

Exploring the Utilization of Generative Artificial Intelligence Tools with Design Students

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Abstract— This research is part of an investigation into the use of Generative Artificial Intelligences (GenAI). Through a case study, we analyze the application and abstention of these tools by students in the creative industry during the resolution of a graphic challenge. The study addresses the need to develop competencies in emerging technologies that promote creative solutions. The central question investigated is how GenAI tools are employed in the co-creation process and the development of design solutions. The initial hypothesis suggests that GenAIs are primarily used as support tools in the conception and creation of graphic projects. However, the results indicate that, despite their potential, these tools are still underutilized by students in this particular case.

Keywords: *Generative AI; Artificial Intelligence; Hackathon; creative industry.*

I. INTRODUCTION

Generative Artificial Intelligences (GenAI) are significantly changing work processes across various economic sectors, allowing for opportunities to explore its utilization. In this sense, this research aims to investigate how students utilize GenAI as an innovative tool to address and solve design challenges. This article presents a case study on an event held in the format of a hackathon, conducted in a digital innovation project discipline, in a bachelor degree program at the Federal University of Santa Catarina (UFSC). The event consisted of a challenge where 10 students were divided into 5 groups of 2 participants. Each group was required to deliver two graphic solutions: one without the use of Generative AI and the other with its application.

The central theme of the challenge revolved around the United Nations' 13th Sustainable Development Goal - Climate Action, with the main challenge being: "How to promote awareness about the preservation of the Amazon Rainforest?". The event featured an evaluation of the deliverables by a jury, with predefined criteria for selecting and awarding the deliverable that best met the challenge, according to the criteria. The initial hypothesis was that

students in the creative industry are reshaping their work methods through creation with Generative Artificial Intelligences (GenAI). In this regard, the research aims to analyze how Generative AI is being incorporated into their creative tasks.

Accordingly, this research utilizes the Case Study methodology to examine qualitative data gathered through a structured form filled out by the participating students of the Hackathon. The goal is to analyze the experiences, perceptions, and outcomes reported by the students, providing an understanding of the factors that contributed to the success or failure of the event's challenges. The paper is structured as follows: In Section II, we present the theoretical framework underpinning our study, exploring prior research related to AI in the creative process. Section III details the methodology employed, including the research design, data collection, and analysis techniques used to gather and interpret the data. In Section IV, we provide a comprehensive analysis of the findings, discussing the implications and significance of the results. Finally, Section V shows our conclusions.

II. THEORY

AI tools are increasingly being used in the design and creative industry, with a focus on content creation, information analysis, content enhancement, information extraction, and data compression [1]. It has also been transforming visual processes through creating concepts, styles, and aesthetics [2].

The literature presents different cases within creative domains especially in design [3][6], art [2][7] and architecture fields [8]. However, while investigations within creative industries and professional contexts presents insights over increased productivity and enhanced creativity [5], studies on the impact of AI focusing on students of creative areas seems comparatively less researched. Moreover, considering the recency of Generative AI, there is still considerable scope for further investigation.

III. METHODOLOGY

This research constitutes a case study [9] and is fundamentally qualitative. The primary data collection instrument used was structured questionnaires about the event, administered to participants post-event. To enrich the discussion, these data were supplemented with participant observation by the researchers and document analysis of the jury's evaluation.

At the beginning of the Hackathon challenge, participants were provided with basic instructions regarding the deliverable: The file format was restricted to JPEG or GIF and only free images repositories or images created by themselves were allowed. The students were organized into five groups. Each group had access to one computer to perform the tasks, with a time limit of one hour for each proposed challenge.

In the first challenge, students were allowed to use any software tool to create, as long as it did not incorporate any AI functionalities. For the second challenge, various AI tools were recommended to assist the students, including Adobe Firefly, Copilot, Gemini, Midjourney, Photoshop, Illustrator, and ChatGPT. Each challenge lasted for one hour with a 10 min break. The theme of the challenge was "How to promote awareness about the preservation of the Amazon Rainforest?" for both deliverables. This format was chosen to allow for a direct comparison and to assess the differences in the scores of the deliverables created with and without the use of GenAI, focusing on the same thematic issue.

The jury, composed of three individuals, including two designers and one advertising professional, consisted of two doctoral students and one master's student. They assessed the materials in a separate room using a Google Forms questionnaire. The evaluation interface categorizes the projects according to three criteria: Visual Communication, Clarity of Message, and Originality and Innovation, with scores ranging from 1 to 5. Additionally, to ensure an impartial evaluation of the relationship between participants and judges, the teams and the deliverables were anonymized. Works were submitted to the judging panel under randomly assigned letters from A to J. The jury was not informed about which deliverables were created with the use of AI. This decision was made to ensure impartiality in the evaluation process, allowing the judges to assess each submission based on the pre-defined criteria.

