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Beyond the Machine: Human-AI Collaboration in Jewelry Design

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Abstract

Creativity is a widely debated topic, as this concept is arguably the quintessence of Humankind. Artificial Intelligence constitutes a radical and unprecedented change because it disrupts this prerogative. The article analyzes the relationship between human creativity and Artificial Intelligence in jewelry design higher education. The hands-on research experience is described in terms of results, limitations, and opportunities. Integrating AI into the design process is not limited to mere technical assistance. Still, it is a dialogical collaboration in which AI becomes a creative partner that may support and amplify the designer's idea. In this context, designers behave as interpreters mediating between their vision, aesthetic, sensitivity, and the outputs of the software, which has to be coached and guided in a process of iterative dialogue.

Keywords: *Jewellery Design; Creativity; Artificial Intelligence; Higher Education.*

1. Myths, Machines, and the Human Mind: Navigating the Evolution of Creativity

But fiction has enabled us not merely to imagine things, but to do so collectively. We can weave common myths such as the biblical creation story, the Dreamtime myths of Aboriginal Australians, and the nationalist myths of modern states. Such myths give Sapiens the unprecedented ability to cooperate flexibly in large numbers.

Harari, 2015

The engine of innovation, artistic expression, and understanding of the social and cultural fabric: creativity, imagination, and, more generally, abstract thinking have played a crucial role in the history of humanity's evolution and its distinction from other living species, enshrining a key position in its evolutionary process (Harari, 2015): these capacities have enabled *Homo Sapiens* not only to survive but also to thrive, build complex societies and cultures, and become the dominant species on the planet. Imagination and abstract thinking are those abilities peculiar to humans to conceive ideas, develop concepts, and figure out scenarios that have no immediate

or direct physical counterpart in reality: this, therefore, means not only thinking about abstract concepts such as time, morality, or justice, but also the ability to imagine and prefigure objects, situations, or worlds that do not exist or have not yet existed. According to Yuval Noah Harari in his "Sapiens: A Brief History of Humankind," it is this very ability of ours to believe in shared stories, myths, religions, and ideologies that underlies our ability to cooperate in extended groups: it is these abstract narrative constructions based on imagination that have enabled humans to cooperate in a structured manner and vastly greater numbers than other living species, overcoming the limitations imposed by immediate interpersonal relationships. Imaginative abilities have thus been crucial to humankind's distinction and evolutionary success, enabling it to construct and navigate complex social and cultural realities unique to the animal kingdom. Artificial Intelligence now threatens to subvert this uniquely human prerogative to think, create, and imagine. Indeed, the introduction of Artificial Intelligence, especially in design, crafts, and applied arts in general, has thus ushered in an era of transformation, opening up new creative and technical possibilities. However, this disruptive innovation has also fueled debate about its role within creative processes and possible ethical implications (Mahadevan, 2018), such as replacing machines in activities that are not only practical but also speculative and creative, like art practices (Chatterjee, 2022). From the first industrial revolution onward, the role of technology, intended as *'machina*,' the machine, has been predominantly confined to the practical dimension, that is, to aspects related to the physical realization of objects, to mass production, and contrasted with *'manus*,' the expert hand of the artist or craftsperson that conferred uniqueness, preciousness, and harmony with its intervention (Bolton, 2016; Cappellieri et al., 2021). With the introduction of Artificial Intelligence, this debate has expanded: technology is breaking the boundaries of the physical dimension of artifact making, creeping into the imaginative skills that have always been the unique prerogative of humans. Recent research has opened the discussion around the role of AI and Generative AI in relation to creativity and art, focusing on the relationship between human intellect and the machine (Mazzone & Elgammal, 2019). This topic raises fundamental new questions: how is human creativity positioned in this new context? How can AI coexist with, complement, or even enhance human creativity in design? What skills will the new professionals working in design need to have? What impact will it then have on education?

2. Methodology

2.1. Structure and brief of the workshop

The research explores how integrating Artificial Intelligence in design education, with particular application to jewelry design, impacts the creative process and roles. The research was conducted through a month-long workshop experience in the Accessory Design Studio at the Master's Degree Program in Name of the Degree Program at the Name of the School of Name

