Haaga-Helia

Artificial Intelligence in Digital Design

Irina Pchelnikova

Haaga-Helia University of Applied Sciences

Bachelor’s Thesis

2022

Abstract

Author(s)
Irina Pchelnikova

Degree

Bachelor of Business Administration

Report/thesis title

Artificial Intelligence in Digital Design

Number of pages and appendix pages

27 + 5

Being the mix of art and technology, digital design is one the most fascinating and fast-changing area of information technologies. When it comes to innovations in digital design, by using the game-changer technology Artificial Intelligence (AI) designers can create immersive digital masterpieces within seconds, having thousands of various shapes and colours to choose from. The best time for designers, isn't it? However, some of them assume that the AI algorithm might replace designers in the future.

The aim of this research is to explore the present and future of AI in design by gathering information from various sources and providing answers to the main research questions:

- What are the main constrains of utilizing AI in design?
- What are the main pros and cons of using Artificial Intelligence in design?
- Will AI algorithm replace designers in the future?

In the theoretical part of the research the author explains the main principles of AI and its brief history and explores what AI can do in various digital design areas such as UX/UI design, websites and mobile applications, graphic design and logos, VR and 3D design. Also, the possible future trends of AI in design were explored in this part.

In the empirical part, the researcher analyses qualitative data by gathering insights from the survey, conducting expert interviews and summarising various points of views in the final discussion. The data collected from the respondents and experts was visualised using charts to make it easier to understand quickly by non-experts.

In the discussion and conclusion part the author summarizes all data collected from the respondents and the experts to provide detailed answers to the main research questions and oppose them against the theoretical part.

The results of this study valid only on the context where the author conducted survey and interview. To generalize the results, further investigation needed by collecting more responses and conducting more interviews.

Keywords

Artificial Intelligence, digital design, IT industry, designers, UX/UI

Table of contents

Abstract 2
1 Introduction 1
1.1 Research question 2
1.2 Research objectives 2
2 Theoretical Background 3
2.1 Brief history of Artificial Intelligence and Machine Learning 3
2.2 Possible dangers that AI can pose 3
2.3 Current practices of AI in different areas of design 4
2.3.1 Applications and Websites Design 4
2.3.2 Graphic Design 6
2.3.3 Social Media 7
2.3.4 VR/AR Design 7
2.3.5 3D Design 8
2.4 Future trends of AI in design 9
2.5 AI design - is possible to recognize it? 9
3 Research method 12
3.1 Data collection methods 12
3.2 Questionnaires and Expert Interviews 12
4 Data collection and analysis 14
4.1 Questionnaire: collection and analysis of valuable insights 14
4.2 Expert Interviews 20
5 Discussion and conclusion 22
5.1 Discussion and learning outcomes 22
5.2 Reliability and validity 24
6 Conclusion 25
References 26
Appendices 28
Appendix 1. List of questions for the questionnaire 28
Appendix 2. Transcript of the interview with Expert A 29
Appendix 3. Transcript of the interview with Expert B 31

1 Introduction

Living in 21st century is an amazing adventure, and we are the lucky ones to see how the familiar world we live in is rapidly transforming to the high-tech and aesthetically perfect world from the science fiction books and movies. Artificial Intelligence (AI) is a one of the magical technologies helping us to reach that perfect world dream a bit faster.

Artificial Intelligence, particularly Machine Learning (ML), – the machine's ability to keep improving without human, - is the most important general technology of our era. (Brynjolfsson & McAfee 2019, 12.)

According to Nadia Batok (2020)," Artificial Intelligence is the use of computer science programming to imitate human thought and action by analysing data and surroundings, solving or anticipating problems, learning of self-teaching or adapting to a variety of tasks".

Machine Learning (ML) is an application of Artificial Intelligence that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. The key differences between AI and ML are:

- Artificial Intelligence will go for finding the optimal solution and leads to intelligence or wisdom.
- Machine Learning will go only for the solution, whether it is optimal or not, and leads to knowledge. Batok (2020).

Due to its enormous potential, AI plays important role in such areas as health care, transportation, finance, manufacturing, education, media, customer service, travel – basically, almost every sector successfully uses AI. Most people don't even realize how often they interact with AI in their daily routine life by using, for example:

- Voice, text and speech recognition tools: chatbots, Siri, Google Assistant, speech-o-note transcribing, translation of languages;
- Image and video recognition: face recognition on photos, Face ID;
- Travel navigation;
- Smart homes and smart cars - Tesla electric car;
- Drones: Amazon and Walmart drone delivery

Especially for big companies, AI is a game-changer as it helps businesses to get to the new level of relationships between customers and product, significantly raising the level of

customers satisfaction. Due to its amazing cognition and problem-solving ability, AI can help companies to analyse huge amount of raw data to improve and automate business processes and resolve complex issues in a fast and effective way. Bernard Marr (2019, 6) considers that AI can help business to better understand their customers, offering them products and services they might want, and based on that predict marketing trends and create a personal approach for each customer. In the future, AI could help humans at work, performing tasks that are dangerous for humans and assisting in medicine, caregiving, security, building and industry. Batok (2020).

When it comes to design, using innovative game-changer AI, designers create immersive digital masterpieces within seconds, having thousands of options of various shapes and colours to choose from. The best time for designers, isn't it? However, some of them think that the robot will replace human force.

The aim of this research is to explore the amazing things that AI can do for various digital design areas, such as UX/UI design of websites and mobile applications, graphic design and logos, digital media design, VR and 3D design.

1.1 Research question

The aim of this research is to explore the present and future of AI in design by gathering information from various sources and providing answers to the main questions:

- What are the main constrains of utilizing AI in design?
- What are the main pros and cons of using Artificial Intelligence in design?
- Will AI algorithm replace designers in future?

1.2 Research objectives

This research thesis would be especially useful for UX/UI, web and graphic designers, AI enthusiasts and professionals.

Main objectives:

- Analyse the difference between AI-based and human design
- Gather information about AI in design from various digital sources
- Explore the current and future trends of AI in design
- AI vs designers: can algorithm replace the human force?

2 Theoretical Background

2.1 Brief history of Artificial Intelligence and Machine Learning

According to Bernard Marr (2019, 3.), AI refers to the ability of computer systems or machines to display intelligent behaviour that allows them to act and learn autonomously", - in simple worlds, AI follows certain calculations or algorithms (rules) written by a human and applies them to the data to make decision or predict outcomes.

The term "artificial intelligence" was first introduced in 1995 by the professor of Dartmouth John McCarthy, although the roots of AI can be tracked to 1942 when the famous American writer Isaac Asimov published his novel "Runaround", where for the first time introduced his three laws of robotics: obey the orders, not to hurt human being, protect its own existing as long as it doesn't conflict with the first and the second laws. This science fiction masterpiece was so much ahead of its time and inspired a lot of scientists in the field of robotic, AI and ML, including Marvin Minsky, the co-founder of the MIT AI laboratory. (Haenlein & Kaplan 2019, 6.).

