

ARTIFICIAL INTELLIGENCE VS DESIGNER: THE IMPACT OF ARTIFICIAL INTELLIGENCE ON DESIGN PRACTICE

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Abstract. *Technological advances, including the use of possibilities offered by artificial intelligence (AI), have become an area of strategic importance and a key driver of economic development. AI today has been integrated into a variety of economies, the design industry is no exception: AI is being increasingly applied in the development of design products and services. However, as technological breakthroughs rapidly shift the borders between the work tasks performed by humans and those performed by machines and algorithms, global labor markets are undergoing major transformations. This raises the question: how are these changes affecting and will continue to affect designers' work in the future? What skill sets will be needed for designers to begin or continue working in the industry? The article aims to perform a meta-analysis, summarizing the research on the impact of AI on the designer's professional activity and test the capabilities and results of AI-based design solutions. Research methods – theoretical – research and analysis of literature and Internet resources; empirical – case study to analyze possibilities and results of AI-based design solutions.*

Keywords: *artificial intelligence, designer, future, case study.*

Introduction

Technological development has become an area of strategic importance and a key driver of economic development (European Commission, 2020, World Economic Forum, 2018).

According to the results of the global employers survey, provided by the World Economic Forum (2018; 2020), technological advances, including artificial intelligence, are set to dominate the period of 2018–2025 as drivers positively affecting business growth.

Recent theoretical developments have revealed that artificial intelligence (AI) influences business by creating competitive advantage, new opportunities, expanding the range of customers, connected devices that provide a constant flow of data on functionality, usage, production, and customer needs. These options can provide companies with a competitive advantage by creating results that

people can quickly interpret, predict, and use (Pandya, 2019). This a mature field that is now being spun out into commercial applications. AI today has been integrated into a variety of economic sectors, such as finance, national security, health care, transportation, and smart environment technologies. The design industry is no exception: AI is being increasingly applied in the development of design products and services.

However, there is the other side to the coin. The latest World Economic Forum (2020) data show that “by 2025, 85 million jobs may be displaced by a shift in the division of labor between humans and machines, while 97 million new roles may emerge that are more adapted to the new division of labor between humans, machines, and algorithms”. This is more widely used at the time of the COVID-19 pandemic. “Automation, in tandem with the COVID-19 recession, is creating a ‘double-disruption’ scenario for workers” (World Economic Forum (2020).

Not all designers today use AI-based programs, which allows to generate design solutions saving time. However, potential customers of designers have increasing opportunities to directly, without live contact, obtain them on AI-based sites.

This raises the question: how are these changes affecting and will continue to affect designers' work in the future? What skill sets will be needed for designers to begin or continue working in the industry?

The article aims to perform a meta-analysis to define future challenges for designers, design curriculum developers, and educators.

Research methods: theoretical – research and analysis of literature and Internet resources; empirical – case study to analyze possibilities and results of AI-based design solutions.

This research considers the field of the impact of Artificial Intelligence as the main subject of its study.

Opinions on the Prevalence of AI in the Work of Designers

Views on the “next normal” and future work of designers and architects are widely discussed in various media, websites, and blogs.

The central question is: will AI and robots replace creatives – designers and architects? Here are different opinions. The most concerned are professionals in design and related fields.

1. Architects and designers will be replaced by software applications.

Sebastian Errazuriz (2019) believes that ninety percent of architects will lose their jobs, if artificial intelligence takes over the design process, since machine learning will allow software applications to synthesize a large volume of projects

in a short time, customers will be able to define to an app their intensions, requirements, and budget and get a range of options in seconds.

S. Errazuriz (2019) considers that only 1%, maximum 5% of architects will survive, so a tiny elite will continue architecture. In this context he recommends designers and architects to become programmers.

2. Designers and architects will not be replaced by technologies in the near future.

In turn, results of a survey of graphic designers "Will" Graphic Designers "be replaced by AI & Robots?" (Will Robots Take My Job?, n.d.) show that there is a very little chance of this profession being replaced, however, the chance of automation in the next 2 decades could be 39%.

Analysis of data from a study on computerization by two Oxford professors show that there is only a 1.8% chance U.S. architects' jobs will be automated in the next decade or so (Lubell, 2018).

3. AI facilitates architects' and designers' workflows by analyzing large amounts of data in a short time and offering solution options.

Another group of authors (Ervin, 2019; Philips, n.d.; Tailor Brands, 2019; Andersen, 2019) – design thinkers and researchers (Verganti et al., 2020) – believe that AI will transform the design industry, yet these technological advances will not replace human designers. AI will mainly be related to optimization and speed. M. Philips (n.d.) claims that designers working with AI will be able to create designs faster and cheaper due to the increased speed and efficiency it offers.

