The Power of Generative AI:

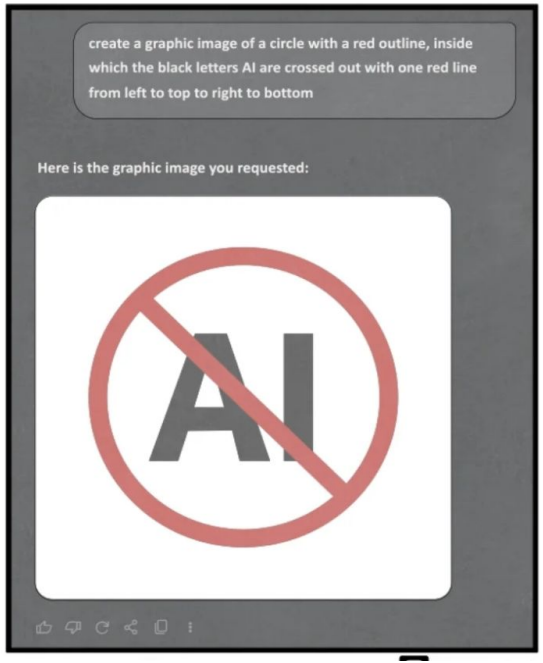
What we Learned from Global Hackathons

Prof. Dr. Júlio Teixeira | julio.teixeira@ufsc.br
Federal University of Santa Catarina - UFSC, Brazil

First of all, remember: creative professionals are "peculiar"!

YES,

BUT



What I do:

Prof. Dr. Júlio Monteiro Teixeira

- **Design Program** | Bachelor's Degree
- **Graduate Program in Design** | Master's & PhD
- **Graduate Program in Knowledge Engineering & Management** | Master's & PhD
- **Leader, Research Group** | Lemme Lab
- **Montex** | A freelance consultancy focused on digital innovation

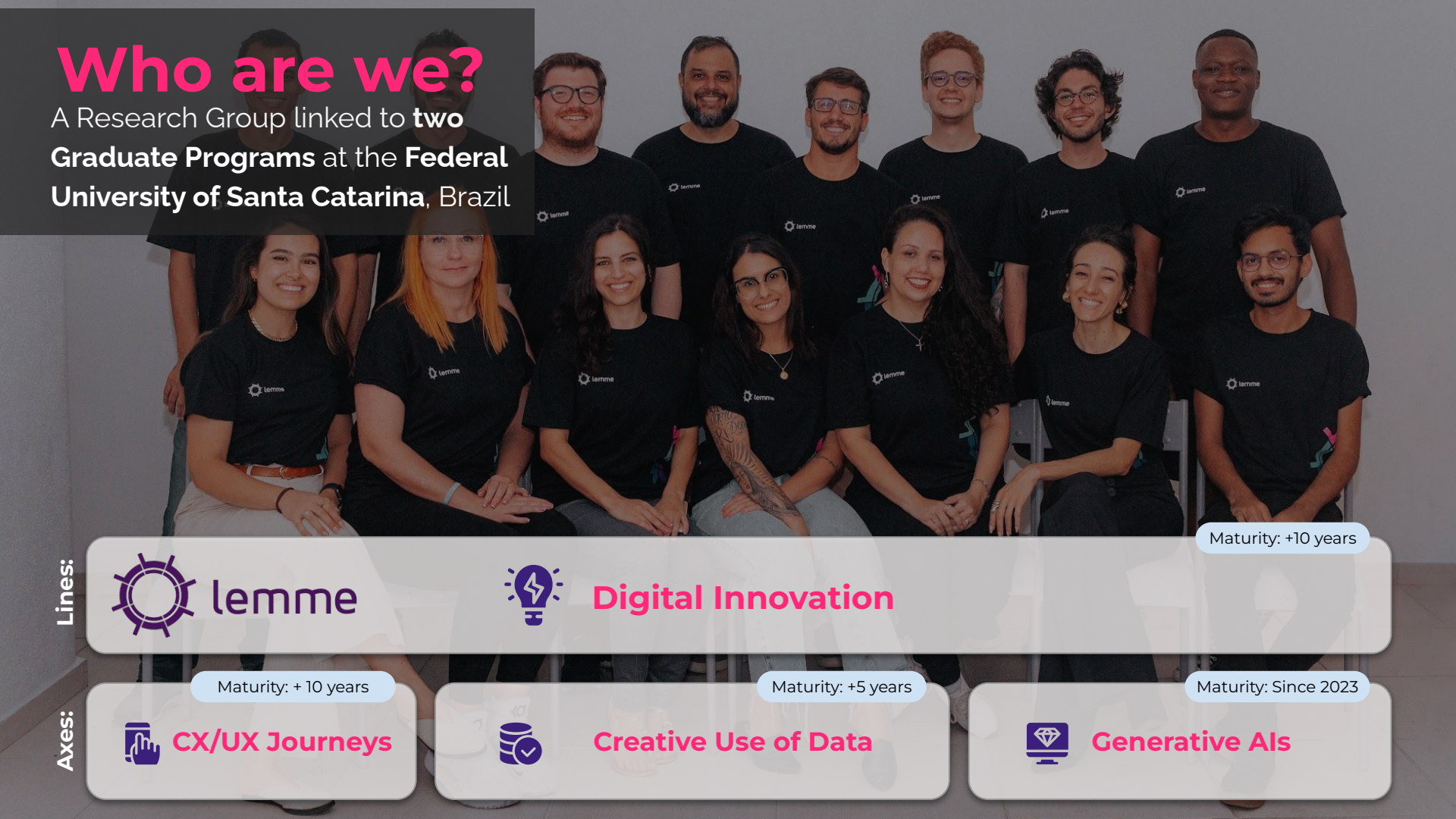
UFSC

lemme

MONTEX

Who are we?