of the Institution. The workshop involved 37 international students, 1 professor specialized in jewelry design, and 1 Ph.D. student as tutor of the activity. The brief of the project was to create a capsule collection that embodies the concept of the Greek binomial *Kalos Kai Agathos*, that means "beautiful is also good." This concept challenges the students to explore the contemporary notions of beauty today while integrating principles of sustainability and ethics into their design process. The target audience for this collection was Generation Z (GenZ), a demographic known for its strong values and desire for products that align with their beliefs. In particular, this is a generation whose shopping behavior is largely influenced on the one hand by digital technology and on the other by social factors (Turner, 2015; Kowalska et al., 2020). The methodology to be followed during the workshop to satisfy the requirements of the proposed brief included specific goals, i.e. concept exploration with concept statement exploring the brief; design integration and development including a mood board, target and lifestyle, sketches, technical drawings, material board, a physical prototype, and advertising board; sustainability research and ethical considerations; focus on GenZ. Students were asked to choose and integrate AI tools into their design process. The workshop included initial lectures on the project brief, contemporary interpretations of jewelry design, meta-design, and digital fashion, including suggestions on AI tools to experiment with in the design process. However, the AI tool integration process preferred learning-by-doing and free exploration methods.

2.2. Data analysis process

To conduct the analysis, a continuous observation process was activated through the conduct of lessons and project reviews. At each lesson, students participated in individual reviews with professors, showing their progress and explaining the design process used. Moments of independent individual work were promoted and conducted with continuous monitoring of the activity. Furthermore, the students were asked to produce a final report on the integration of the AI tools which was used to analyze the research results. In particular, specific questions were asked to the students, useful for arguing the report and collecting useful data: How did you integrate AI into your design process? Which AI tool? Why did you choose them? What was the positive feature of using them? Which was the negative one?. The analysis of the research results involved the evaluation of the design outputs, according to criteria of relevance to the design brief, autonomy of the design process, and originality of the concepts, and the analysis of the reports highlighting the AI tools used, role within the design process, limitations and opportunities of the tools, specific comments from students. In the following paragraph, the main results will be presented.

3. Results

The workshop produced 37 capsule collection proposals related to the *Kalos Kai Agathos* concept co-created with the support of different AI tools. Among the 37 reports produced by the

students, 5 were not taken into consideration for the analysis as they had partial or missing information on AI. Furthermore, one student expressly declared that did not use AI in the design process and was consequently excluded from the evaluation of the reports. In total, 31 reports exposed interesting results on the integration of AI tools into the design process. The students integrated 25 different AI tools into their design process, primarily using ChatGPT and Photoshop AI Beta. In particular, the tools identified are shown in Table 1.

Table 1. AI tools that emerged from the report submitted to the students. The table shows the name of the AI tool with the corresponding number of students who used it. The total number of students is 31. Source: created by the authors (2024).

CHAT GPT	27	PHOTOSHOP AI	11	MICROSOFT BING	3
ILLUSTRATOR AI	1	NOMAD	1	MITO DESIGN STUDIO	1
PROME AI	1	KHROMA	2	MIDJOURNEY	4
APPFLAIR	1	PIXEL CUT	1	GENCRAFT	1
GENTIMING.AI	1	DALL-E	3	ADOBE FIREFLY	1
PEBBLEY	2	LOOKA	1	VIZCOM	1
REMOVEBG	1	HYPOTENUSE AI	1	IMMERSE	1
RUNWAY	1	AI IMAGE ENLARGER	1	LEIAPIX	1
ZYRO	1				

3.1. Uses of AI tools emerged from the analysis

The students used ChatGPT especially in the ideation phase, favoring its conversational aspect to implement the initial brainstorming process and collect data on trends, competitors, and the target audience. Some of them stated how it supported their decision-making and allowed them to explore different design alternatives. They particularly appreciated "*the ability to engage in a dynamic conversation allowed for a more nuanced exploration*", the ability to "*expand my thinking and quickly understand a familiar concept*", or the fact that "*it helped me to get new ideas while I was mentally stuck*". Some non-native English-speaking students used it to help correct grammar and improve the project description. Although ChatGPT was considered an essential tool for exploring and carrying out research for the project, critical issues emerged relating to the truthfulness and timeliness of the information produced by the AI, often limited to the data with which it is trained. The students highlighted how the "*importance of grasping directions*" among the alternatives that the tool proposes emerges, underlining how the designer and creatives "*must adjust and confirm the information that it gives us*". This result is close to the discussion proposed by Verganti et al (2020), according to which the designer's activity, in relation to that of the machine, would be oriented more towards sensemaking, underlining the importance of leadership and decision-making, changing design practices.