Tailor Brands (2019) points out that designers will play a more complex and nuanced role, while artificial intelligence tools will facilitate the work of human designers by preserving tools rather than replacing them. Thus, human designers will be required to oversee the process and make the most important decisions. M. Andersen (2019) considers artificial intelligence as a possibility that will allow designers to integrate AI applications, such as machine learning, into their current practice.

This necessitates to define a new set of skills that are essential for designers to work in their specialties.

Extensive research on design issues in the age of artificial intelligence has been carried out by R. Verganti, L. Vendraminelli and M. Iansiti (Verganti et al., 2020).

The authors characterize the traditional design process as an intermittent activity that is performed irregularly, especially in cooperation with users; as a complex process in time and resources, resulting in projects. If the use of AI is limited with the automation of existing design tasks, the essence of design practice remains the same. However, the cases of Netflix and AirBnB show that the impact of AI profoundly changes the practice of design.

Using AI capabilities, problem-solving, usually performed by designers, is automated into learning loops that think in a radically different way than a designer. They operate without limitations of volume and speed, address complex problems through simple tasks, iterated exponentially (Verganti et al., 2020).

The authors (Verganti et al., 2020) conclude: AI does not undermine principles of design thinking. By removing limitations in scale, scope, and learning, it realizes the ultimate form of people-centeredness, with experiences that can be designed and improved for each person. AI may enhance creativity, by expanding the scope of the design space beyond product categories and industries.

Approaches to AI Solutions for Designers and Architects

As it is noted by the group of researchers (Lee et al., 2019), there are two AI development approaches: symbolic and neural.

Symbolic AI includes all programming methods and systems that use symbols, such as letters and numbers, to encode human knowledge, rule-based actions, and defined policies. It assumes that high-level representation symbols and combinations of symbols performing reasoning in a manner similar to human deductive reasoning (Lee et al., 2019). So, symbolic AI thinks like a human. Symbolic AI is the most well-known and widespread AI systems applied in manufacturing and production, design, process planning, production control, and diagnosis (Lee et al., 2019).

Neural AI or Connectionism relies on an artificial neural network (ANN) or an aggregate of machine learning algorithms enabling computers to learn from data. “Technically, can be classified into three areas: (1) supervised learning, which involves learning from correct answers (labeled data); (2) unsupervised learning, defined as finding knowledge or information when given some raw data (unlabeled data); and (3) reinforcement learning that entails how agents in an environment take action to maximize their rewards” (Lee et al., 2019). Machine learning approaches are suitable to solve more complex problems by learning like neurons in a human brain.

Parametric and generative designs are considered innovative approaches and the future of design. Both have a broad range of use, most importantly, they are applied in industrial and interior design and architecture. Each relies on advanced algorithms in the process offering speed and reliability (archistar.ai, n.d.).

Parametric design is an interactive process that allows creating designs based on the input of parameters, such as materials, site constraints, even environmental issues, to test options and to make changes in real time (Rahman, 2020; archistar.ai, n.d.). “Whether parametric algorithms use iteratively

some components in order to identify the best solution to a specific design intent within a design boundaries (parameters and rules), the process may be defined as Generative Design technique” (Monizza et al., 2017).

According to the explanation of the term, **generative design** is an iterative process that uses advanced algorithms to find the best solutions, which are based on the parameters provided by the designer. With the built-in AI, the software learns from every set of solutions (archistar.ai, n.d.). E. Souza (2020) characterizes generative design as a combination of parametric design and artificial intelligence together with the restrictions and data included by the designer.

Parametric and generative design techniques are more effective in decision-making processes, in case of information and relationships that have to be defined (Monizza et al., 2017).

Different authors (Reddy, 2020; Schumacher, 2020; AI and the Future of Design..., 2017) highlight ways how artificial intelligence can reshape architecture and design. V. Reddy (2020) characterizes Parametricism (*parametric design, aut.*) as “a hidden weapon that allows changing specific parameters to create various types of output designs and create such structures that would not have been imagined earlier”.

According to the author (Reddy, 2020), such a tool and process allows artificial intelligence to reduce human effort giving the best results possible by analyzing a large amount of data.

Artificial intelligence-driven parametric design allows designers to quickly and easily explore a huge number of alternative directions creating millions of design variations in a small amount of time. Thanks to these opportunities the productivity of most designers will increase dramatically (AI and the Future of Design..., 2017).

Parametric design is not related only to software but also to the results of using them – an architectural style.