In 1960, the US Department of Defense funded the research into AI and ML, however, despite the promising predictions, it took many years for AI to finally change our world. In 1957 the economist Herbert Simon predicted that computers would beat a human at chess in 10 years, but it took nearly 40 years. (Brynjolfsson & McAfee 2019, 13). In 1997, finally, IBM's chess-playing computer Deep Blue beat world chess champion Gary Kasparov.

2.2 Possible dangers that AI can pose

Indeed, AI makes our world a better place. However, everything has its price, and people can potentially face harmful effects of AI and Big Tech.

Nadia Batok (2020) in her article "Artificial Intelligence has changed our world" describes some example of dangers that AI can pose in the future:

- Invasion of privacy: although even today it's possible to track us, AI may lead to loss of privacy even more. For example, facial recognition can identify individual in the crowd on the streets. Due to AI's ability to work with huge amount of data, this data is stored and analysed and can be used further by authorities. China is working on AI-based Social Credit System that will give all Chinese citizens a score

based on their behaviour, including, for example, parking in wrong places, smoking, etc.

- Loss of human jobs: AI's main purpose is to help most of the people to do their job faster and efficiently, but as AI becomes more advanced, in future it will take over jobs performed by humans. According to a report by the McKinsey Global Institute, around 800 million jobs could be lost worldwide due to automation by 2030.

2.3 Current practices of AI in different areas of design

2.3.1 Applications and Websites Design

According to Statista Research Department (2022), the global AI software market is going to grow significantly in the coming years, reaching around 126 billion U.S. dollars by 2025.

Since AI-based applications are getting more and more advanced, take over user markets and displace non-AI apps, we will explore some main advantages of AI-based apps.

According to NeoITO (2021), some main perks of mobile AI are:

- More Powerful App Authentication: AI will have more significant impact on security and authentication so AI will keep apps informed about irregularities and anomalies in user behaviour. AI, ML and blockchain can reduce threat perceptions and vulnerabilities;
- Automated Reply Functions: auto-reply feature in AI-based apps enables communication between user and device. For example, Gmail already uses smart reply feature to understand the message and suggest answer accordingly;
- Real-Time Language Translation: AI-enabled translators integrated into our mobile apps allow our smartphones to translate various languages instantly without Internet connection and, and it perfectly works offline;
- Improved Security with Facial Recognition: introduced by Apple in 2017, facial recognition had some issues, but combined with AI today it works perfectly and can be also used, for example, to make sure that kids cannot access restricted content on the internet, or in medicine, helping doctors to diagnose patients by scanning their faces;
- Enhances Search: AI-based voice and image recognition to significantly improve user experience. As an example, Goodle Lens uses AI to recognize an item or a person/animal on image and give all details about the product, even where you can buy it (see figure 3).

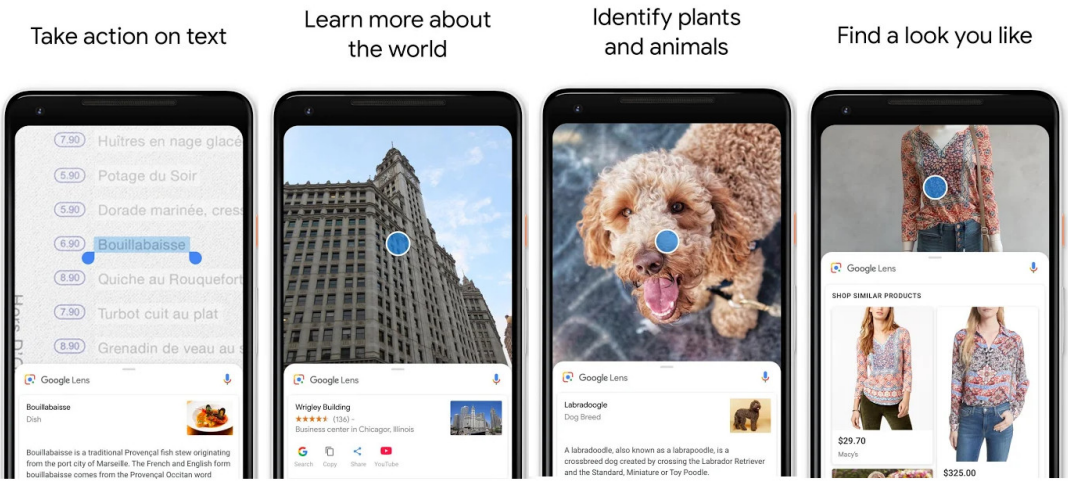

Figure 1: Goodle Lens (Source: Neowin 2018)

- Recommendation services: AI helps to provide users with relevant content for each user to keep them engaged and increase sales for eCommerce apps such as Amazon. For example, when we buy some product in app, we see “Customers who bought this also bought …” ;
- Emotion Recognition: allows to read human emotions by uses advanced AI image processing and audio data interpretation;
- Automated Reasoning: for example, Uber uses this feature to study and process trillions of data from drivers and then use it to predict time to destination, price, etc. to make the net ride faster and more comfortable;
- Behavioural Patterns: almost all AI-based apps learn from user’s behavioural patterns and use this data to improve user experience.

Advantages of AI-based websites:

- Artwork and language personalization: as an example, Netflix’s personalized recommendation system uses AI to generate the right title for each user, testing various of different titles to find the most compelling for each user which will convince user to watch (see figure 4);

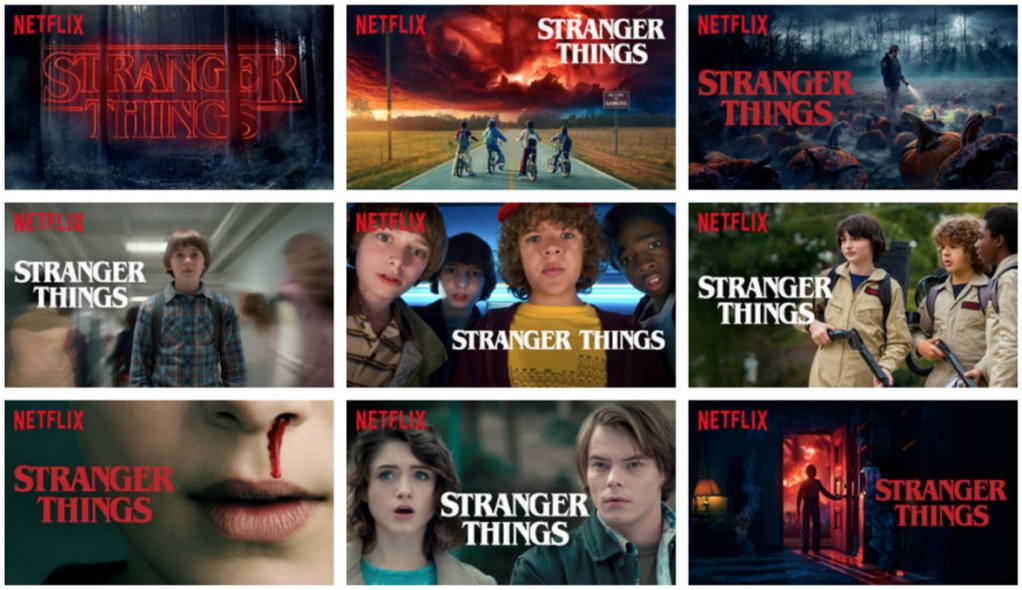

Figure 2: Examples of titles with different artwork (Source: Netflix TechBlog 2017)

