INCORPORATING GENERATIVE AI INTO INDUSTRIAL DESIGN: IMPROVING BOTH PROCESS AND EDUCATION



Kavya K
Assistant Professor, Information Technology Department, Sambhram University, Jizzax, Uzbekistan

Annotation.

The integration of generative artificial intelligence (AI) propels advancements in product ideation, development, and production within industrial design. Through the automated generation of design alternatives, AI fosters creativity, streamlines efficiency, and tackles intricate design obstacles. This study delves into the impact of generative AI on improving the design process and the educational frameworks that equip designers for the future. By examining case studies, applications, and technological advancements, this investigation underscores how AI not only enhances the capabilities of industrial designers but also necessitates new educational methods to ensure the successful integration of these tools into the design curriculum.

Keywords: GENERATIVE AI, INDUSTRIAL DESIGN PROCESS, EDUCATION

1.Introduction

An application of machine learning called generative AI has become a game-changing tool in industrial design, providing new capabilities that alter conventional design processes. It produces design solutions using input parameters including material characteristics, structural specifications, and performance objectives. Through the simplification of ideation, optimization of material utilization, and facilitation of customization, this article seeks to investigate how generative AI improves the design process. The article also discusses how education is changing and how it has to change to prepare designers for a time when AI tools will be used extensively in the creative process.

Generative AI in Industrial Design Process By streamlining intricate design procedures, automating and boosting creativity, and opening up new avenues for product creation, generative AI is transforming the industrial design industry. Artificial intelligence may now produce design alternatives on its own based on inputs like goals, materials, and restrictions by utilizing machine learning algorithms. Every stage of the design process, from developing the initial concept to

manufacturing, is significantly impacted by this paradigm shift. Generative AI also describes systems that, given input parameters, employ algorithms to create content—like designs, pictures, or even 3D models—on their own. With the help of this technology, industrial designers may quickly investigate hundreds of possible design ideas, frequently revealing creative and refined forms that a human designer might not have thought of on their own.

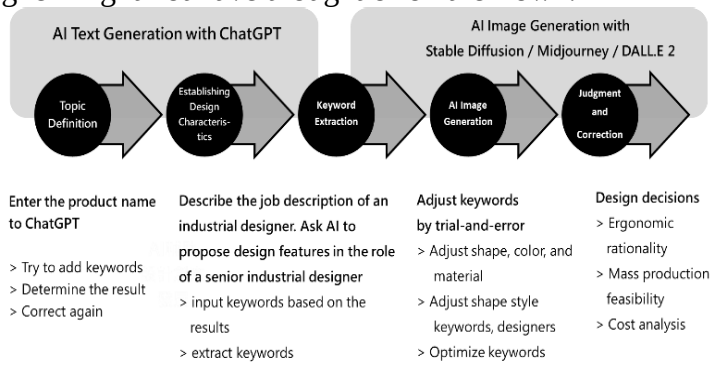


Fig. 1: Action Items for Generative AI in Industrial Design

Developing Concepts and Ideas

Generative AI helps designers during the ideation stage by quickly producing a variety of design choices according to predetermined criteria. This is in contrast to conventional approaches, where the designer's imagination and expertise are the main sources of ideation. AI allows designers to experiment with more options, such as shapes and forms that might not be immediately obvious when using manual design methods. For instance, Auto-desk Generative Design. With the use of this application, designers may create a vast diversity of design solutions by entering limitations, production techniques, and material qualities. AI has been utilized by automakers like General Motors to create seat brackets, which are 20% stronger and 40% lighter than conventionally built parts.

The Optimization of Structures

Design optimization for strength, weight, and material efficiency is one area where generative AI is especially helpful. Through performance and material consumption simulation, AI-generated designs can minimize material waste while meeting stringent functional requirements. This is particularly critical in industries like aerospace, where substantial cost and energy savings result from component weight reduction.

For instance, Airbus: The aerospace corporation created an ideal partition for its A320 airplane using generative AI. In comparison to traditional designs, the AI-generated design produced a component that was 45% lighter while preserving structural integrity.

Adaptability and Individualization

Generative AI creates designs based on user preferences, allowing for mass customization. As businesses increasingly offer customized products that meet the specific needs of each customer, this skill is especially pertinent to consumer product design. With the help of AI, designers can quickly create and alter designs in response to user input, providing scalability and customization.