Participant observation, conducted by the researchers, also formed part of the conclusions in the study. This approach offers the observer the opportunity to avoid solely perceiving elements that conform to their implicit or explicit hypotheses, thus leading to a genuine questioning [9]. Therefore, by exploring the significance and utilization of the elements and distinguishing its applicability, the observer improves their analytical framework [9]. In this context, the researchers were able to identify how the AI tools were used and not used by the students, which significantly influenced the final product outcome.

After the event, the instrument for collecting qualitative data from the students was distributed. This collection tool

consisted of seven questions, the answers to which will later be discussed in relation to the experience of the event. In conclusion, the participant observation experience complemented the qualitative analysis of the data collected through the forms. Specific aspects observed, such as the decision to not use AI tools to generate content at certain stages of the process, were highlighted and later clarified by the students in the forms.

IV. ANALYSIS

After the judge's evaluation, we obtained a partial average for each of the projects considering the three analysis categories (Visual Communication, Clarity of Message, and Originality and Innovation). Both the highest-rated project and the one with the lowest score were completed without the use of AI Generation, whereas the projects that scored closest to the average of our sample were those using AI Generation. However, the project with the highest overall average was the only one where the deliverable was in GIF format; the other projects were in JPEG format. This raises the hypothesis for future research on the establishment of a unique format for deliverables to ensure that the evaluation is even more free from bias by the judges. Table I represents the average score and the category of each of the project, analyzed by the jury:

TABLE I. JURY EVALUATION

Jury Evaluation		
<i>Deliverable Code</i>	<i>Average grade</i>	<i>Category</i>
A	5.5	Without GenAI
B	6.8	Without GenAI
C	8.4	Without GenAI
D	6	With GenAI
E	6.2	With GenAI
F	4.6	Without GenAI
G	5.7	With GenAI
H	6	With GenAI
I	5.3	Without GenAI
J	5.7	With GenAI

The work with the highest score, achieving an average of 8.4 among the judges, was done without the use of GenAI. Conversely, the work with the lowest score, also without the aid of GenAI, reached an average of 4.6. These results constitute a standard deviation of 0.97, which suggests that the evaluations were relatively consistent. As mentioned, after the event, a structured questionnaire was submitted to the participants, containing the following questions:

1. Were you already familiar with generative AI tools for use in design processes? If so, which ones?

2. At what stages of the process/challenge did you use AI? Please describe which tools you used and how you utilized them.
3. What are the main tools you typically use in your traditional creation processes?
4. What were the main challenges you encountered in the task without the use of AI?
5. What were the main challenges you faced in the task with the use of AI?
6. After completing the challenge, did any new questions arise about the use of generative AI in the design process?
7. What did you think of the activity? Please leave your overall feedback.

From the responses to the questions mentioned above, the students highlighted some difficulties within the event, among which are notable:

- The limited time available for completing the challenges;
- The students' low level of prior knowledge regarding the use of GenAI in design processes;
- A lack of experience in constructing prompts;
- Limited familiarity with generative AI interfaces.

The qualitative analysis of the data from this questionnaire, along with the participant observation, provides insights for several key inferences.

Firstly, regarding the students' complaints about insufficient time to complete the challenges, participatory observation revealed an acceleration of the process in the initial stages of ideation and drafting. In the final phases, the students showed little interest in exploring new images with the remaining time. Indeed, three of the five groups completed the activity before the initially scheduled deadline. It was also observed that participants had limited knowledge about GenAI tools, with only two of them stating they had prior experience with these types of technologies. The others reported a basic familiarity with some tools, such as Adobe Firefly and Photoshop Beta, but had not effectively used them previously.

One of the main challenges identified both in the questionnaire and in the participant observation was the students' lack of prior knowledge in formulating appropriate prompts for image creation. This specific challenge was also identified in previous literature about GenAI content creation with students, where the need for further research in developing effective prompt engineering strategies is highlighted [10]. For instance, one participant entered the input expecting the GenAI to produce a literal representation of the final challenge result. This approach was also observed in other groups. Three respondents mentioned using ChatGPT to refine the prompts before inserting them into the GenAI. From this perspective, we observed students cannot expect AI tools to produce fully

polished results; rather, these creative process outcomes must be refined by human intervention. This also aligns with existing literature that emphasizes the role of AI as a tool or collaborative assistant for creativity, rather than a sole creator of original work [1][10]

Secondly, comments from students, such as "I did not get exactly what I was imagining" and "the images did not turn out as we wanted", expressed in the answers of question 05, illustrate the difficulties encountered in constructing and refining prompts. Similarly, question 06 highlighted their low familiarity with the interfaces of the tools, as expressed in comments, such as "How to use the tool correctly so that it produces art more faithful to the ideas we have" and "I feel I need to practice more with the tools to learn to think about prompts more effectively".

For example, one group stated that Adobe Firefly was used for creating campaign images, while attempts to utilize generative AI within Illustrator for refinement were ultimately unsuccessful, leading to the creation of a new artwork from scratch, supplemented by text from Canva. Another group decided not to use GenAI for the graphic stage of the second deliverable, preferring more traditional tools because they felt more confident in their use. Therefore, this group used ChatGPT exclusively for immersion and idea generation, abstaining from using AI in the creation of the final deliverable.

