

"Instant Design": Five Strategies for the use of Generative AI in NIME Ideation Workshops

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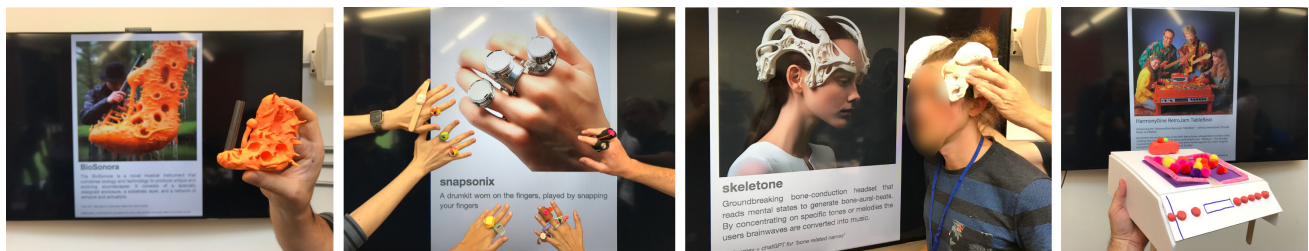


Figure 1: Physical prototypes of new musical instruments alongside the AI generated images that informed their design.

Abstract

This paper presents five strategies for facilitating workshops that incorporate AI text-to-image (TTI) generators in the conceptual design of new musical instruments. Developed through a series of iterative workshops, this approach examines the integration of generative AI (GenAI) within creative processes, with a particular focus on idea generation and the interplay between AI-driven tools and traditional craft-based activities in workshop contexts.

The primary study was conducted at the Artificial Intelligence and Musical Creativity Conference (AIMC '23) [2] and the paper shares insights from the workshop, including the combination of physical prototyping and GenAI concept design through image creation. The paper emphasises the practical implications of incorporating AI tools into group design fiction workshops and offers five suggestions for facilitators and practitioners. It considers the tensions and opportunities that arise in the collaboration between AI and human creativity, underscoring the importance of iterative feedback and the benefits of clearly defined design briefs within speculative design practices.

Keywords

Musical Instrument Design, Speculative Design, Collaborative Design, Generative AI.

1 Introduction

Ideation and future thinking are design techniques that can invite participants to situate themselves in unknown worlds to speculate on an alternative future [36]. Workshops serve as an effective

means for exploring potential solutions to user-centred design and interaction problems, encouraging participant engagement in novel designs [14], and identifying research opportunities [4]. Speculative design activities and thought processes have been the impetus of several HCI focused workshops [39] and have been achieved through a range of techniques from creating artefacts from bricolage [10], sketching [34] and basic electronics [32]. There are several examples of workshop formats that take inspiration from design fiction methodologies by engaging with the personal, extra-ordinary and absurd [26] due to the potential to expand the scope for user engagement in workshop settings[4]. The use of speculative design has also previously been explored for designing human-AI interactions [25] and fictional AI workshops that incorporate text-to-image tools to evaluate the use of collectively designing prompts within group settings.

This paper focuses on the implications of integrating generative AI tools into the creative process, specifically for the context of musical instrument design. The main objectives are to 1) share our initial findings using AI tools within group design fiction workshops and, 2) question how best to incorporate these new technologies when developing new creative ideas or concepts.

In order to explore the potential of generative AI within design methods for instrument design, a workshop was organised at the Artificial Intelligence and Musical Creativity Conference at The University of Sussex in August 2023. The outcomes of this workshop are presented in Section 5 alongside the initial findings from the round table discussion which covers a range of topics around the use of AI tools, iterative feedback in Creative Design and the participants' experience of the workshop. This paper seeks to bridge the gap between discussions and practical applications, offering insights for both researchers and practitioners exploring AI and creativity within the context of new musical instrument designs.



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We present five novel workshop strategies integrating new AI Text-to-Image (TTI) generators in the context of musical instrument design workshops through the lens of a speculative future. The approach presented in this paper has been developed over several iterations of a workshop format and seeks to share the potential of new GenAI tools for instrument designers.