For instance, Nike: a well-known shoe company that employs AI to create unique shoe designs from each person's foot scans. By optimizing each shoe for the wearer's foot shape and motion, this method improves both comfort and performance

Education for Design and Generative AI

Educational institutions need to change as generative AI becomes increasingly integrated into the design process in order to equip upcoming designers to collaborate with these cutting-edge technologies. It is imperative that traditional design education, which emphasizes manual skills like sketching and CAD modeling, change to incorporate competencies in data analysis, artificial intelligence, and algorithm-driven design.

Using AI to Teach Design

To make sure students understand how to connect with and control these systems, design

programs need to include AI technologies in their curriculum. In order for students to apply AI to enhance their design skills, courses should cover the fundamentals of machine learning, algorithmic design, and data-driven creativity.

Cooperation Between AI and Designers

Promoting a collaborative approach between designers and AI should be a key area of education. Students should be taught how AI can be a creative collaborator, providing fresh viewpoints and improving design results, rather than being seen as a substitute for human innovation.

Designing AI with Ethics in Mind

The ethical ramifications of AI in design should also be covered in educational programs. Important subjects for conversation include concerns about data privacy, intellectual property, and possible prejudice in AI-generated designs. Pupils need to be prepared to handle these difficulties in a responsible manner.

Generative AI's Future Prospects in Industrial Design and Education

There is great potential for generative AI in industrial design in the future. With the ongoing development of AI technologies, we may anticipate

AI-powered creativity: AI tools will help designers more and more with creative tasks, allowing them to experiment with form and function in hitherto unexplored areas.

Deeper interaction with CAD tools: AI will be able to work more smoothly with CAD software, enabling real-time AI-generated recommendations when designing.

Sustainability powered by AI: AI will be essential in advancing sustainability by improving product designs to utilize less energy and materials.

The development of design education will continue as educational establishments integrate AI-powered design tools into their foundational courses and inspire students to view AI as a collaborator in the creative process.

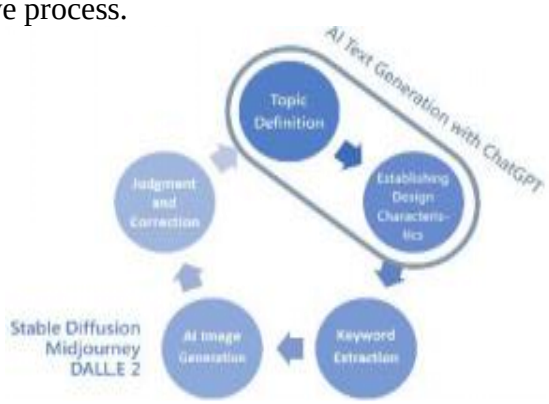


Fig.2 Generative AI aids design creativity.



Fig. 3 Using Generative AI for Design Education

Conclusion

Generative AI is automating the creation of creative, efficient design solutions, hence revolutionizing the industrial design process. It increases innovation, speeds up the development process, and provides never-before-seen levels of personalization. But as AI becomes more and more integrated into the design process, the business and academic institutions need to confront the issues it raises, such as data quality, ethical issues, and the changing role of designers. The entire promise of generative AI may be achieved through thoughtful integration of AI into design practice and education, paving the way for a more inventive, efficient, and sustainable design future.

References

1. N. Oxman (2016). "Age of Entanglement: The Role of Materiality in Digital Design." 168–184 in Design Studies, 47.

2. Fitzmaurice, G., Kazi, R. H., Grossman, T., and Chevalier, F. (2017). "DreamSketch: Early Stage 3D Design Explorations with Sketching and Generative Design." ACM Symposium on User Interface Software and Technology (UIST) Proceedings, 2017.

3. Autodesk (2021). "Generative Design: Empowering Designers to Achieve More."

4. Kazakov, V. A., and J. S. Gero (2018). "The Future of AI in Design: Implications for Creativity and Collaboration." 32(3), 265-278; AI EDAM (Artificial Intelligence for Engineering Design, Analysis and Manufacturing).

5. M. A. Schnabel (2017). "Designing with Generative Systems: An Exploration of AI's Role in the Future of Architecture and Industrial Design." 119–138 in Design Studies, 54.

6. Abdug'aniyev, B. (2020). Анализ инструментов расследования цифровой криминалистика. Архив Научных Публикаций JSPI.

7. Alishev, S. A., & Alishev, A. A. (2022). FORMATION OF STUDENTS'COMPETENCE TO OBTAIN INFORMATION USING INTERNET RESOURCES. In ТЕОРИЯ И ПРАКТИКА СОВРЕМЕННОЙ НАУКИ (pp. 128-130).

8. Bobobekov, S. R. (2022). Advantages of using cloud services to monitor student learning during the teaching process. Open Access Repository, 8(7), 5-8.