- Advanced AI chatbots;
- AI for Enhancing UI: User Interfaces (UIs) optimized through AI can take design decisions entirely on their own and produce functional and attractive web design. For example, the popular web development platform Wix actively uses ADI (artificial design intelligence) to allow users create customize websites by choosing from millions combinations, created by algorithm;
- AI Recommendation and Optimization Tools: for example, Netflix's recommendations based on user's preferences;
- AI as a Web Design Diagnostic Tool: AI-powered analytics tools effectively eliminate the need for A/B testing and get better site design results. (Ifran 2020).

2.3.2 Graphic Design

Today, AI is the best friend of lucky ones working in digital design industry as it can generate millions of shapes, figures, and layouts just within seconds and without any human assistance, and many companies had already benefited from trying new ways of product design.

For example, the company Ferrero making popular hazelnut spread Nutella "hired" AI to work as a package designer, and it created seven million of unique patterns and colors of Nutella's package, and all seven million of jars with this special edition were sold out in Italian supermarkets within a month (see figures 3 - 5). (Dezeen 2017).

Figures 3 - 5: Unique AI-based design of Nutella jars (Source: Dezeen 2017)

2.3.3 Social Media

Today, almost all popular social media platforms use AI to improve user experience. Mike Kaput (2021) in his article “AI for Social Media: Everything You Need to Know” providing us with examples of AI in different social media:

- Facebook: Facebook uses AI to predict what content user prefer based on user’s historical engagement, also it uses AI to target advertising to audiences;
- Instagram: uses AI to target ads and serve users interesting content based on what users have engaged with in the past;
- YouTube: uses AI is to fight misinformation by identifying and flagging videos;
- TikTok: almost entirely AI-based, every video on TikTok is directly determined by AI ranking algorithms to meet each user’s preferences.

2.3.4 VR/AR Design

Why VR/AR and AI are” made for each other”? According to Rebekah Carter (2021), “Artificial intelligence and virtual reality are two of the most exciting technologies in the world today. While both solutions focus on different things, they each allow human beings to have a deeper connection with the digital world. Virtual reality uses a combination of software and hardware to immerse human beings within digital environments. Artificial Intelligence supports us in creating technological advancements that can respond intelligently to situations”.

Examples of blending AI and VR/AR:

- VR tours with AI virtual assistant: VR tours are already commonly used by, for example, airlines, amusement parks and hotels, and together with AI virtual assistant answering user questions and suggesting activities it creates truly immersive user experience;

- Shopping: VR creates new ways to enhance the shopping experience – customers can virtually “try out” products before making a purchase. Using AI, the seller could also suggest similar products based on previous purchases;
- Virtual co-working spaces: companies can also benefit from AI by creating virtual co-working space for remote employees from different part of the world to work on projects together (metaverse). With AI, virtual assistant can, for example, take notes, transcribe conversations in real-time, bring some documents and find information needed for meetings and discussions. (Carter 2021).

2.3.5 3D Design

“3D modelling empowered with Artificial Intelligence (AI) is no longer in the future. It’s the present” - Rugile Uzdavinyte (2021). According to Uzdavinyte (2021), main benefits of AI AI in the 3D modelling are:

- Reducing of time of 3D modelling process;
- With AI, bigger number of 3D models can be produced at the same time;
- Need for manual work to produce simple 3D models reduced to minimum, allow designers to spend more time on complicated models, but quality assurance are always done manually;

However, AI not yet capable of replacing the human eye. It capable of producing simple 3D models, but the perfect reflection, light, shadows, and optimized polygon count still have to be made by the 3D artist. The figure below is an example of the same 3D model made purely with AI (left) and the other one improved by our 3D artist (right), and we can clearly see the difference. (Source: Sayduck 2020).

Figure 6: Example of a 3D model made with AI (left) compared to the one improved by a 3D artist (right) (Source: Sayduck 2020)

2.4 Future trends of AI in design

Can one predict a future? According to Olha Bahaieva (2021), when it comes to future of AI in design, we can try to guess some main future AI trends based on its current practices:

- Creative interaction design: enabling smooth user's transition from one screen to another without any page breaks; creating a design that made up of screens flowing into each other;
- 4-dimensional and multi-sensory design: appeals to users using smell, touch, taste and sound;
- Gene marker design: as most likely everyone will have personal genetic marker (DNA sequence) in future, designers can take an advantage of it by meeting each person's unique needs and preferences;

Rob Girling (2022) also believes in the bright future of AI in design:

- Everyone can be a designer: no need to be a "creative" or to learn specific skills, AI tools will create millions of shapes, colours and layouts to choose from;
- Designers will be a curator, not creator: in the future, designers will train AI to solve design problems by creating models based on preferences.

2.5 AI design - is possible to recognize it?

Is AI-based design better than a human-based and can regular users distinguish between them?
According to Marc Shenker (2021), AI design means that machine learning has advanced to the point where it is almost impossible to tell what was created by the human and what was created by the machine. Shenker describes some characteristics that can help human eye to identify AI design:

- Distortions
- Too much perfections
- Angular features
- Intricate patterning
- Striking, vibrant colors
- Great attention to detail

For example, new AI text-to-art generator DALL·E 2 by OpenAI is extremely realistic tool to convert any text into masterpieces. Indeed, it is almost impossible to realize that this painting (see figure 7) was created by algorithm and not by a human painter. Although it is a huge progress for AI, some people concerned with the power of the tool since they used to believe that machine is not capable of creating piece of art and completely displace artists (Piper 2022).

The text for the figure below was: “a painting of a fox sitting in a field at sunrise in the style of Claude Monet” (OpenAI 2022).