A Research Group linked to **two Graduate Programs** at the **Federal University of Santa Catarina**, Brazil



Lines:

lemme

Digital Innovation — Maturity: +10 years

Axes:

CX/UX Journeys — Maturity: + 10 years

Creative Use of Data — Maturity: +5 years

Generative AIs — Maturity: Since 2023

This month, we're launching our research group's first book:

Design 5.0 – The Role of Creative Professionals in the Digital Industry.

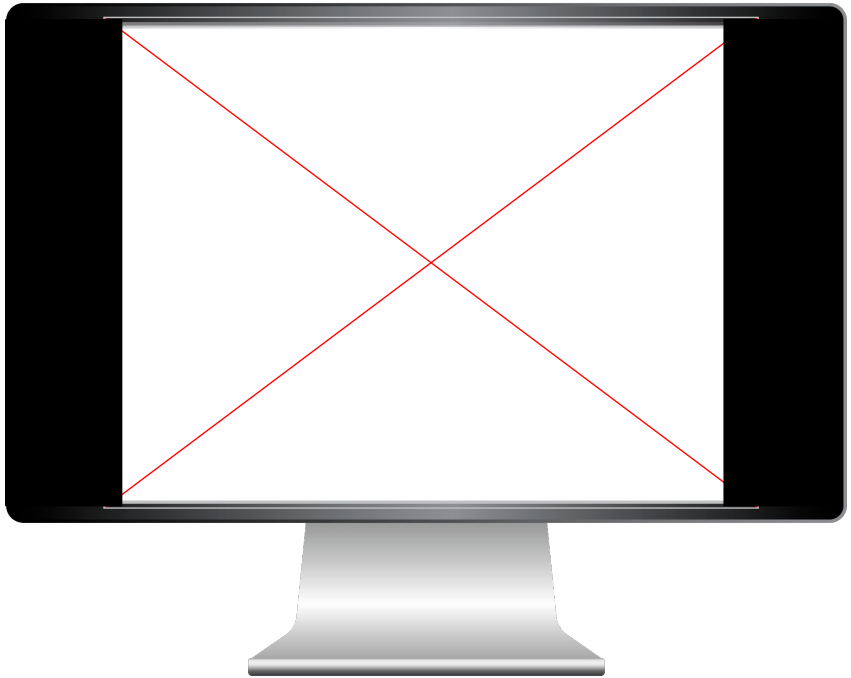
lemme

Creative Hackathons with GenAI

How Students Are Using AI to Develop Innovative Solutions:

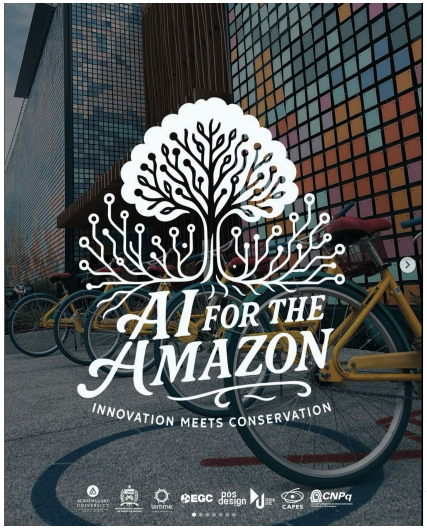
We organized a series of 5 creative hackathons focused on hands-on experimentation with GenAI.

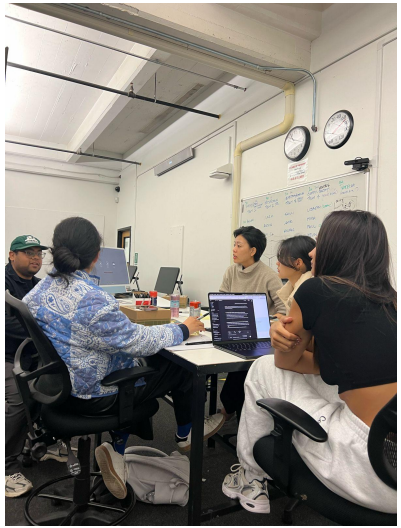
Given 4–6 hours, teams responded to proposed challenges with rapid ideas, including visuals, products, and campaigns.