3.2. Limits and Opportunities of AI tools

The students bring out a precise awareness around the limits of the AI tools, especially regarding the biases of the data it uses to produce answers regarding the lack of "*human touch*" in the answers and in understanding the emotional aspects of the project. Furthermore, some of them

appear concerned about the possibility of standardization of the proposed results and support the priority and essential role of the designer in the creation of the project: "*AI tools might lead to a potential reduction in the human touch and intuition essential for artistic expression in fashion design.*", "*it has limitations in generating truly creative and novel ideas. For the artistic aspects of fashion design, human creativity remains essential.*", "*The answers given to the prompts are not always specific, therefore giving general information sometimes useless*". The students also highlighted how many of the difficulties in obtaining the desired output, particularly when using Midjourney, DALL-E, or Photoshop's generative fill, were due to the learning curve of the programs, and that with more practice they would have acquired greater naturalness in writing prompts: "*I was pleased with the result, while in others, less so. This variation is also due to my limited knowledge of using them to their full potential.*", "*Ensure to invest time in understanding these tools to maximize their effectiveness and minimize potential pitfalls.*", "*managing prompts input to get desired results can be a daunting task".*

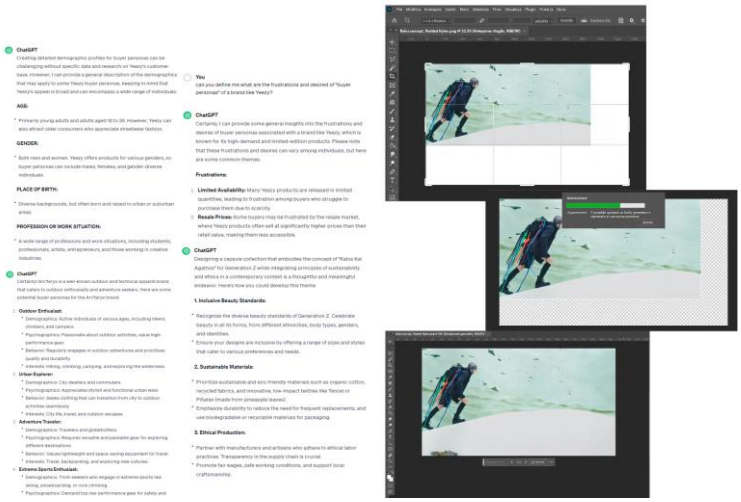

Figure 1. Example of a workshop student's combined use of ChatGPT and Photoshop AI Beta. In particular, the two tools were used respectively for the brainstorming and research stage, and for the editing of the ADV, i.e. for the beginning and end of the design. Source: images provided by the student in the final report of the workshop (2024).

4. Discussion

4.1. A Conversational Co-Creative Process

In ancient Greece, dialectics was the art of dialogue, of discussion. The dialectical method was based on structured dialogue between two or more people with different opinions. For Socrates, dialectics was a research method based on dialogue that he used to draw out personal thoughts

and positions from his students (Giannantoni, 2005). For Plato (Migliori, 1990), it was the tool par excellence of philosophy, being the privileged way to go back from the manifold to the unity of the Idea, which is the origin and final goal of knowledge: that cognitive procedure that allowed access to the essence of things, grasping the universal ideas beneath the multiple determinations of the real world. The dialectic approach thus allowed a higher truth or a better solution to be reached by synthesizing different perspectives. Dialectics thus constituted a method aimed at structuring an argument and a useful tool for seeking truths. Dialogue was the preferred tool for comparing different and sometimes opposing ideas. Through this tension between the parties, it was possible to explore and define abstract concepts, seek solutions or answers to complex questions, and enrich knowledge. Conversation, constructive confrontation, dialogic tension, fusion of different perspectives, collaboration, and iterative processes oriented toward effective solutions also underlie the relationship between human creativity and artificial intelligence. Although widely misunderstood as an autonomous creative entity, AI acts as a collaborative partner within the creative process. Images and ideas are not born "from" AI but "with" AI in a co-creative journey that merges human intelligence with machine computational capabilities. This synergy emphasizes the importance of the role of the designer, who is not just a creator but also a sort of *educator* for the AI software. In this co-creation process, the designer thus takes a proactive role, engaging in AI training to achieve coherent content and direct a given aesthetic. In this perspective, the AI is an evolved extension of the artist's palette. In this iterative dialogue, the workshop students challenged the AI on content and aesthetics, training the AI to recognize and replicate different styles in line with their visions. The designer's training of the AI software is not merely a technical act but an iterative creative process: they add their stylistic inputs and preferences into the system using prompts and images, and this process allows the AI to "learn" and develop an aesthetic in line with the sensibilities of its human trainer. The result is a hybrid output blending human aesthetics with AI's precision and processing power. The co-creation, therefore, is not unidirectional but appears as an ongoing dialogic tension between the designer and the software: designers gradually provide feedback on the outputs generated by the AI, moving closer to their original vision but embracing the unexpected. Indeed, the co-creation process involving Artificial Intelligence is characterized by high unpredictability. The diversity and uniqueness of AI-generated responses can enrich the creative process by introducing unplanned elements. This constant iteration allows for progressive refinement of the AI's creative capabilities, leading to results that are increasingly in line with the designer's content expectations and aesthetic sensibility.