2 Related Work

In this section, we explore the theoretical and practical contexts that informed our study designs and methodologies. Specifically, we introduce speculative design as a future-orientated design approach, the use of a workshop format to design musical instruments and the capabilities of generative AI technologies in creative and collaborative workshop settings.

2.1 Speculative Design

Speculative Design is a methodology coined by Dunne and Raby which situates designers within unknown worlds to look beyond identifying needs and solving problems, and instead move towards a more “generative, speculative, and future-oriented space of alternative possibilities” [13]. Speculative design has been used previously in workshop settings to explore a variety of fields, from practical design of urban technology [17] to having a social and cultural role in generating conversations and solutions to important social issues [28].

Most notably, speculative design has been explored within the third wave of HCI as a future-orientated, critical design methodology [13] that situates users in unfamiliar circumstances [38] [18]. A central tenet of speculative design is to accept that the product of the design process may never become ‘real’. Moving away from what is possible or achievable provides space to think from an anti-solutionist perspective [4]. The resistance of impulses towards solutionism is well explored within ‘Anti-Solutionist Strategies: Seriously Silly Design Fiction’ which states that much work around technology ideation “solves problems that don’t exist or ignores the complexity of personal, political and environmental issues” [10]. We situate our workshop plan within Participatory and Collaborative design methods [21] which typically acknowledge that people who are affected by a design decision, event or product should have an opportunity to influence it. By embracing a speculative design outlook within a collaborative workshop setting, we are aiming to situate workshop participants within a divergent thinking space [1] to encourage a large pool of ideas which can later be used as a resource for further design activities.

2.2 Musical Instrument Design Workshops

There are several noteworthy examples of musical instrument design workshops [4] [35] [7] [27]. These workshops explore many perspectives within the design space, employing methodologies that encourage the design of instruments from the absurd [26] to the fun and ‘modern’ [11]. These exploratory workshops present varying work plans that invite participants to ideate, think about and imagine the future of musical instruments. One notable example is the Magic Machines workshop, conceived and executed by Kristina Andersen et al [4]. This workshop introduces an innovative approach that prioritises the participants’ experience over the conventional workshop outcome driven approach. Featured in the workshop plan is a technique that involves constraining workshop activities to a short timeframe, fostering quick and arguably instinctive actions among participants.

2.3 Generative AI

Recent advances in generative AI have enabled highly detailed and realistic images to be generated from text prompts given in natural language [9]. The tools used in this study use generative AI technology such as Stable Diffusion [31] and Midjourney [29] for image generation, and large language model-based models such as ChatGPT [20] for text-based suggestions. Image generators can replicate a wide range of artistic styles, from established movements like ‘Impressionism’ to more contemporary aesthetics such ‘3D rendering’. They can also combine multiple stylistic elements and subjects, allowing for complex and highly customisable outputs.

The ethical implications of the training data of these large AI models is a much discussed topic due to the potential for the infringement of copyright [24] and intellectual property [23]. Furthermore, generative AI models are often seen as neutral, but they have been criticised for producing biased outcomes, which can inherently perpetuate stereotypes, discrimination and can unfairly disadvantage certain groups [16]. In addition to bias, there is also criticism that Generative AI tools leave a significant carbon footprint due to the energy intensive nature of training and using these systems [12] [19].

The collaboration between humans and AI has become a subject of increasing significance in real world creative applications [3] and the use case of these new technologies is stimulating conversations about intellectual property the originality of ideas [22] [6], as well as new dynamics of human art making [30].

The capability of new generative AI tools in creating seemingly complete, albeit often implausible designs has led to them being used in a manner we term “instant design” (as quoted by one of our workshop participants), where the entire human input to the design process is in the contribution of a text prompt. In contrast to this “instant design”, we are interested in is how GenAI tools can be used *within* a wider design process as opposed to *being* the design process.