Patrik Schumacher (2020) considers parametricism as architecture’s answer to contemporary, computationally empowered civilization. According to the author, parametricism is the only style that can adequately address the new societal tasks posed to architecture by the new social dynamics engendered by the information age. It is congenial to recent advances in structural and environmental engineering capacities based on computational analytics and optimization techniques.

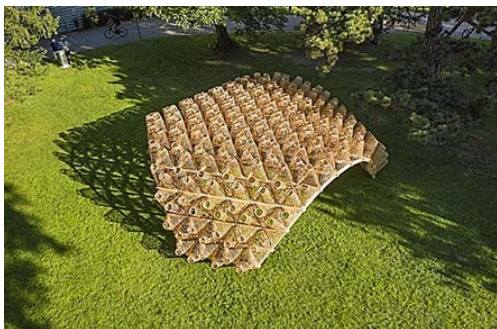
In this regard, V. Reddy (2020) opposes P. Schumacher (2020) considering such outline depicts parametric design not merely as a useful tool but as the enabler of an entirely new kind of architecture, a new aesthetic. The author (Reddy, 2020) believes that such formulations make parametricism more related

to taste than problem-solving. V. Reddy (2020) mentions another important possibility in using AI as a tool in research: analysis of data and results.

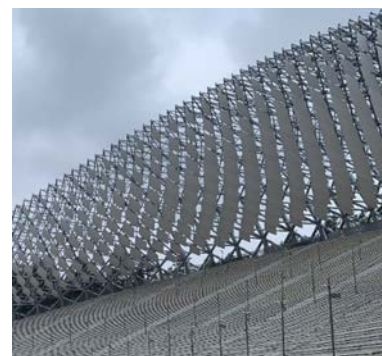
AI analyses the collected data in seconds and recommends different solutions. Decisions that are based on research and reliable data are important in the development of both design and architectural projects. There, as the specialists from the Autodesk development team point out (Smolker, 2020), generative techniques offer the ability to filter and select the solutions that suit the goal the best.

Designers and architects use computer programs (Revit, Grasshopper, Rhino, Finch, Dialux, Blender, etc.) which makes it possible to create a variety of shapes and simulations.

Many world's star architects, such as Zaha Hadid, Norman Foster, and others, as well as Latvian architects, have used software to design their buildings. For example, the Wicker Pavilion (DJA, architects: D. Jaunzems, & D. Sapega) is designed combining contemporary architecture and Latvian traditional craftsmanship (Fig. 1, 2) and the architecture of National Open-Air Stage in Mezaparks (Studio Mailitis Architects). This is the place where the Latvian Song Festival takes place. This stage is a symbol of the wisdom of life and the Latvian landscape (Fig. 3, 4).



*Figure 1, 2 Wicker Pavilion. Ancey Paysages landscape architecture festival.
DJA, architects: D. Jaunzems, & D. Sapega, 2020.
(<https://www.youtube.com/watch?v=otoP8puJzKY>)*



*Figure 3, 4 National Open-Air Stage, Mezaparks, Riga, Latvia.
Mailitis Architects, 2016. (Photo: Egils Dalmanis)*

There are designers and architects who do not limit themselves to the use of computer programs, they have also mastered programming. Michael Hansmeyer (2003-2019) is an architect and programmer who, inspired by cell division, explores the use of algorithms and computing to generate an architectural form.

Summarizing all the opinions, the authors can agree with Rob Girling (n.d.): – when humans and computers work together, they can accomplish amazing things that neither could do alone. However, questions of sense and purpose are becoming increasingly important.

Can Everyone be a Designer?

Software companies continue to offer an impressive range of AI-based graphic and interior design platforms that are available to everyone.

In addition to the theoretical research described in the previous section, a case study has been conducted. Without claiming to be experts in the field of AI, the authors analyze some available parametric design programs and platforms from the designers' position.

To assess whether the existing AI solutions for design development are competitive with the work of professional designers, the authors tested: 1 interior design site Planner 5D and 4 logo design sites: Designs.ai, Tailor Brands Studio, Design Iconic and Brand Crowd.

For comparison, the authors evaluated logos and design solutions of the AI designer Nikolay Ironov, which is based on neural AI.

Methodology

The interior design site Planner 5D was tested according to the criteria:

- a) Principles of design development;
- b) Choice of materials, colors, furniture, lighting fixtures and equipment;
- c) Opportunities to make changes.

Logo design sites was tested according to the following criteria:

- a) Comprehensibility and structure of the site;
- b) Design development criteria;
- c) Offered opportunities;
- d) Execution speed and volume of designs;
- e) Quality of results;
- f) Customer's ability to make adjustments.