The Power of Generative AI

03 in person events





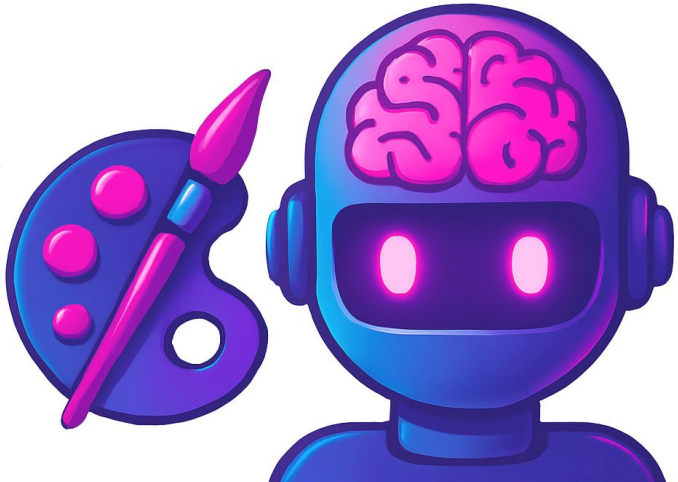
02 remote events

Understanding the Power of GenAI
in the Creative Industries

Research Questions:

- How do Generative AI (GenIA) tools impact the development processes of creative professionals?

- How are creative professionals currently using GenAI in their work?



Understanding the Power of GenAI
in the Creative Industries

Our work is in progress...

Current Status:

- 05 events realized (Hackathons)
  - The last one in person, in the U.S., with Brazilian Government support (me, 1 PhD, 2 MSc)
- 03 papers in writing
- 01 paper published
- 01 Master's Thesis (in progress)

Exploring the Utilization of Generative Artificial Intelligence Tools with Design Students

Gustavo Modena
Knowledge Engineering Department
Federal University of Santa Catarina
Florianopolis, Brazil
e-mail: gustavomodena2@gmail.com

Melise Peruchini
Network and IT department
Federal University of Santa Catarina
Florianopolis, Brazil
e-mail: meliseperuchini@gmail.com

Julio Monteiro Teixeira
Graphic Expression Department
Federal University of Santa Catarina
Florianopolis, Brazil
e-mail: juliomontex@gmail.com

IARIA
International Academy, Research, and Industry Association

Best Paper Award

Exploring the Utilization of Generative Artificial Intelligence Tools with Design

by

Gustavo Modena, Melise Peruchini, Julio Monteiro Teixeira

Presented during DIGITAL 2024, Advances on Societal Digital Transformation, held on Porto, Portugal during June 30 - July 3, 2024

IARIA Board

HKT #1

Paper received the

Best Paper Award from **IARIA 2024**

Overview of Methodological Approach:

Research Characterization:

- **03 countries involved** | Brazil, USA, and Germany (or 04 if including the UK judge)
- **93 Participants** | 68 students, 16 judges, 9 staff people
- **05 cases studies** | 03 in person, 02 remote (03 Global, 02 national)
- **Longitudinal study** | From 03/2024 to 04/2025.
  The study follows a longitudinal design adapted to the rapid evolution of AI.

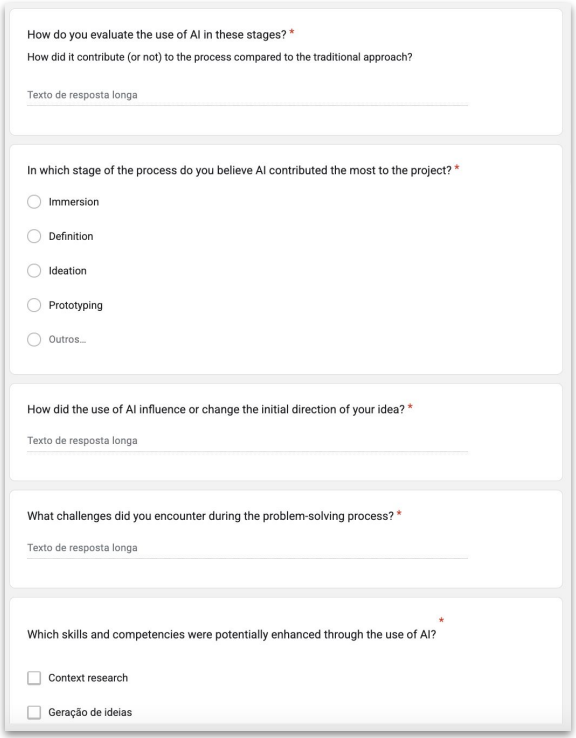
Overview of Methodological Approach:

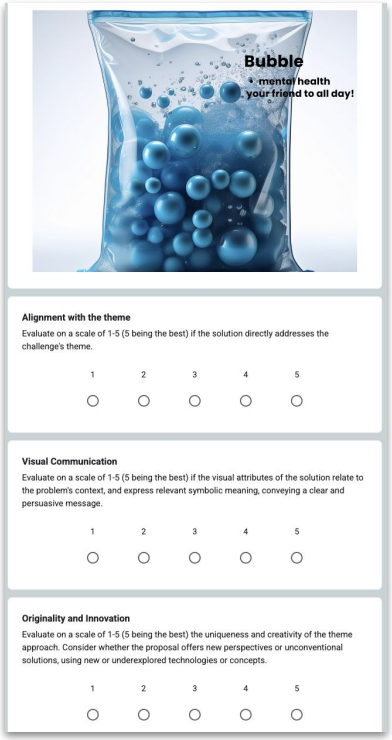
Research Characterization:

Qualitative Analysis | Main Data

Sources:

- Participant Observation
- Video Recordings
- Post-Event Student Survey (Google Forms)
- Jury Evaluation (scores and qualitative feedback during deliberations)