2.4 Generative AI in Creative and Workshop Settings

The use of AI tools within group settings is a growing topic that has previously been explored in workshops such as Vartiainen et al.’s study [37] that explores the use of TTI generators as a basis to explore a variety of craft materials in Finnish education. The study implements a hands-on workshop approach and discusses the tensions of adopting Generative AI within workshop settings. Interestingly, they state that ‘AI may assist the ideation process by providing new perspectives and visualising the possible and the impossible’ [37]. This has been used to the advantage in other workshop topics that explore fictional situations in relation to the participants. An example of this is Epstein et al.’s workshop where participants are asked to collectively imagine utopias facilitated by AI-generated imagery. [15] Interestingly, the findings highlight the unexpected difference between the participant’s imagined output and the generated image were the most talked about insights into the use of these novel tools[15]. Although there is a significant increase in workshops exploiting GenAI within workshop settings, the use of these tools for instrument designers working within the field of NIME and beyond is little explored.

2.5 Author's Related Workshops

The authors of this paper have been central to several previous workshops that explored fictional design, digital musical instruments, and the accessibility of novel interfaces. This experience has influenced the workshop design described in this paper as well as the narrative, activities and approach. A brief overview of the previous workshops is started below.

2.5.1 Workshop A at Joy of Sound . This workshop was attended by Disabled participants affiliated with the inclusive arts organisation Joy of Sound (JOS) in January 2023. The workshop included activities that invited participants to co-create conceptual images of new instruments using AI TTI generators by providing key words for the prompt. These included the overall appearance of the instrument, constituent materials, and other design characteristics of the instruments. This workshop was the central topic of a paper [8] which was presented at NIME 2023.

2.5.2 Workshop B at NIME 2023 . The second workshop was hosted at the NIME conference in Mexico City in May 2023. The workshop was attended by 7 conference attendees and the activities included an introduction to AI image creation tools; Image creation using generative AI TTI tools and time to compose audio that accompanies the new instruments. This workshop used AI tools through the lens of a Digital Luthier and questioned how AI rendered images can directly influence new instrument designs.

2.5.3 Workshop C: The 10,000 Instruments Workshop . This third workshop was held in July 2020 at NIME Conference with the aim of questioning "...the role of technology in creative practice through make-believe, fragile and contradictory artefacts and playful design explorations". The lofty but unachievable aim was to create thousands of new instrument ideas, which participants took seriously and did their best to achieve.

3 The Central Study: AIMC Workshop

3.1 Context of the Workshop

The qualitative data for this study was collected at the AIMC Conference at the University of Sussex in August 2023. The workshop was advertised through the conference website and attendees could sign up for free. The workshop was named after an instrument which was developed in a workshop A by the lead author as "A Synth made of Chicken Nuggets you Play with your Elbows": A workshop exploring AI supported Musical Instrument Design.

3.2 Participants

In total, there were ten workshop participants, and six facilitators present at the study. Participants were asked to bring "one non-musical item with them" which was to be used in the introductory section of the workshop.

3.3 Workshop Materials

Within the workshop space, there was a projector that was used to show pre-arranged slides and every participant had access to their own computer. The facilitators provided craft materials (see figure 2) which were laid out on tables around the room. The materials included Styrofoam, colouring pens, rubber bands, pom-poms, moulding clay, crayons, tapes, scissors, and more. The selection of craft materials was deliberate, offering participants an array of options to create mock-ups representing a broad range of shapes and forms throughout the activities.



Figure 2: Workshop craft materials which were laid out of on participant's tables

We encouraged participants to use a variety of TTI generators as well as provided an easy-to-use tool that was not limited by signup requirements or limited credits. We used the paid subscription of MidJourney v5 [33], which is accessed through the chat interface "Discord" [5].

4 AIMC Workshop Outline

The workshop had various stages, including an overview of AI tools, instrument generation, extended AI techniques, instrument mock-ups, a presentation opportunity, before a concluding round-table discussion. The workshop schedule was as follows:

Warm-up (10 mins) Participants were asked to place their non musical object in the middle of their table, craft a brief description of one of the objects, and subsequently pass the descriptions to the neighboring table. Participants were asked to interpret the description and create a mock-up or physical sketch of their design using the craft materials.

Overview of AI Tools (30 mins) Participants were introduced to a range of AI tools, including ChatGPT, Midjourney, DALL-E 2 and Bing. Participants were encouraged to try out ones they were less familiar with.