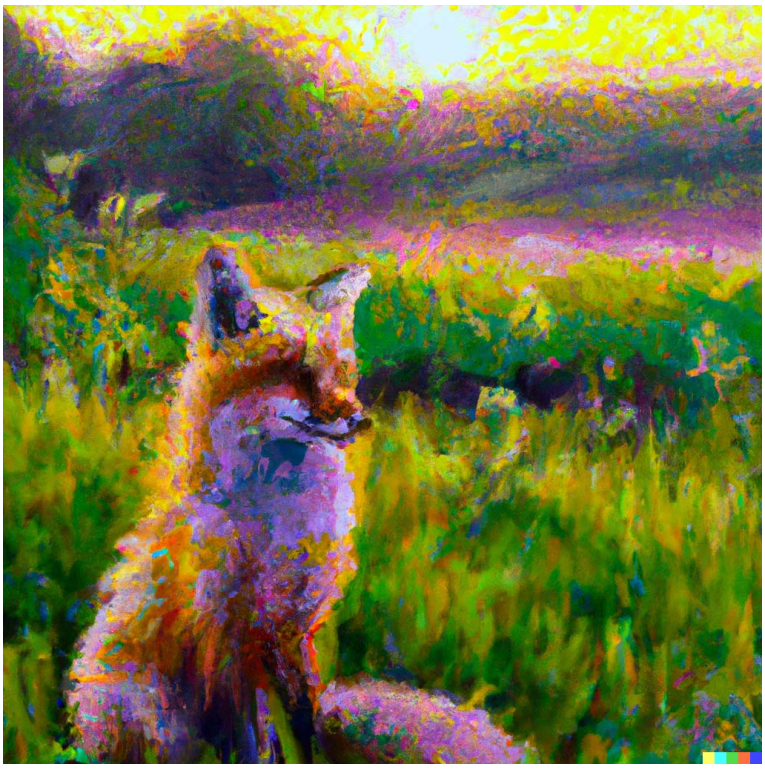

Figure 7: AI artwork created by DALL·E 2 (Source: OpenAI 2022)

Another example is a funny story about Russian famous designer Artemy Lebedev. His design studio (the best well-known in Russia) makes logos for famous persons, and once Russian famous YouTube blogger Yuri Hovansky has ordered a logo for his blog and merchandise, and the final logo is demonstrated on the figure 8.

Figure 8: Nikolay Ironov's logo for Yuri (Source: Artemy Lebedev's studio 2022)

Yuri did not like it at all and was looking for the designer who created this "masterpiece". On the Lebedev studio's website he found out that the name of designer is Nikolay Ironov and he has been working in studio since 2018. Guess what? Exactly, there are no person named Nikolay Ironov works in the studio. Nikolay Ironov is the name for AI-based neural network and nobody ever could guess that the machine has created this and many other logos and designs.

3 Research method

Since the aim of this research is to provide the reader with an answer to the main question of research through discussions and expert interviews, qualitative research method is the most suitable research method for this topic.

3.1 Data collection methods

According to Nicholas Walliman (2011, 72 - 73), qualitative data cannot be accurately measured and counted, rely on human interpretation and evaluation, and cannot be measured in a standard way. However, it doesn't mean that qualitative data are less valuable than quantitative; on the contrary, the richness of qualitative data can lead to great insights into human society. For qualitative research method, some typical examples of collecting the data are interviews, observation notes, meeting minutes, documentary films, historical records, memos, etc.

3.2 Questionnaires and Expert Interviews

Another perfect way to collect qualitative research data is using questionnaire. This method has a significant advantage since it helps to collect data from many respondents from different locations without talking and meeting them; it easy and convenient for interviewer and respondents, cheap and quick way to collect and organize large number of responses, and even embarrassing questions can be asked with a fair chance of getting true reply. However, questionnaires have to be short and simple, without complex question structures. (Walliman 2011, 97).

To collect the data for this research, interviews would be the best option since interviews are particularly useful when qualitative data are required. (Walliman 2011, 99). There are three types of interviews that are mostly used for data collection:

- Structured interview: pre-maid questions, following interview schedule, answers may be in closed format;
- Unstructured interview – a flexible format, based on the choice of the interviewer;
- Semi-structured interview – contains both structured and unstructured formats with standardized and open type questions. (Walliman 2011, 99).

Interviews can be carried out by different ways, for example, face-to-face interviews, group interviews, or telephone interviews. (Walliman 2011, 100).

To collect the data, 2 – 3 expert interviews will be conducted for this research. Due to COVID-19 restrictions, it would be safer to conduct interviews remotely by using modern technologies such as Zoom, the most popular software for video and audio calls and online meetings.

4 Data collection and analysis

4.1 Questionnaire: collection and analysis of valuable insights

Since the aim of this research is to answer the main question – can AI algorithms replace human designers –, the best way is to find the answer by analysing various points of views, collecting insights from respondents and experts, and organizing the final discussion. In this part, we will analyse the data from questionnaire responses.

Although questionnaire is the best option for collecting responses fast, quickly, and anonymously, it was complicated to collect responses for this specific research, since the respondents preferably have to be experienced in digital design industry and have at least the basic knowledge about AI.

Total number of responses collected: 18

Tools used to collect the data: Typeform and Google form

Questions: the questionnaire includes questions for both qualitative and quantitate methods of data collection (see the full list of questions in Appendix 1).

Data analysis methods: while analyzing quantitate data from responses, pie charts have been created as a visualization of collected data. Charts and diagrams are easier to understand quickly by non-expert than are results presented in numbers (Walliman 2011, 118).

Q1: What is your current occupation?

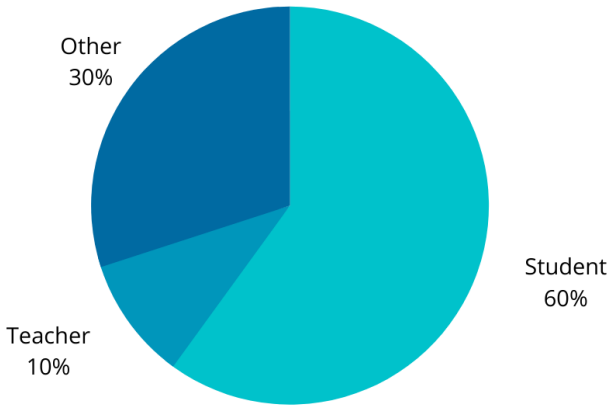

Figure 9: Pie chart questionnaire responses for question 1

Figure 9 demonstrates that most of our respondents (60%) are students, 10% teachers and 30% chose “Other occupation”.

Q2: How long have you been in digital design industry?