HKT EDITION **Format**/Date	**#01** 🇧🇷 👥**In person** [Mar/24]	**#02** 🇧🇷🇺🇸 💻**Remote** [Jul/24]	**#03** 🇧🇷 👥**In person** [Aug/24]
CHALLENGE	**How to promote awareness about the preservation of the Amazon Rainforest?**	**1: Present a solution that promotes ergonomic health in work-from-home or office environments** **2: Present a solution that can efficiently improve urban mobility**	**Create a campaign, visual piece, or artifact that represents a contribution to the education of the future.**
EXPERIMENT SETUP	**2 deliverables (JPG/GIF):** **1 with AI & 1 without AI** 3 Brazilian jury members 11 students from UFSC	**2 deliverables (JPG):** **1 with AI at the beginning** **1 with AI at the end** 3 Global jury members (DE, BR, UK) 6 students from Brazil (UFSC) 6 students from the USA (AAU)	**2 deliverables (JPG):** **1 with AI & 1 without AI** 3 Brazilian jury members 7 students from UFSC
KEY FINDINGS & HIGHLIGHTS	- Students showed limited proficiency with GenAI tools. - Had difficulty writing prompts that matched their creative goals.	The difficulty with prompts persisted However, we observed that AI made the ideation process smoother and boosted creativity, especially in the final stages.	The difficulty with prompts persisted However, AI proficiency levels improved compared to the first edition

HKT EDITION **Format**/Date	**#04** 🇧🇷🇩🇪 💻**Remote** [Nov/24]	**#05** 🇺🇸 👥**In person** [Apr/25]
CHALLENGE	**Develop solutions that promote Sustainability and Ecological Design**	**Develop solutions that contribute to the preservation of the Amazon Rainforest**
EXPERIMENT SETUP	**2 deliverables (JPG/PNG): 1 with AI & 1 without AI** 3 Global jury members (BR, US, DE) 8 students from Brazil 12 students from Germany	**1 deliverable (Presentation + Pitch Deck): unrestricted AI use at all stages** 4 Global jury members 18 students from the USA (AAU)
KEY FINDINGS & HIGHLIGHTS	- In stage 2 (with AI), students refined more ideas. - They tested more solutions compared to stage 1 (without AI). - AI supported iteration and exploration	- More AI use in prototyping and pitching. - Students felt more comfortable using AI tools.

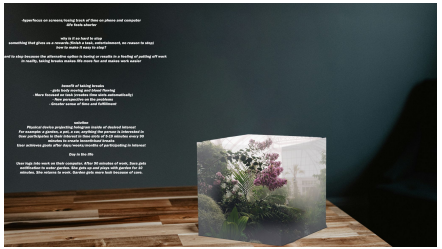
Hackathon #1 🇧🇷 UFSC - In Person [Mar/24]

Without GenAI

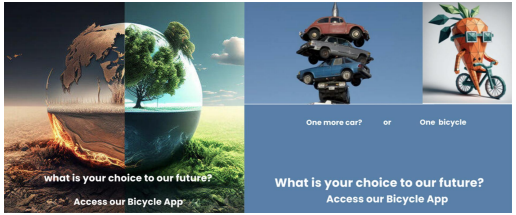
With GenAI

Hackathon #2 🇧🇷 🇺🇸 UFSC & AAU - Remote [Jul/24]

Ergonomic Health Challenge

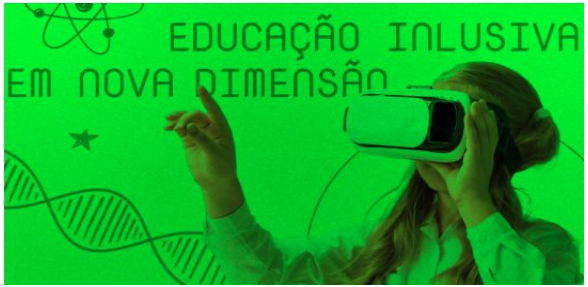


Urban Mobility Challenge

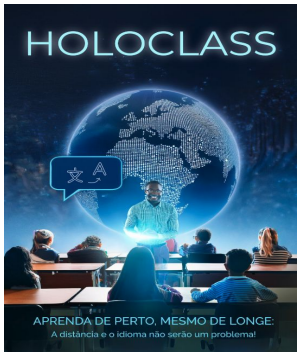


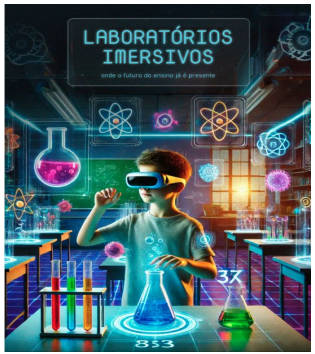
Hackathon #3 🇧🇷 UFSC - In Person [Aug/24]

Without GenAI

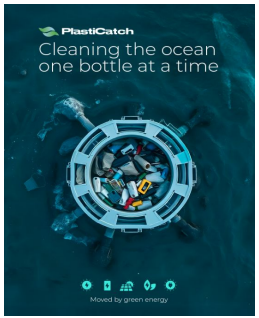


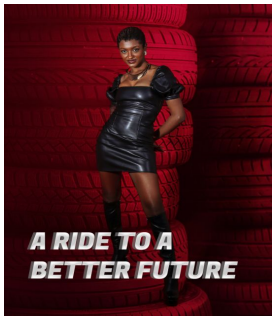
With GenAI





Hackathon #4 🇧🇷 🇩🇪 UFSC & RheinMain - Remote





Hackathon #5 🇺🇸 UFSC - In person [Apr/25]

Our Initial Qualitative Findings:

General Observations:

- Students **progressively demonstrated greater familiarity** with GenAI tools. However, challenges in **prompt** formulation still persist;
- When groups or pairs start using **AI from the very beginning**, they tend to face **difficulties in achieving originality**.