Instrument Generation (30 mins) Participants were tasked with creating a plethora of novel instruments, drawing inspiration from personal objects. To enhance the process, prompts and images were incorporated into a live feed showcasing a continuous stream of evolving instruments, fostering a dynamic environment for "prompt remixing." This live feed was hosted within a collaborative file named the 'Compendium of Imaginary Musical Instruments,' allowing everyone to upload their creations to a shared space in real-time, facilitating the immediate viewing and interaction with each other's contributions.

Instrument Themes (45 mins) Following an introduction to extended AI techniques like in/out-painting, participants collectively organised instruments into 'families'. This process aimed to familiarise participants with designs, identify higher-level similarities and themes, and encourage the exploration of unexplored areas in the design space.

Instrument Mock-ups (45 mins) Participants were encouraged to craft low-fidelity prototypes of their designs using basic materials such as foam board, card, and paper prototyping.

Show and Tell (30 mins) Participants engaged in a brief show and tell of the final instruments, followed by a round-table discussion reflecting on the workshop process. Discussion topics included various aspects of the process and the broader implications of integrating AI tools into the creative process of musical instrument designers.

5 Workshop Outcomes

5.1 Instrument Themes and Categorisation

During the workshop, participants were invited to a collaborative task of organising their 99 instrument inventions into distinct themes within the ‘Compendium of Imaginary Musical Instruments.’ This exercise served a dual purpose of fostering in-workshop reflection and facilitating group discussions through reflection, co-analysis, and categorisation of their instrument designs. The resulting themes cover various concepts, from aesthetic attributes such as ‘Steampunk’ to functional elements such as ‘Drivable Instruments’ and sensory experiences such as ‘Odorous’ and ‘Edible Instruments’ (see Figure 3).



Figure 3: Four selections of musical instruments made by participants under the ‘Edible Instruments’ theme

Despite inevitable overlaps, self-organising the outcomes of the workshop allowed for a more nuanced understanding of the range of designs among the group.

Below are the most prevalent categories and the respective number of instruments arranged into each section:

- Wearable Instruments: 19 designs
- Steampunk Instruments: 16 designs
- Edible Instruments: 11 designs

This distribution suggests a range of motivations, from imaginative and whimsical ideas, such as the Sinister Instruments, to more practical and feasible designs, exemplified by Wearable Instruments (see Figure 4).

Post-workshop we extracted common prompting patterns (see Figure 5), with the aim of visually capturing the common trends



Figure 4: Four selections of musical instruments made by participants under the ‘Wearable Instruments’ theme

and interests that emerged during the workshop. Notably, participants often specified the instruments based on material, method of producing sound, or the intended user, as well as visual cues.

Made From / Made Of / Constructed From (15)

a rare flute **made from** insects and money

With + Physical Characteristics (13)

kandinsky modular synthesiser **with glowing wires**

Played By (11)

a gigantic musical instrument like durdle door with strings **played by** dolphins

A Musical Instrument That (10)

a musical instrument **that** has robotic arms that fight you while you’re trying to play it

Which Is Also / Which Also (10)

a musical instrument **which is also** a piano that is also a bee hive

That Uses (10)

a hybrid electronic-biological musical instrument **that uses** its tentacles to make sound

In the Style Of (7)

a modular synthesizer **in the style of** Salvatore Dali

Figure 5: Common prompt patterns and frequency in ().

In addition to the common trends above, many of the participants specified how the instrument should sound as shown in the prompts below:

- “A new musical instrument that converts stomach digestion sounds into light and music”
- “A hybrid electronic-biological musical instrument, that uses its tentacles to make sound.”
- “Massive gongs suspended beneath the water’s surface that resonate deeply when hit by powerful waves, producing a majestic and awe-inspiring sound.”
- “A fantastical stringed instrument that requires the player to scream at the top of their lungs for any sound to play. The sound it makes is terrifying, but very quiet.”
- “A musical instrument based on a flower, where each petal makes a different sound.”



Figure 6: An AI image of a example of a build-able musical instrument named ‘Chord Key’

Finally, the materials used for the instruments were a key consideration, ranging from unconventional sources like insects and money to more conventional materials like wood and concrete. Some workshop designs were unfeasible, but others provided practical references for fabrication. Figure 6 shows an instrument from the workshop that was entitled ‘Chord Key’, which represents one of the more practical instrument designs.