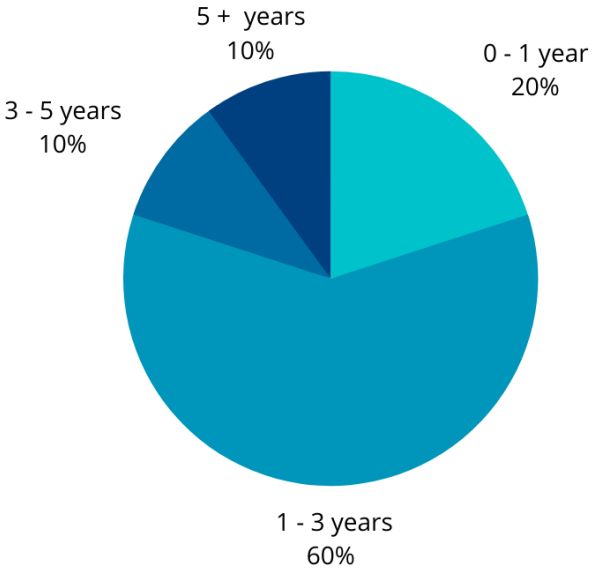

Figure 10: Pie chart questionnaire responses for question 2

Figure 10 demonstrates that the most of our respondents (60%) have been studying digital design or working in the digital design industry for 1 – 3 years, 20% chose 0 – 1 year, 10% 3 – 5 years, and 10% more than 5 years. This numbers illustrates that most of the respondents have some experience in digital design industry.

Q3: Does your organization use Artificial Intelligence in design projects? If yes, please specify how exactly and for what purpose?

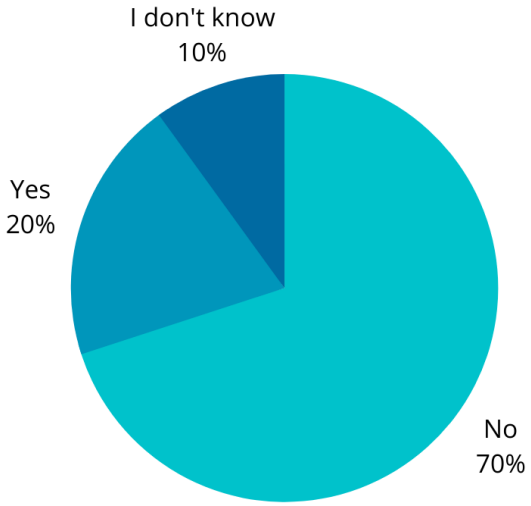

Figure 11: Pie chart questionnaire responses for question 3

Figure 11 demonstrates that the most of organizations of our respondents (70%) do not yet utilise Artificial Intelligence in design projects, and only 20% of the respondents confirmed that their organizations use AI in design projects, 10% of the respondents does not know.

Q4: Would you use Artificial Intelligence in your design projects? If yes, please specify, how exactly and for what purpose?

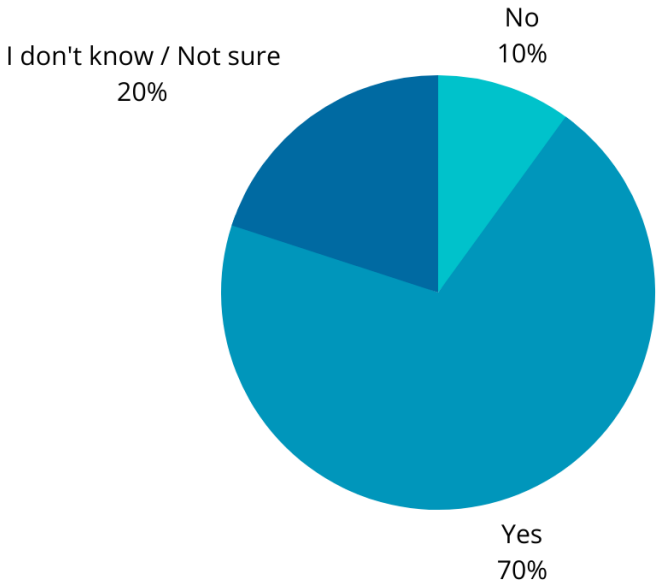

Figure 12: Pie chart questionnaire responses for question 4

Figure 12 demonstrates that most of the respondents (70%) would use AI in their design projects, meaning that the respondents are mostly optimistic about using AI.

Most interesting responses for the second part of the question “If yes, please specify, how exactly and for what purpose?”:

- “Yes, probably, intended use behavior does not equate actual use behavior. So either in the actual design this gap can be reduced or later acquired use data and AI can lead to a better design.”
- “I might like to know what applications are possible, and with that knowledge evaluate how to apply it to our processes, if it is practical, then yes”

Q5: Could you briefly describe the main pros and cons of using Artificial Intelligence in design?

Main pros:

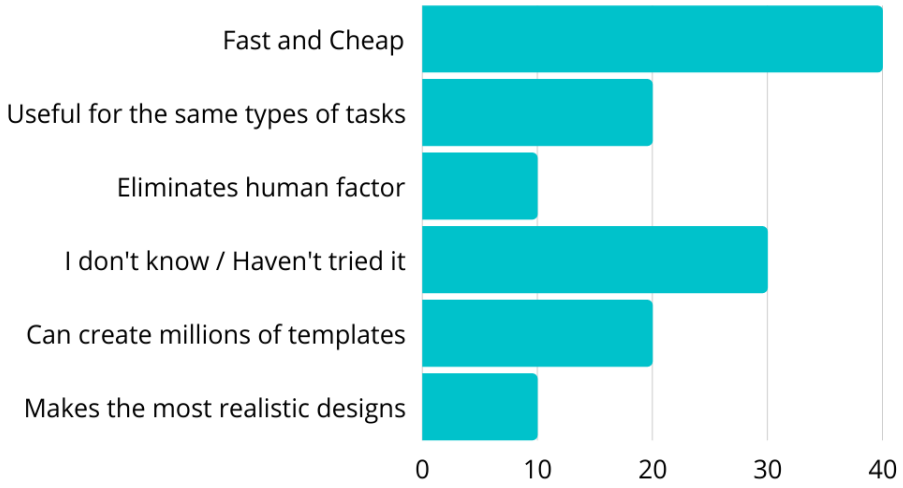

Figure 13: Row chart questionnaire responses for question 5

Figure 13 demonstrates that most of the respondents (70%) have provided in-depth answers to the question, meaning that the respondents have at least the basic understanding of AI and its main advantages. 40% find AI fast and cheap tool to use in their design projects. 30% of the respondents have not yet tired utilising AI, therefore they might get confused with this question. 20% mentioned the ability of AI to create millions of design templates, meaning that these respondents are more advanced in this matter. 10% of the respondents thinks that AI eliminates human factor, and the other 10% considers AI to make the most realistic designs, illustrating the full understanding of the subject in question.