Our Initial Qualitative Findings:

General Observations:

- Groups or pairs that used **AI mainly during the refinement stage** reported greater efficiency and **higher final quality**;
- Defining the **final solution remains the most challenging stage**;
- Most frequently mentioned tools: **ChatGPT, MidJourney, Firefly, and Sora**.

TABLE 01

ID	Alignment with the theme	Visual Communication	Originality and Innovation	Final Grade	Categoria
10	4.7	4.3	3.7	12.7	Started without GenAI
06	5.0	4.0	3.0	12.0	Started without GenAI
03	4.0	3.7	4.0	11.7	Started with GenAI
09	4.3	4.3	2.7	11.3	Started with GenAI
02	4.3	3.7	2.3	10.3	Started without GenAI
07	3.0	4.0	3.3	10.3	Started without GenAI
12	4.3	3.3	2.0	9.7	Started without GenAI
05	3.3	1.7	3.7	8.7	Started without GenAI
11	4.0	2.7	2.0	8.7	Started with GenAI
08	4.3	2.3	1.7	8.3	Started with GenAI
01	2.0	2.0	3.3	7.3	Started with GenAI
04	3.0	1.3	2.7	7.0	Started with GenAI

Our Initial Qualitative Findings:

Regarding the judge scores:

- The **"Originality and Innovation"** category contributed the most to the winning solutions
- **"Visual Communication"** showed higher performance in the solutions that integrated GenAI throughout the entire process or specifically during the final stages
- The **"Theme Alignment"** criterion showed consistently high scores across all solutions, regardless of GenAI involvement

Our Initial Qualitative Findings:

With AI
vs
Without AI

Projects **without GenAI** showed greater variability (with results at both: the highest and lowest score ranges).

In contrast, projects **with GenAI** had **more consistent performances:**

- **Most performances with Gen AI were near the overall average** (when considering both with AI and without AI).
- However, when **analyzing them separately,** projects **with AI** showed a modestly higher average compared to those **without AI**.

TABLE II. AVERAGE SCORE OF JURY'S EVALUATION

Jury Evaluation	
Average Grade	*Category*
8.4	Without AI
6.8	Without AI
6.2	With AI
6	With AI
6	With AI
5.5	Without AI
4.6	Without AI
5.7	With AI
5.7	With AI
5.3	Without AI

HKT #1
IARIA Paper (2024)

Our Initial Qualitative Findings:

AI -beginning use

vs

AI at the end

Projects that used AI **mainly during the final stages** tended to receive **higher evaluations**.

AI as Co-Pilot

Projects that used **GenAI as a co-pilot** (complementing human skills) **achieved above-average performance**.

Exploring Challenges and Opportunities to Support Designers in Learning to Co-create with AI-based Manufacturing Design Tools

Frederic Gmeiner, HCI Institute, Carnegie Mellon University, Pittsburgh, PA, USA, gmeiner@cmu.edu
Humphrey Yang, HCI Institute, Carnegie Mellon University, Pittsburgh, PA, USA, hanliny@cs.cmu.edu
Lining Yao, HCI Institute, Carnegie Mellon University, Pittsburgh, PA, USA, liningy@andrew.cmu.edu
Kenneth Holstein, HCI Institute, Carnegie Mellon University, Pittsburgh, PA, USA, kjholste@cs.cmu.edu
Nikolas Martelaro, HCI Institute, Carnegie Mellon University, Pittsburgh, PA, USA, nikmart@cmu.edu

ABSTRACT

AI-based design tools are proliferating in professional software to assist engineering and industrial designers in complex manufacturing and design tasks. These tools take on more agentic roles than traditional computer-aided design tools and are often portrayed as "co-creators." Yet, working effectively with such systems requires different skills than working with complex CAD tools alone. To date, we know little about how engineering designers learn to work with AI-based design tools. In this study, we observed trained designers as they learned to work with two AI-based tools on a realistic design task. We find that designers face many challenges in learning to effectively co-create with current systems, including challenges in understanding and adjusting AI outputs and in communicating their design goals. Based on our findings, we highlight several design opportunities to better support designer-AI co-creation.

CCS CONCEPTS

• Human-centered computing → Empirical studies in HCI; • Applied computing → Computer-aided design.

KEYWORDS

computational co-creation, generative AI, human-AI collaboration, think-aloud study, group cognition, team learning

ACM Reference Format:

Frederic Gmeiner, Humphrey Yang, Lining Yao, Kenneth Holstein, and Nikolas Martelaro. 2023. Exploring Challenges and Opportunities to Support Designers in Learning to Co-create with AI-based Manufacturing Design Tools. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25), April 25–28, 2025, Hamburg, Germany.* ACM, New York, NY, USA, 20 pages. https://doi.org/10.1145/3544548.3580999

This work is licensed under a Creative Commons Attribution International 4.0 License.