4.2. Integrating Creativity and Technology: The Evolving Role of Designers in the AI Era

Interpreter, but also moderator, of this dialogic process, straddling the physical dimension of the real and the intangible world of the digital proper to AI: the figure of the prompt designer emerges as a possible key player in this iterative process. These creatives have the role of formulating textual prompts and inputting images that guide AI toward results that are as

specific and timely as possible, incorporating style, tone, and creativity. The prompt designer sits at the intersection of the technology analytic approach to technology and the synthetic approach to creativity, combining technical and creative skills: in fact, they must not only be familiar with the language and capabilities of AI but also be familiar with the design method, the logic of the reference system, in terms of physical and aesthetic constraints. Creating prompts becomes a design process in its own right: it is not just about providing instructions but about expressing concepts, emotions, and visions through a language the AI can interpret and transform into output. Prompt designers must be able to manage a dual point of view: seeing the world through the filters of AI to understand and predict how it can interpret and transform the input provided while maintaining their creative vision.

5. Conclusions

The paper analyzes the relationship between human creativity and artificial intelligence in higher education in jewelry design. It first highlights the privileged role of creativity and abstract thinking in the evolution of humanity. It identifies the introduction of artificial intelligence as a radical change precisely because it disrupts the prerogative. The research investigates how the introduction of this technology has impacted the world of jewelry design and its implications in higher education. The results highlighted how the iterative conversational aspect with AI tools such as ChatGPT is preferred, where human language intersects with the artificial one to generate creative alternative solutions. Having a co-assistant on the design project can push the limits of the human mind and provide enhanced design exploration. The limits of AI tools also emerge, especially in the possibility of standardizing the results and in the difficulty in the relationship with the machine itself, which involves a refinement of the language used to construct the prompt. The integration of AI into the design process is not limited to simple technical assistance; it is an actual collaboration where the AI becomes a creative partner that can amplify and enrich the designer's vision. In this context, designers behave as interpreters able to mediate between their vision, their sensibility, and the software outputs that must be coached and guided in a process of iterative dialogue. This new paradigm raises fundamental ethical questions about authorship, the creator's identity, and the nature of the creative process itself. In a world where AI plays such a central role in creation, what does it mean to be a designer? How is human creativity perceived and valued? These questions open up further research for an interdisciplinary field of inquiry involving technology, art, philosophy, and sociology.

References

Bolton, A. (2016). *Manus x Machina: Fashion in an Age of Technology*. New York: Metropolitan Museum of Art.

Cappellieri, A., Tenuta, L., Testa, S. (2021). *Jewelry Interactions: from Analog to Digital*. In: (ed) Yothers, W., Cappellieri, A., Richards, T., Testa, S. Digital Meets Handmade: Jewelry Design, Manufacture, and Art in the Twenty-First Century. Albany, New York: Suny Press, pp. 229-238, ISBN 1438487665

Chatterjee A. (2022). *Art in an age of artificial intelligence*. Front Psychol. 30(13). doi: 10.3389/fpsyg.2022.1024449.

Giannantoni, G. (2005). Dialogo Socratico e Nascita della Dialettica nella Filosofia di Platone. Bibliopolis

Harari, Y. N. (2015). *Sapiens: A Brief History of Humankind*. London: Arrow.

Kahawandala, N., Peter, S., Niwunhella, H. (2020). *Profiling purchasing behavior of Generation Z.* International Research Conference on Smart Computing and Systems Engineering (SCSE), Colombo, Sri Lanka, pp. 155-160, doi: 10.1109/SCSE49731.2020.9313038.

Mahadevan, S. (2018). *Imagination Machines: A New Challenge for Artificial Intelligence*. Proceedings of the AAAI Conference on Artificial Intelligence, 32(1). https://doi.org/10.1609/aaai.v32i1.12214.

Mazzone M, Elgammal A. Art. (2019). *Creativity, and the Potential of Artificial Intelligence*. Arts. 8(1), p. 26. https://doi.org/10.3390/arts8010026

Migliori, M. (1990). Dialettica e Verità. Commentario filosofico al "Parmenide" di Platone. Milano: Vita e Pensiero

Platone. (2007). *La Repubblica*. Editori Laterza

Turner, A. (2015). *Generation Z: Technology and Social Interest*. The Journal of Individual Psychology, 71(2) , pp. 103-113. DOI: https://doi.org/10.1353/jip.2015.0021

Verganti, R., Vendraminelli, L. and Iansiti, M. (2020). *Innovation and Design in the Age of Artificial Intelligence*. Journal of Product Innovation Management, 37(3), pp. 212-227. https://doi.org/10.1111/jpim.12523