Overall, participants found generative AI useful for idea generation and structuring, but encountered challenges when using it for final image creation, preferring traditional design methods or tools for achieving desired outcomes. In summary, despite the initial hypothesis that GenAIs are utilized as supportive tools in the conception and creation of graphic projects by students, the results of the experiment indicate that these tools are still underutilized by students in the creative process. However, the students showed interest in deepening their knowledge of the tools and developing their skills to enhance their performance in using them.

V. CONCLUSION

GenAI have made significant advancements recently and have captured the interest of the academic and scientific community due to their disruptive potential, which reinforces the relevance of research on the subject. In this study, we investigated how students in the creative field use AI tools in graphic challenges. Based on our sample, the students are still not familiar with the techniques and GenAI tools in their daily workflows. This provides an opportunity to the development of training programs that enable them to effectively appropriate these technologies to optimize their creative processes.

It was observed that, although there was an initial advance in the ideation and drafting phases, the students faced considerable challenges due to a lack of prior knowledge and experience both with the technology itself and with formulating effective prompts for image generation. This often resulted in unsatisfactory outcomes, as highlighted by the students' comments about the discrepancy between their expectations and the images produced. Therefore, the implementation of GenAI tools in

educational contexts requires a well-structured strategy that includes both technical and creative preparation, ensuring that participants can effectively use these tools.

This initial experiment on the use of GenAI within the context of creative challenges provides some insights to the development of future theoretical-methodological stages. For future studies, the objective is to expand the sample size to enhance the robustness of the findings. Moreover, academic research can use this case study to replicate the experiment in different creative domains for comparative purposes.

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REFERENCES

- [1] N. Anantrasirichai and D. Bull, "Artificial intelligence in the creative industries: a review," *Artif Intell Rev*, vol. 55, pp. 589–656, 2022, doi: 10.1007/s10462-021-10039-7. [retrieved: April, 2024].
- [2] A. Ibrahim, "Impact of using Artificial Intelligence in visual art performance: Artificial Intelligence on the Design Industry," *Research Journal in Advanced Humanities*, vol. 4, no. 1, pp. 23-34, 2023, doi: 10.58256/rjah.v4i1.1214. [retrieved: April, 2024].
- [3] T. Knearem, M. Khwaja, Y. Gao, F. Bentley, and C. E. Kliman-Silver, "Exploring the future of design tooling: The role of artificial intelligence in tools for user experience professionals," in the *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (CHI EA '23)*, Association for Computing Machinery, Article 384, pp. 1–6, 2023, doi:10.1145/3544549.3573874. [retrieved: May, 2024].
- [4] J. Xu, C. J. Chao, and Z. Fu, "Research on Intelligent Design Tools to Stimulate Creative Thinking," in *Cross-Cultural Design. User Experience of Products, Services, and Intelligent Environments. HCII 2020. Lecture Notes in Computer Science*, vol. 12192, Springer, Cham, 2020, doi:10.1007/978-3-030-49788-0_50. [retrieved: June, 2024].
- [5] R. T. Hughes, L. Zhu, and T. Bednarz, "Generative Adversarial Networks–Enabled Human–Artificial Intelligence Collaborative Applications for Creative and Design Industries: A Systematic Review of Current Approaches and Trends," *Frontiers in Artificial Intelligence*, vol. 4, Sec. AI in Business, Article 604234, 2021, doi: 10.3389/frai.2021.604234. [retrieved: April, 2024].
- [6] S. Altavilla and E. Blanco, "Are AI tools going to be the new designers? A Taxonomy for measuring the level of automation of design activities," *Proceedings of the Design Society: Design Conference*, vol. 1, pp. 81-90, 2020, doi:10.1017/dsd.2020.286. [retrieved: April, 2024].
- [7] F. Limano, "Implementation of Artificial Intelligence Based Image Creation Technology for Conceptual Ideas in 3D Visual Modeling," in the *International Conference on Information Management and Technology (ICIMTech)*, 2023, doi:10.1109/ICIMTech59029.2023.10278051. [retrieved: April, 2024].
- [8] C. Zhang, W. Wang, P. Pangaro, N. Martelaro, and D. Byrne, "Generative Image AI Using Design Sketches as input: Opportunities and Challenges," in *Proceedings of the 15th Conference on Creativity and Cognition*, Association for Computing Machinery, pp. 254–261, 2023, doi: 10.1145/3591196.3596820. [retrieved: April, 2024].
- [9] H. S. Becker, "Research Methods in Social Sciences," 2nd ed., São Paulo: HUCITEC, 1994. [retrieved: April, 2024].
- [10] J. Hutson and M. Lang, "Content creation or interpolation: AI generative digital art in the classroom," *Faculty Scholarship*, 472, 2023, available: <https://digitalcommons.lindenwood.edu/faculty-research-papers/472> [retrieved: June, 2024].