5.2 Physical Prototyping

The workshop included a phase of physical prototyping, inviting participants to make mock-ups of their designs. The physical outcomes of this activity enabled the group to think about scale, materiality and feel of the instrument in a different way to the 2D images. See Figure 7 which shows participants demonstrating their physical prototypes alongside the initial image concept.

6 Developing Strategies

In this section, we describe the development of the five strategies. The process began with a round-table discussion between workshop organisers and participants at the end of the session. This discussion was recorded, transcribed, and anonymised. We then conducted multiple rounds of critical reflection, analysing the transcript to identify key themes emerging from participants’



Figure 7: Workshop participants with their craft mock-ups of the AI Generated Instrument called ‘SnapSonix’

contributions. Below, we present three themes that formed the foundation for the five strategies outlined in section 7.

6.1 Theme 1: Clear Briefs and Constraints: Balancing Creativity and Clarity

The discussions revealed a nuanced perspective on the balance between speculative design and the need for clearer design brief parameters. While acknowledging the nature of speculative design methods, participants expressed a desire for more defined design briefs and constraints. Participant four (P4) noted, “I think it’d be more fun doing it if we had a clear brief. So, design a new instrument, if it was like designing a new instrument for bouncing, and then everyone works.”

In addition to the desire for clearer design briefs, the limitations of the AI tools themselves were brought to the forefront. P4 emphasised the essential role of constraints, stating, “When I’m thinking of designing a musical instrument, I need to have some constraints... I think it’s more productive to give the model a starting point.” This sentiment reinforces the workshop’s exploration of the delicate balance between creative freedom and the need for structured guidance.

6.2 Theme 2: Limitations of Technology: Exploring Constraints in Design Ideation

While the workshop successfully introduced and used TTI generators for conceptualising new instruments, the participants raised valid concerns about the limitations inherent in designing exclusively through prompts. Criticism regarding the constraints imposed by the technology, hindering some participants from fully realising their design visions. Expressing frustration with these limitations, P1 shared, “I really wanted to make the thing actually playable, you know, like, yeah, like, I really tried to put like some sort of membrane.” This view emphasises the participants’ aspirations to move beyond conceptualisation and refine the design, highlighting the need to address technology constraints in future design iterations.

6.3 Theme 3: Grounding Speculative Designs

The challenges associated with grounding speculative designs became evident in the post workshop discussions. While the speculative nature of the workshop allowed for exploration through many topics and ideas, participants recognised the importance

of transitioning towards real-world considerations. As P4 articulated, “But when you design an instrument right now, do you actually, would you actually need to see a picture of the finalised product?” This quote prompts a thoughtful reflection on the necessity of visual representation in the early stages of instrument design and aligns with the broader conversation on balancing speculative creativity with practical design considerations.

7 Five Strategies for the Use of AI Tools within Musical Instrument Design Workshops

Based on the findings from the post workshop discussion and our experience from running several fictional AI musical instrument workshops, we propose five strategies for practitioners facilitating future workshops:

Strategy 1: Provide Clear Activity Briefs and Starting Points Provide participants with a clear and specific brief to guide their creative process. Introduce constraints that help focus on practical aspects, such as playability, materials, potential users or context of use.

Strategy 2: Consider How Speculative the Designs Should Be Encourage storytelling and fictional elements into the design process, encouraging participants to create backstories for their instruments and imagine what it will sound like if brought to the physical world. We suggest establishing speculative designs by introducing real-world considerations like feasibility, playability and materials later in the workshop. Guide participants to think about the practical implications and applications of their designs.

Strategy 3: Structure Tasks Around Collaborative Engagement Promote collaborative design amongst the participants by facilitating discussions to refine and evolve ideas. Create common documents to work from which participants can access and return to. Ask small groups of participants to make a craft mock-up of a chosen instrument to collectively encourage further discussions.

Strategy 4: Encourage Iterative Interaction with AI tools Encourage participants to interact with the AI model iteratively, asking questions and seeking detailed descriptions. Make sure the participants are aware of methods of iterating on a design (in-painting, out-painting, re-use of prompts etc). Consider tools that allow participants to steer the AI model more effectively toward desired outcomes. We found that iterative design with AI tools is useful to participants due to the unpredictability of the first few outcomes.