Main cons:

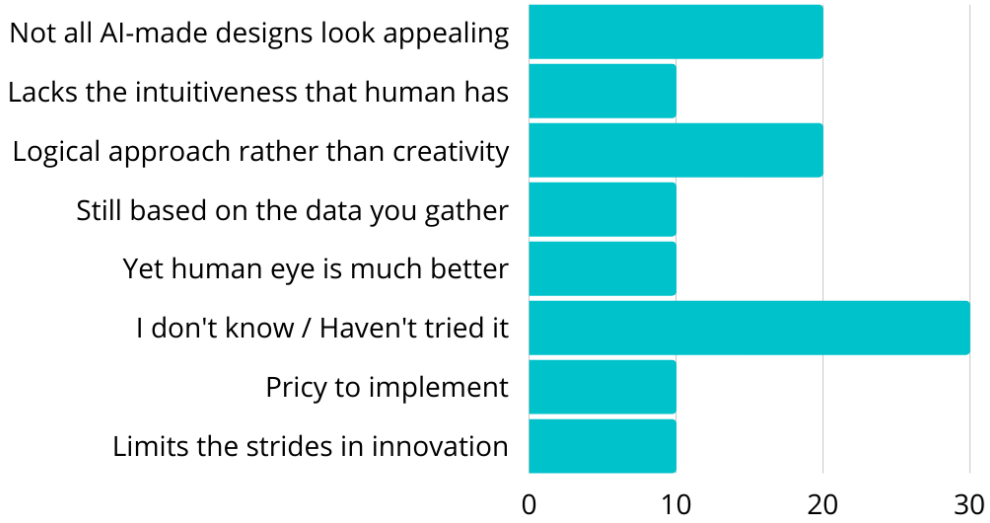

Figure 14: Row chart questionnaire responses for question 5

Figure 14 also demonstrates that most of the respondents (70%) have provided detailed responses for the second part of the question. 20% of the respondents think that not all AI-made designs look appealing, and the other 20% assume that AI is about logical approach rather than creativity. Other respondents (50%) mentioned: lacks the human intuitiveness, based on the data gathered, human eye is much better tool, pricy to implement, limits the strides in innovation, meaning that the respondents understand the principles of AI in design and its main disadvantages.

The most interesting response for this question:

- “Pros: finding hidden patterns or breaking through long-held beliefs (biases)”
- “Cons: garbage in equals garbage out. It is still based on the (historical) data you gather. That also limits the strides you can make in innovation.”

Q6: Artificial Intelligence will eventually replace designers: do you agree or disagree, and why?

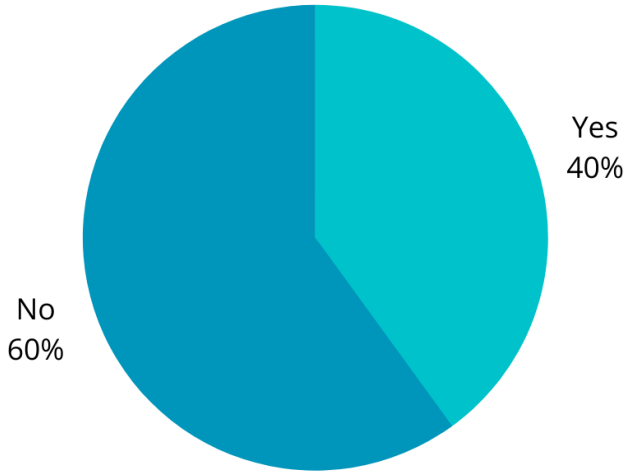

Figure 15: Row chart questionnaire responses for question 6

Figure 15 demonstrates that most of the respondents (60%) do not agree that AI would eventually replace designers, at least not in the nearest future, meaning that the most of respondents do not consider AI as a replacement for “human eye”.

Q7: What are the main constrains of utilizing AI in design?

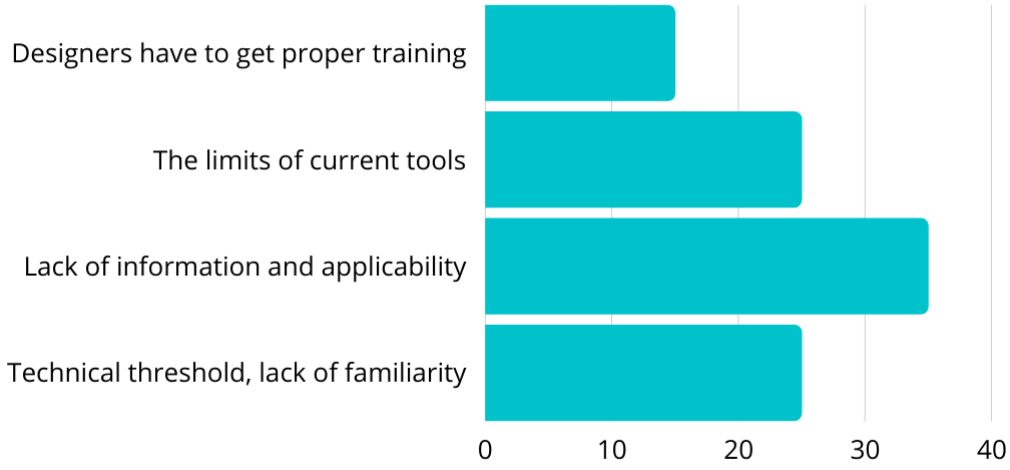

Figure 16: Row chart questionnaire responses for question 7

Figure 16 demonstrates that most of the respondents (35%) believe that the one of the main constrains of utilizing AI in design is a lack of information and applicability. 25% of the respondents think that currently there are limited number of AI-based tools, and the other 25% mentioned the technical threshold and lack of familiarity. 15% of the respondents believe that designers have to get the prober training in order to successfully utilize AI.

4.2 Expert Interviews

Total number of interviews: 2

Data collection method: for this research, semi-structured interview format is the one that gives the most flexibility to both interviewer and interviewee

Tools used to collect the data: both interviews were conducted remotely and recorded via Zoom (Expert A) and MS Teams (Expert B) and transcribed using the tool Otter.ai.

Interview transcript: please see the transcripts for both interviews in Appendix 2 and 3

The process of planning and conducting expert interviews:

- Sending emails to potential candidates for expert interviews;
- Including in the emails a list of example questions and discussing the preferred way of conducting an interview (online or offline). In this case, potential candidates were invited to participate in remote interviews via calls, using online communication tools Zoom and MS Teams;
- Scheduling a call with experts;
- Asking questions and recoding the interviews;
- Transcribing the interviews and analyzing data collected;

Based on the data collected from expert interviews, user profiles of experts have been created:

Expert A

- a lecturer at Haaga-Helia UAS

- 45 + years old man

- 15 + years in digital design industry

- Encourages his students to learn more about AI tools

- Does not think that AI will replace designersin at least for next 10 years because "machine can only think logically, but the design is not fully logical things. Some designers have creativity, and this creativity doesn't come usually from the logical thinking, the creativity is different"

Figure 17: the user profile of Expert A

Expert B

- a lecturer at Haaga-Helia UAS

- 45 + years old man

- 35 + years in IT industry

- Encourages his students to learn more about AI tools

- Does not think that AI will replace designers because "some work could be transferred to automated design, however, eventually we will always need someone to mentor and monitor what the results AI produces."

Figure 18: the user profile of Expert B

Summary: figures 17 and 18 illustrate that our experts have concluded that AI is still far from complete human replacement since it lacks the intuitiveness and creativity and mainly suitable for creating simple patterns, shapes and layouts to choose from, instead of working on the complex designs with textures.

