceived as an operational extension of the designer, optimizing the prototyping cycle without eliminating the need for human supervision and interpretation.

In the **Evaluation** phase, the excerpts concentrate on reflections about critical analysis, reliability, and ethics. Notable examples include "*AI works better with text than with numbers... it requires the professional's critical analysis*" (ID3-14), which reaffirms the central role of human judgment. Other excerpts highlight empirical practices and measurement challenges — "*A/B testing as the main solution...*" (ID8-12) and "*It's hard to translate UX data into direct financial impact*" (ID9-08). Ethical issues also emerge, such as the risk of data leakage (ID5-09).

Overall, the findings indicate that generative AI permeates all phases of the design process—Research, Ideation, Prototyping, and Evaluation—acting as a complementary and augmentative resource rather than a substitute for human expertise. Across these stages, AI enhances efficiency, supports information processing, and stimulates creativity, while simultaneously introducing new demands for critical thinking, prompt literacy, and ethical awareness. The results suggest a shift in the designer's role toward that of a mediator and curator of AI-generated outputs, responsible for interpreting, validating, and contextualizing results. At the same time, challenges related to reliability, data interpretation, and the translation of UX outcomes into business value reinforce that human judgment remains central. Thus, the integration of generative AI in UX design can be understood as a socio-technical transformation that combines productivity gains with increased cognitive and ethical responsibilities.

5. Discussion

This study addressed the research question—*How can GenAI be applied in the User-Centered Design (UCD) process?*—by identifying how generative AI is used across all four phases defined by ISO 9241-210:2019 [4]. The results indicate that GenAI permeates the entire UCD lifecycle, assuming different roles in each stage: supporting data collection and synthesis in Research, stimulating creativity in Ideation, accelerating artifact production in Prototyping, and assisting analytical reflection in Evaluation. These findings extend prior work, which tends to focus on isolated phases—especially ideation and prototyping—by demonstrating a more holistic integration of AI into design workflows [6, 7, 8]. Thus, the research question was answered by providing an empirical and structured mapping of GenAI applications throughout the UCD process.

At the same time, the findings reinforce concerns discussed in the literature regarding the risks associated with the indiscriminate use of GenAI, such as hallucinations, privacy issues, and overreliance on automated outputs [2, 3]. These challenges highlight that the integration of GenAI is not merely technical, but socio-technical, requiring critical thinking, ethical awareness, and methodological guidance. In this context, the role of the designer shifts toward that of a mediator responsible for interpreting and validating AI-generated outputs. Therefore, this study contributes by not only identifying where GenAI is applied, but also by clarifying how it reshapes design practices and decision-making in contemporary UCD processes.

6. Conclusion

This study investigated how Brazilian professionals are incorporating Generative Artificial Intelligence (GenAI) across different phases of the User-Centered Design (UCD) process. Through closed coding,

we identified consistent patterns of use that reveal how AI is embedded in design and software engineering activities. The findings show that GenAI is predominantly applied in analytical and reflective phases—particularly Research and Evaluation—supporting tasks such as data collection, synthesis, interpretation, and critical assessment, while also extending to Ideation and Prototyping as a productivity and creativity enhancer.

The results further indicate that, although GenAI contributes to increased efficiency and acceleration of design workflows, it simultaneously introduces new risks and responsibilities. Activities such as text generation, interface creation, and data analysis conducted without proper supervision may lead to model hallucinations and unintended exposure of sensitive information, raising concerns related to reliability, data privacy, and ethical use. In this sense, the adoption of GenAI in UCD should be understood not only as a technological advancement but as a socio-technical shift that redefines the role of designers toward critical mediators of AI-generated outputs.

As a contribution, this paper provides an initial empirical mapping of how GenAI is used across UCD phases, highlighting both its practical benefits and associated risks. By explicitly connecting AI usage to specific design activities, the study advances the understanding of where and how GenAI impacts the UCD process, offering a foundation for future research and practice. Future work includes expanding the sample size, incorporating open and inductive thematic analyses, and triangulating qualitative findings with quantitative UX performance metrics to further investigate the relationship between GenAI usage and business-oriented outcomes such as ROI.

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Declaration on Generative AI

The authors confirm that no generative AI tools were used in the writing, analysis, or preparation of this manuscript.

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