Strategy 5: Involve Physical Materials and Activities We found that the use of physical objects in the workshop addressed some of the challenges mentioned in the findings from Workshop A in Section 2.5.1 and encouraged participants to move away from gestures associated to existing instruments to a new found gestural space. Create craft mock-ups of the AI generated designs within the workshop to help participants think about the scale of their designs, as well as decisions about other design considerations such as gestural control and mapping strategies. Ask the participants to present their craft mockups alongside the AI generated images to give plenty of material to convey their design ideas.

These five strategies aim to enhance the overall experience of using AI models in creative workshops, balancing the speculative and practical aspects of design processes whilst fostering an effective collaboration with the new technologies.

8 Discussion

The findings from prior workshops conducted by the authors; Workshop A 2.5.1, Workshop B 2.5.2, and Workshop C 2.5.3 provided essential context and experience that informed the development of the five strategies outlined above. Two of these workshops explored the integration of AI tools in co-design and speculative design practices, particularly within the design of new NIMes. In contrast, Workshop C focused on developing a broad range of musical instruments using traditional craft mock-ups alongside electronic components.

A key insight that shaped Strategy 3 was the use of a shared slide deck with a set template to structure the ideation process from Workshop C. We observed that participants duplicated, edited, and rearranged slides freely, allowing for an organic collision and melding of diverse concepts and ideas. Another significant finding, which informed Strategy 1, was the role of physical objects in participants’ immediate environments in seeding ideas. Participants often combined two readily available objects, quickly assembling and photographing them before adding them to the slide deck. This process helped ground design concepts in tangible, familiar materials.

Whilst Workshops A and B provided a platform to trial novel AI TTI generators with a range of instrument makers and musicians, incorporating physical craft mock-ups of the instrument designs, inspired by Workshop C, was a key focus. Generative AI facilitated expansive idea generation, yet participants noted the difficulty in transitioning from AI-generated images to images of realistic, playable instruments and physical prototyping activities helped ground the speculative ideas. By refining these approaches, we hope that facilitators can create more structured and meaningful interactions between participants and AI tools within workshop settings.

However, the AIMC workshop also revealed challenges and considerations for future iterations. Participants expressed a desire for clearer design briefs and constraints, highlighting the need for a balance between speculative and focused direction. The limitations of the AI tools were acknowledged, with participants desiring more constraints and productive starting points. The workshop discussion highlighted the importance of iterative design with AI tools and the consideration of feasibility, playability, and materials in the design process.

Whilst this series of workshops demonstrate the creative potential of AI tools from an instrument design perspective, where AI tools can help expand ideation and support diverse participation, they also highlighted the importance of critically engaging with the limitations and ethical implications of the tools. As these technologies become further embedded into co-design practices, considerations around bias, authorship, and the longer-term impact on creative agency and AI tools should be considered. Testing these tools in practice allowed us to explore their benefits while also navigating the complex ethical terrain in which they are situated. For example, over 90% of the images depicting people in the compendium were white, despite no prompts indicating the subjects’ ethnicity or nationality. Future workshop iterations should continue to question the ethical use of these tools, whilst seeking to use responsible and transparent technologies that are aligned with the values of the participants and facilitators.

9 Conclusion

Our exploration of “Instant Design” strategies for the use of generative AI in speculative ideation workshops builds upon

the authors' experience in facilitating workshops in fictional design and musical instruments. The workshop described in this paper provided insights from previous workshops, to propose an engaging approach to integrate generative AI tools into the creative process of musical instrument design.

To guide future workshops, we proposed five strategies based on post-workshop discussions and the authors' collective experience. These strategies aim to enhance the overall workshop experience, fostering effective collaboration between participants and generative AI tools while maintaining a balance between speculative exploration and practical design considerations.

10 Ethical Standards

Full ethical approval was received from the University of the West of England on 05/01/2023 for the duration of this project. Participants gave informed consent to be part of this project and had the right to withdraw at any time throughout the study.

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