Results

Evaluating the strengths and weaknesses of the considered AI platforms, it can be concluded:

1. Planer 5D is a home interior design application, which offers quite a few options: it allows to change the dimensions and geometry of the room, to add floors, to choose doors, windows, materials, furniture, light fixtures, etc. When testing the program, it appeared to be simple and considerably suitable for any user. The program allows to use templates, as well as to create an individual design, which calls into question the functionality and quality of non-professional solutions.
2. The structure of the service is almost identical on all logo design sites: possibility to define the industry; for some, to choose keywords and slogans; to choose a type of sign – only text or symbol and text; to choose a coloristic solution;
 - 2.1. Paid sites have good internet speeds and options;
 - 2.2. The number of options offered is significant – about 300 pages with more than 10 design solutions each;
 - 2.3. The program generates design options instantly;
 - 2.4. Programs do not generate symbols but choose them from the available range. They seem to be quite seen, sometimes illogical combinations of text and characters are formed;
 - 2.5. Customers have limited options to adjust the selected option – change the distances between letters, lines of text.
 - 2.6. Against the general background, AI designer Nikolay Ironov (n.d.), established by Art Lebedev Studio, stands out and seems different and quite well educated. If the examples analyzed above were clearly impersonal, then in this case we can talk about style and individuality, which makes each designer unique. Since Nikolay Ironov (NI) is based on neural AI (Kulinkovich, 2020), it indeed does not think like a human being, offering quite unusual and unconventional solutions (Fig. 5). Judging by the company's turnover, NI also surprises customers.

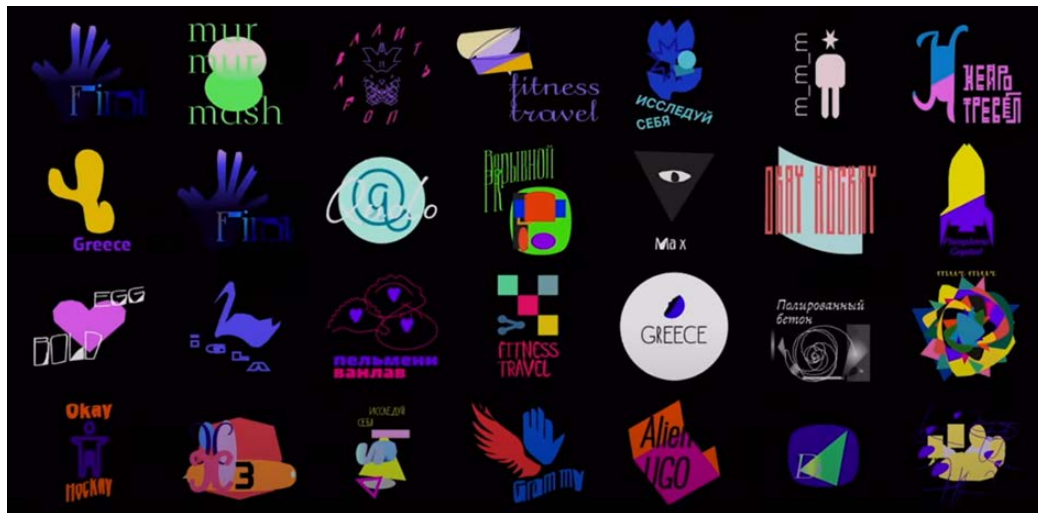


Figure 5 Logos (Nikolay Ironov, n.d.)

The analysis leads to the conclusion: although there are some positive examples, there is a possibility that the world will be flooded with design solutions of mediocre or questionable quality. There is a need for professional knowledge to assess the quality of the solution. This should not be considered critical in the case of individual housing, but in the field of corporate identity, the quality is essential.

Can everyone be a designer? It depends on the definition and understanding of design. However, it is clear that only a person with a professional education can develop solutions, including samples, to teach AI, that complies with the principles of “good design” (Rams, 1976), which have not been challenged to this day. It seems that another question is more appropriate in this context: does everyone need a good design?

Conclusions

1. The possibilities offered by technology allow optimizing the work process of designers, save time and costs.
2. The use of AI in the provision of design services change a business model: the product development does not require a human designers and managers: generation of design samples, cooperation with customers and selling take place simultaneously.
3. The new work model defines new work tasks for designers determining the need for new competencies to design the problem-solving loops that will develop the design solutions.
4. If previously managers were taught to think and act as designers, now designers will have to plan and manage processes as curators, innovation managers, or art directors. It brings design closer to management sciences.

5. AI will not completely replace human designers, because only the designer can define what is meaningful and important, determine when to continue the process and when to stop, approve or reject the solution.
6. The demand for designers with traditional design education will likely decrease in the future. This makes it necessary to consider changes in the design education process and content.

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