CHI '25, April 25–28, 2025, Hamburg, Germany
© 2025 Copyright held by the owner/author(s).
ACM ISBN 978-1-4503-9421-5/23/04.
https://doi.org/10.1145/3544548.3580999

1 INTRODUCTION

Modern manufacturing processes allow designers to produce complex parts optimizing strength-to-weight or leveraging new materials such as shape-changing plastics, yet their creation often surpasses the designers' cognitive capabilities. Recently, computer-aided design (CAD) tools have begun incorporating AI-based features to generate part designs based on a designer's myriad optimization goals [54]. For example, Japanese electric vehicle manufacturer WHILL used Autodesk Fusion 360 Generative Design to optimize material economy, strength, and sustainability for an electric wheelchair component [27]. AI tools are also helping designers generate parts using emerging manufacturing processes such as shape-changing smart material structures [80]. In both examples, working with AI allows designers to create designs that would be extremely tedious or infeasible without AI support.

These generative AI tools take more agency and autonomy in parts of the human-AI design process and are often referred to as "co-creators" [18]. However, effective and practical co-creation presents a significant learning curve for designers, as they are required to work and think collaboratively with AI agents that operate differently than human collaborators or complex CAD tools.

Studies have shown that effectively working with professional feature-rich non-AI design software already requires substantial and continual learning as such software becomes more capable [38, 49]. Consequently, instead of simplifying the software's interfaces, an active field within HCI studies how the learning of such complex software systems can be better supported through interactive interfaces [24, 44, 51]. However, working with AI "co-creators" is different from working with conventional CAD tools. Designers do not directly manipulate 3D geometry but rather formulate design goals for the AI system to build from. Yet, little is known about how to support designers in learning to work with AI tools that take on this more active and collaborative role.

In this study, we ask how designers can be better supported in learning to co-create with AI design tools. We guide our investigations by a recent wave of HCI literature that looks to inform the design of human-AI collaboration based on the mechanisms that make human-human collaborations effective—such as *grounding in communication* or *shared mental models* [5, 6, 10, 31, 40, 77, 85].

Co-creating with **AI as a co-pilot/CAD** enhances designers' performance

Gmeinder et al (2025)

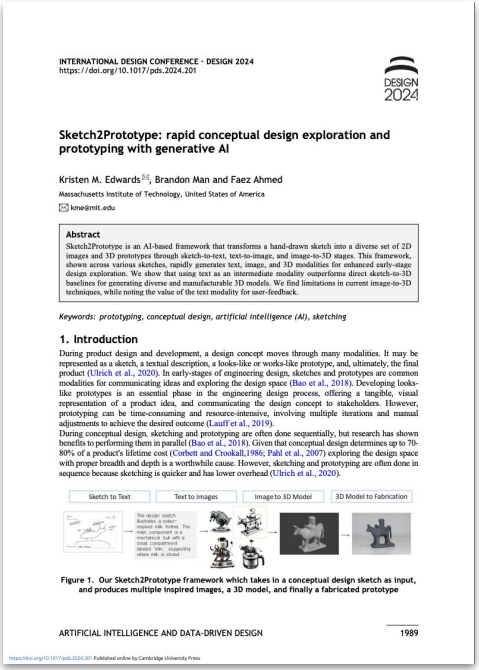
First Comparison with Existing Literature:

Cumulative Findings by Our Research Group (Hackathons & Beyond):

1. AI accelerates design from draft ideas

AI tools like Vizicom.ai and Adobe Photoshop can turn sketches into structured models instantly.

This helps creative professionals analyze and refine their ideas quickly, comparing them to existing market solutions.



INTERNATIONAL DESIGN CONFERENCE - DESIGN 2024
https://doi.org/10.1017/pds.2024.201

DESIGN 2024

Sketch2Prototype: rapid conceptual design exploration and prototyping with generative AI

Kristen M. Edwards, Brandon Man and Faez Ahmed
Massachusetts Institute of Technology, United States of America
kme@mit.edu

Abstract
Sketch2Prototype is an AI-based framework that transforms a hand-drawn sketch into a diverse set of 2D images and 3D prototypes through sketch-to-text, text-to-image, and image-to-3D stages. This framework, shown across various sketches, rapidly generates text, image, and 3D modalities for enhanced early-stage design exploration. We show that using text as an intermediate modality outperforms direct sketch-to-3D baselines for generating diverse and manufacturable 3D models. We find limitations in current image-to-3D techniques, while noting the value of the text modality for user-feedback.

Keywords: prototyping, conceptual design, artificial intelligence (AI), sketching

1. Introduction

During product design and development, a design concept moves through many modalities. It may be represented as a sketch, a textual description, a looks-like or works-like prototype, and, ultimately, the final product (Ulrich et al., 2020). In early-stages of engineering design, sketches and prototypes are common modalities for communicating ideas and exploring the design space (Bao et al., 2018). Developing looks-like prototypes is an essential phase in the engineering design process, offering a tangible, visual representation of a product idea, and communicating the design concept to stakeholders. However, prototyping can be time-consuming and resource-intensive, involving multiple iterations and manual adjustments to achieve the desired outcome (Lauff et al., 2019).
During conceptual design, sketching and prototyping are often done sequentially, but research has shown benefits to performing them in parallel (Bao et al., 2018). Given that conceptual design determines up to 70-80% of a product's lifetime cost (Corbett and Crookall,1986; Pahl et al., 2007) exploring the design space with proper breadth and depth is a worthwhile cause. However, sketching and prototyping are often done in sequence because sketching is quicker and has lower overhead (Ulrich et al., 2020).