5 Discussion and conclusion

5.1 Discussion and learning outcomes

For the past years, AI has been a hot topic in different sectors, including the digital design industry. The power of AI still amazes and sometimes even scares people; therefore, AI and its impact has always been the controversial point raising a lot of questions.

Like it has been stated in section 1.1, the aim of this research is to explore the present and future of AI in digital design and provide the answers to the following research questions:

- What are the main constrains of utilizing AI in design?

Based on the results of the study as shown in figure 16, most of the respondents (35%) believe that the main constrains of utilizing AI in design is a lack of information and applicability, 25% of the respondents think that currently there are limited number of AI-based tools, and the other 25% mentioned the technical threshold and lack of familiarity. This result means that most our respondents have fair knowledge about AI and full understanding of the subject in question.

Expert A assumes that the main constraint is that machine cannot think like a human being, machine can only think logically, but the design is not fully logical thing (see Appendix 2).

- What are the main pros and cons of using Artificial Intelligence in design?

Pros: based on the data collected from the respondents, figure 13 illustrates that most of the respondents (70%) have provided in-depth answers to the question, meaning that the respondents have at least the basic understanding of AI and its main advantages. The main pros of using AI in design mentioned by most of the respondents: fast and cheap, useful for the same type of tasks, eliminates human factor, can crate millions of templates, makes the most realistic design.

Cons: figure 14 demonstrates that most of the respondents (70%) also have provided detailed responses for the second part of the question. According to the respondents, the main cons: not all AI-made designs look appealing, AI is about logical approach rather than creativity, lack of the human intuitiveness, pricy to implement.

Expert A believes that the main challenges from the design perspective is that the intuitive cannot be done through machine, but the positive part is that the machine could get the user preferences and profile and then provide the solution over the age. Based on that, it could be a good approach and benefits for everybody, both the designer and the user (see Appendix 2).

Expert B assumes that the main pros could be an ability to generate a lot of different kinds of variations on certain elements. It would be also very cheap to produce lots of different kind of patterns. When it comes to the cons – AI is another technique one should learn and be able to apply, so it might be time consuming the result wouldn't be the quality wanted (see Appendix 3).

- Will AI algorithm replace designers in future?

For the final and most important question of the research, as it shown in figure 15, most of the respondents (60%) do not agree that AI would eventually replace designers, at least not in the nearest future. However, 40% of the respondents have expressed the opposite view by assuming that AI will eventually take over designers' jobs. For example, there are some opposite points of view were expressed:

- «I disagree. Sometimes you have to try something completely new. That is not AI's strong suit»
- «Agree but it will take more than a decade. People have not found a tool for a well detailed explanation of their creative requests»

As it demonstrated in Expert A and Expert B user profiles (figures 17 and 18), both experts have concluded that AI is still far from complete human replacement.

All experts from the theoretical part of this research have also drawn the same conclusion for the main question of our research – can AI replace designers in future, - and the simple answer is "no", at least not now or in the nearest future.

For example, Miklos Philips (2018) thinks that AI and robotics are not going to replace designers in a short term, but instead AI provides designers with exiting opportunities that would be available because of co-creation with AI.

Tailor Brands, AI logo design and branding platform (2019), claims that "Artificial intelligence tools will facilitate the work of human designers while remaining a tool – and not a replacement — for human designers".

5.2 Reliability and validity

The results of this study valid only on the context where I conducted survey and interview. To generalize the results, we need to investigate further by collecting more responses and conduct more interviews.

6 Conclusion

Before starting this research, I was deeply convinced that AI in design is a vast and complex topic for the research thesis, and I proved myself right – indeed, most of the respondents do not have enough experience of utilizing AI in design, therefore it was hard for some of them to answer the questions.

However, being a freelance UX/UI designer and having a friend with his own design agency who has been already successfully utilizing AI in creating logos and various patterns, I'm deeply interested in innovations and new opportunities that AI can bring to this field. Therefore, conducting research about AI in design was challenging yet exiting opportunity for me to explore the mix of art and technology and have a look into the future of digital design.

In the nearest future, I aim to conduct further research of this topic since I find the topic innovative and meaningful, and the results of this research would be valuable for the IT and digital design industry. For the further research, more experienced respondents from the digital design industry would be invited to fill in the questionnaire, and more experts' interviews would be conducted to collect valuable data for the next steps of the research process.

References

Bahaieva,O. 2021. How AI will affect design trends in the future. URL: https://bootcamp.uxdesign.cc/ai-will-affect-design-trends-in-the-future-c9d2e9b51c7a. Accessed: 14 March 2022.

Batok, N. 2020. Artificial Intelligence has changed our world. URL: https://wsimag.com/science-and-technology/64215-artificial-intelligence-has-changed-our-world. Accessed: 19 March 2022.

Brynjolfsson, E. & McAfee, A. 2019. Artificial Intelligence: The Insights You Need From Harvard Business Review. Harvard Business Review Press.

Carter, R. 2021. Why Do AI and VR Go Together So Well? URL: https://www.xrtoday.com/virtual-reality/why-do-ai-and-vr-go-together-so-well/ . Accessed: 23 March 2022.

Dezeen. 2017. Algorithm designs seven million different jars of Nutella. URL: https://www.dezeen.com/2017/06/01/algorithm-seven-million-different-jars-nutella-packaging-design/ . Accessed: 19 March 2022.

Girling, R. 2022. AI and the future of design: What will the designer of 2025 look like? URL: https://www.artefactgroup.com/ideas/ai_design_2025/ . Accessed: 14 March 2022.

Haenlein, M. & Kaplan, A. 2019. A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence. California Management Review.

Ifran, M. 2020. Artificial Intelligence and the Future of Web Design. URL: https://usabilitygeek.com/artificial-intelligence-and-the-future-of-web-design/ . Accessed: 19 March 2022.

Kaput, M. 2021. AI for Social Media: Everything You Need to Know. URL: https://www.marketingaiinstitute.com/blog/ai-for-social-media . Accessed: 19 March 2022.

Marr, B. 2019. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems. John Wiley & Sons, Incorporated.

NeoITO. 2021. Top 10 Advantages of Artificial Intelligence in Mobile App Development. URL: https://www.neoito.com/blog/ai-in-mobile-app-development/ . Accessed: 19 March 2022.

OpenAI. 2022. DALL·E 2. URL: https://openai.com/dall-e-2/ . Accessed: 10 May 2022.

Philips, M. 2018. The Present and Future of AI in Design (with Infographic). URL: https://www.toptal.com/designers/product-design/infographic-ai-in-design . Accessed: 14 March 2022.

Piper, D. 2022. AI art generator provokes horror and awe online. URL: https://www.creativebloq.com/news/openai-dall-e-2-art . Accessed: 10 May 2022.