Figure 1. Our Sketch2Prototype framework which takes in a conceptual design sketch as input, and produces multiple inspired images, a 3D model, and finally a fabricated prototype

https://doi.org/10.1017/pds.2024.201 Published online by Cambridge University Press

Edwards, Man & Ahmed (2024) presents a pipeline that transforms:
sketches > text descriptions > imagens > 3D models

Demonstrates how this multi-format conversion supports:

- rapid exploration of ideas
- iterative design processes
- enhanced creative flexibility

First Comparison with Existing Literature:

2. Fluency in AI Boosts Creative Velocity

As creative professionals become more familiar with AI tools, **they gain more control over the creative process, pushing their ideas closer to innovation.**

Beyond Automation: How UI/UX Designers Perceive AI as a Creative Partner in the Divergent Thinking Stages

Abidullah Khan*
abid-ullah.khan@polymtl.ca
Polytechnique Montreal
Montreal, Quebec, Canada

Atefeh Shokrizadeh*
atefeh.shokrizadeh@polymtl.ca
Polytechnique Montreal
Montreal, Quebec, Canada

Jinghui Cheng
jinghui.cheng@polymtl.ca
Polytechnique Montreal
Montreal, Quebec, Canada

Abstract

Divergent thinking activities, like research and ideation, are key drivers of innovation in UI/UX design. Existing research has explored AI's role in automating design tasks, but leaves a critical gap in understanding how AI specifically influences divergent thinking. To address this, we conducted interviews with 19 professional UI/UX designers, examining their use and perception of AI in these creative activities. We found that in this context, participants valued AI tools that offer greater control over ideation, facilitate collaboration, enhance efficiency to liberate creativity, and align with their visual habits. Our results indicated four key roles AI plays in supporting divergent thinking: aiding research, kick-starting creativity, generating design alternatives, and facilitating prototype exploration. Through this study, we provide insights into the evolving role of AI in the less-investigated area of divergent thinking in UI/UX design, offering recommendations for future AI tools that better support design innovation.

CCS Concepts

• **Human-centered computing** → **Empirical studies in HCI**.

Keywords

UI/UX Design, Divergent Thinking, AI Tools, Human-AI Interaction

ACM Reference Format:

Abidullah Khan, Atefeh Shokrizadeh, and Jinghui Cheng. 2025. Beyond Automation: How UI/UX Designers Perceive AI as a Creative Partner in the Divergent Thinking Stages. In *CHI Conference on Human Factors in Computing Systems (CHI '25), April 26-May 1, 2025, Yokohama, Japan.* ACM, New York, NY, USA, 12 pages. https://doi.org/10.1145/3706598.3713500

1 Introduction

In today's rapidly evolving digital landscape, User Interface and User Experience (UI/UX) design play a pivotal role in shaping user interactions, significantly influencing product success and overall user satisfaction [15, 16]. A critical component of the UI/UX design process is divergent thinking, which involves exploring a wide range of ideas and solutions to drive innovation and creativity [13]. Different from convergent thinking, which prescribes operations to help achieve "a single correct solution" [12], divergent thinking "allows one to explore in different directions from the initial problem state, in order to discover many possible ideas and idea combinations that may serve as solutions" [12]. While both aspects are important in UI/UX design [9], divergent thinking allows designers to break free from conventional patterns and explore novel approaches to problem-solving, a process vital for tackling the current friction between rapidly advancing technology and limited design innovation [11, 47].

Over recent years, the integration of artificial intelligence (AI) tools into various stages of the UI/UX design process has become increasingly prevalent. These AI tools offer new possibilities for ideation, prototyping, and refinement [26, 30, 37, 39, 40]. Recent research has also significantly advanced our understanding of AI's role in the design process. For instance, Zhou et al. [49] demonstrated AI's potential to enhance both the depth and breadth of design solutions through strategic integration points in the design process. Similarly, Chandrasekera et al. [5] illustrated how generative AI can boost creativity and reduce cognitive load, particularly within design education, underscoring AI's role as a co-creator in producing diverse and innovative design solutions. With the recent advancements of generative AI, many commercial tools also emerged to aid the UI/UX design process. For example, tools like ChatGPT streamline data collection and synthesis, while MidJourney, DALL-E, and Uizard assist in generating visual assets and prototypes. Additionally, Figma's AI plugins like Automator[1] improve workflows by automating repetitive tasks. Tools like Colormind[2] also offer creative inspiration through palette generation.

Despite the significant advancements in AI-assisted design, there remains a critical gap in understanding how professional UI/UX designers perceive AI in supporting divergent thinking, as well as their needs and desires in AI tools to help them create more innovative products. Moreover, while previous studies have explored AI's contributions to design iteration [49] and early-stage creativity [5], little attention has been paid to how AI tools are currently utilized during the divergent thinking phases in the actual design practice. To address this gap, our study deliberately focuses on this aspect and investigates three key research questions:

- **RQ1**: What are the current practices of UI/UX designers in the divergent thinking process?
- **RQ2**: How do designers use AI tools to support divergent thinking in the UI/UX design process?

*Both authors contributed equally to this research.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

CHI '25, Yokohama, Japan

© 2025 Copyright held by the owner/author(s). Publication rights licensed to ACM.

ACM ISBN 979-8-4007-1394-1/25/04
https://doi.org/10.1145/3706598.3713500

[1]https://www.figma.com/community/plugin/1005114571859948695/automator
[2]http://colormind.io/

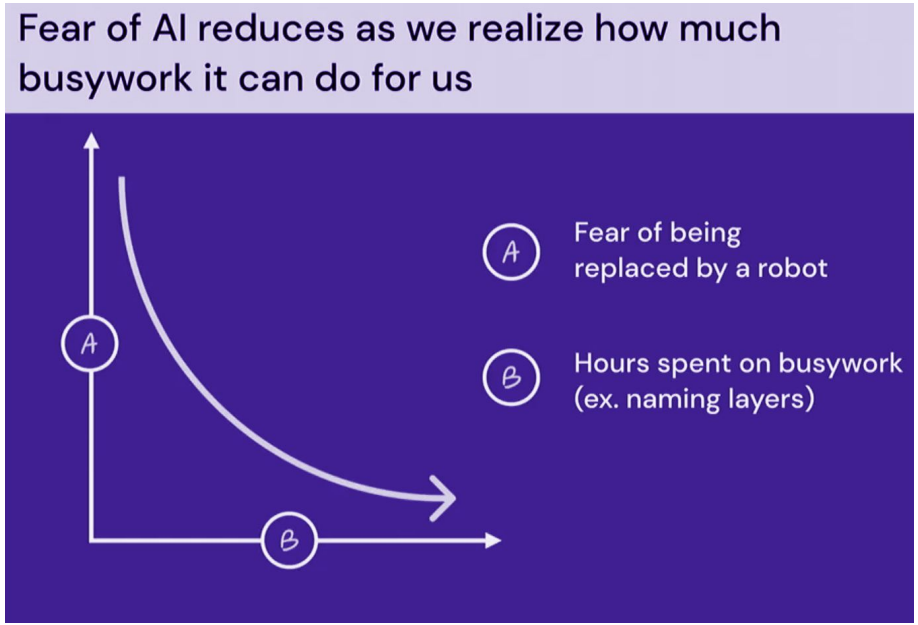
- **Generating diverse alternatives**
- **Accelerating the ideation process**
- **Enabling human control during idea refinement**

Khan et al (2025)

First Comparison with Existing Literature:

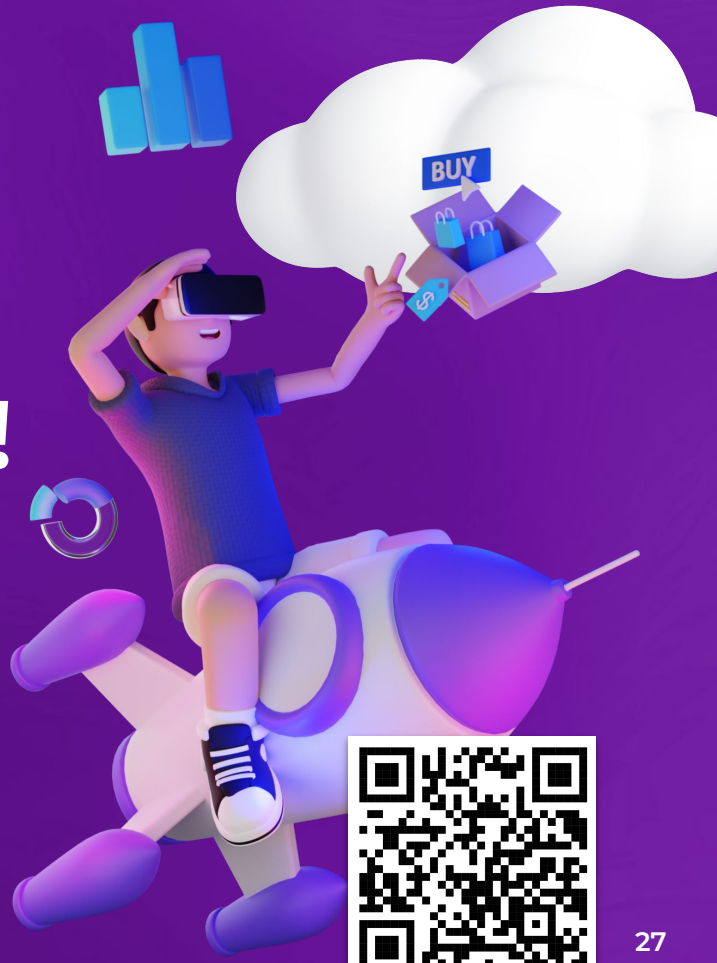
3. Creative Resistance Drops with Use

Resistance to the use of AI tools tends to decrease gradually as creative professionals realize that it can help replace lower-value tasks.



Davis e Gonzalez (2023)

Thank you!

julio.teixeira@ufsc.br

Q&A time!