Piper, D. 2022. AI art generator provokes horror and awe online. URL: https://www.creativebloq.com/news/openai-dall-e-2-art . Accessed: 10 May 2022.

Shenker, M. 2021. Trend Report: Artificial Intelligence and Design. URL: https://creativemarket.com/blog/trend-report-artificial-intelligence-and-design . Accessed: 14 March 2022.

Statista Research Department, 2022. Revenues from the artificial intelligence (AI) software market worldwide from 2018 to 2025. URL: https://www.statista.com/statistics/607716/worldwide-artificial-intelligence-market-revenues/. Accessed: 19 March 2022.

Tailor Brands, 2019. AI and the future of design. URL: https://www.informationage.com/ai-future-of-design-123486346/. Accessed: 14 March 2022.

Uzdavinyte, R. 2021. 3D modelling empowered with Artificial Intelligence (AI) is no longer in the future. It’s the present. URL: https://sayduck.com/2021/07/01/3d-modeling-ai/ . Accessed: 23 March 2022.

Walliman, N. 2011. Research methods: the basics. Routledge.

Appendices

Appendix 1. List of questions for the questionnaire

Examples of questions:

1. What is your occupation?
2. How long have you been in digital design industry?
3. Could you briefly describe what do you know about Artificial Intelligence in digital design?
4. Does your organization use Artificial Intelligence in design projects? If yes, please specify, how exactly and for what purpose?
5. Would you use Artificial Intelligence in your design projects? If yes, please specify, how exactly and for what purpose?
6. Could you please briefly describe the main pros and cons of using Artificial Intelligence in design?
7. Artificial Intelligence will eventually replace designers: do you agree or disagree, and why?
8. What are the main constrains of utilizing AI in design?
9. Please provide your email for further clarification, if needed.

Appendix 2. Transcript of the interview with Expert A

Irina: Thank you for participating in our interview! Could you please introduce yourself? What are you doing in what's your current occupation?

Expert A: Right now, and for next month I will be a lecturer at Haaga-Helia, then I will move on with different universities.

Irina: Okay, thank you. How long have you been in digital design industry?

Expert A: It's more than 16 years.

Irina: All right. Could you briefly describe what do you know about artificial intelligence in design?

Expert A: Since I'm teaching artificial intelligence, I know mainly the challenges associated with AI and design, but AI in design is the early phase and getting its momentum right now. So, I know the background very well. A lot of extensive research are ongoing to make design tools intelligent. Now, for example, there are some universities in Finland, they are doing a lot of research that make design tools intelligent, to predict, for example, the color based on the culture or based on the user profile and so on. This type of initiatives are ongoing, but since design is more about the intuitiveness, that's make the design very difficult. And that's makes the AI as a design tool, not as easy as, for example, AI in natural language processing. So that's why it's difficult and tough. But I think within the next five years, we will see more robust application and development in these fields.

Irina: Yes, thank you, can you briefly describe the main pros and cons of using AI in design?

Expert A: Since design is based on our own experience and intuitiveness, we cannot decode and come up with the intuitiveness through coding, even though deep learning somehow makes this kind of similar behavior as neural network to come up with intuitiveness, but still AI is far from being replaced completely with human. So, in that sense, we are at the early phase of the design using AI. For example, some companies have used utilized AI to design kind of brochure, advertisement flyer or something like that, but as robust design, we are not yet there, we need more investigation and studies and so on. The main challenges from the design perspective is that the intuitive cannot be done through

machine, but the positive part is that if, for example, the machine could get the user preferences and profile, and then provide the solution over the age. Based on that, it could be a good approach and benefits for everybody, both the designer and the user, in sense that machine recognizes what kind of application setups I have.

Irina: In the nearest future, AI will replace designers, do you agree with this?

Expert A: as a complete replacement, I don't see it at least for next 10 years, but eventually it will be feasible, and we will get some robust tool by then by five years.

Irina: Okay, and the next question: what are the main constraints of utilizing AI design?

Expert A: the main constraint is that machine cannot think like a human being, and it requires a lot of development algorithm which we are going toward that direction. I can put it like this: machine can only think logically, but the design is not fully logical things. So that is the main problem right now. Some designers have creativity, and this creativity doesn't come usually from the logical thinking, the creativity is different, and that's makes things hard.

Irina: Yeah, I agree. Thank you. And the last question: as a teacher, do you encourage your students to learn more about AI based tools? And if you do, then how do you encourage them?

Expert A: I encourage them in the digital design path to learn basic AI. That is, I think it's crucial that they learn, because they need to know that within next five years AI will be dominated in all sectors. We also have to remember that AI is extent for the designer since it can help significantly, for example, in color selections or identify the emotion that are associated with different colors, and these things can be done with AI. That's why I encourage students to learn the tools, there are many tools now exist, and in my digital service prototyping course I encourage students to learn AI tools and to practice.

Appendix 3. Transcript of the interview with Expert B

Irina: Thank you again for participating in our interview. Could you please introduce yourself? What is your current occupation?

Expert B: I am a senior lecturer in Haaga-Helia UAS.

Irina: Thank you! How long have you been in IT or digital design industry?

Expert B: About 35 years in IT industry.

Irina: Could you believe briefly describe what do you know about artificial intelligence in design?

Expert B: Well, I know that all creative tasks have been tested when artificial intelligence is applied in different areas of design, for example, composing, paintings, and producing graphical elements. However, I don't know much about how physical objects are designed using AI, but some digital elements have been lastly designed or made kind of test how capable AI is in designing, showing graphical digital elements.

Irina: I see. Would you use artificial intelligence in your design project and if yes, please specify how exactly and for what purpose?

Expert B: Well, it mainly depends on which kind of project it would be. For example, when producing logos or printouts with the different variations, AI could be useful to suggest any kinds of a patterns, so I think I would use it. Professional graphical designers, they would use.

Irina: Could you briefly describe the main pros and cons of using AI in design?

Expert B: When I think about the main pros, it could be an ability to generate a lot of different kind of variations on certain elements. It would be also very cheap to produce lots of different kind of patterns and you might just find something that you couldn't expect to have. When it comes to the cons – AI is another technique you should learn and be able to apply, so it might be time consuming. The one can try utilizing AI, but the result wouldn't be the quality wanted, and may be expensive if you hire experts in that.

Irina: Thank you. And as a teacher, do you encourage your students to learn more about AI based tools and if yes, how do you encourage them?

Expert B: Yes, of course. AI has a lot of potential when we think about future, and students always are the future workers, so of course I will encourage them to follow up any AI possibilities.

Irina: Artificial intelligence will eventually replace designers: do you agree or disagree and why?

Expert B: I disagree that artificially intelligence would eventually replace designers as far as we can see. Some work could be transferred to automated design, for example, website design with automatic suggestions about the layout what kind of design that could be. However, eventually we always need someone to mentor and monitor and see what the results AI produces, and of course human thoughts to design.