

Czech University of Life Sciences Prague

Faculty of Economics and Management

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Bachelor Thesis

Evaluation of AI Technologies for UX Design

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Thesis title

Evaluation of AI technologies for UX (design, testing, UI)

Objectives of thesis

The main objective of the thesis topic is to evaluate the impact of AI technologies on UX design.

Partial objectives:

- Research the current state of AI technologies for UX design.
- Investigate the impact of AI on UX design.
- Analyze and compare the results of AI-generated designs to those created by humans.

Methodology

The theoretical part is based on a collection of knowledge obtained from a review of existing literature and case studies. Meanwhile, the practical part involves collecting data through interviews with professionals to identify the impact of AI on design efficiency and productivity, followed by user testing to compare traditional designs against those using AI-powered solutions. Finally, results will be evaluated based on positive and negative effects that can be attributed to incorporating artificial intelligence into UX design processes.

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Declaration

I declare that I worked on my bachelor's thesis, "Evaluation of AI Technologies for UX Design," by myself, using only the sources mentioned at the end of the thesis. As the bachelor's thesis author, I declare that the thesis does not violate any copyrights.

In Prague in 15/03/2024

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Evaluation of AI Technologies for UX Design

Abstract

Artificial intelligence is rapidly developing and is used everywhere and in every field. User experience design is one of these areas. The rapid advancement of artificial intelligence opens up new opportunities and challenges for user experience design, both in the design process, for designers, and design results.

This study aims to evaluate the impact of artificial intelligence technologies on User Experience design, the opportunities and challenges it brings, its current status, and its impact on the design process and results. Additionally, this research aims to compare designs created by artificial intelligence with those created by human designers. The study uses a mixed methods approach, combining a comprehensive literature review and case studies to establish a theoretical foundation. While the theoretical part includes analysing the existing literature and reviewing relevant case studies to gain insight into the integration of artificial intelligence technologies in user experience design, in the practical part of the study, data obtained through interviews with professionals and user testing to compare both the impact during the design process and the impact on the user after design. The interviews aim to uncover the perceived impact of AI technologies on design efficiency and productivity, and user testing was conducted to compare traditional designs with designs created using artificial intelligence-generated solutions. This comparative analysis comprehensively assesses the benefits and drawbacks of incorporating AI into UX design processes.

This study will contribute to the existing knowledge about artificial intelligence technologies and their effects on user experience design. Insights from this research can help designers, researchers, and practitioners make informed decisions about integrating AI technologies into design processes to improve user experiences and optimise design outcomes.

Keywords: Artificial Intelligence, Design, Usability, User Experience, User Satisfaction

Hodnocení AI technologií pro UX design

Abstrakt

Umělá inteligence se rychle rozvíjí a používá se všude a v každé oblasti. Jednou z těchto oblastí je návrh uživatelského dojmu. Rychlý pokrok umělé inteligence otevírá nové příležitosti a výzvy pro návrh uživatelských zkušeností, a to jak v procesu návrhu, pro návrháře, tak i ve výsledcích návrhu.

Tato studie si klade za cíl vyhodnotit dopad technologií umělé inteligence na design uživatelského prostředí, příležitosti a výzvy, které přináší, jeho současný stav a jeho dopad na proces a výsledky návrhu. Kromě toho se tento výzkum zaměřuje na porovnání návrhů vytvořených umělou inteligencí s návrhy vytvořenými lidskými designéry. Studie využívá přístup smíšených metod, který kombinuje komplexní přehled literatury a případové studie za účelem vytvoření teoretického základu. Zatímco teoretická část zahrnuje analýzu stávající literatury a přezkoumání relevantních případových studií, aby získala vhled do integrace technologií umělé inteligence do návrhu uživatelské zkušenosti. , v praktické části studie data získaná prostřednictvím rozhovorů s profesionály a uživatelským testováním za účelem srovnání jak dopadu během procesu návrhu, tak dopadu na uživatele po návrhu. Cílem rozhovorů je odhalit vnímaný dopad technologií umělé inteligence na efektivitu a produktivitu návrhu a bylo provedeno uživatelské testování, aby bylo možné porovnat tradiční návrhy s návrhy vytvořenými pomocí řešení generovaných umělou inteligencí. Tato srovnávací analýza komplexně posuzuje výhody a nevýhody začlenění AI do procesů návrhu UX.

Tato studie přispěje ke stávajícím znalostem o technologiích umělé inteligence a jejich vlivu na design uživatelské zkušenosti. Poznatky z tohoto výzkumu mohou pomoci návrhářům, výzkumníkům a praktikům činit informovaná rozhodnutí o integraci technologií umělé inteligence do návrhových procesů s cílem zlepšit uživatelské zkušenosti a optimalizovat výsledky návrhu.

Klíčová slova: Umělá inteligence, Design, Použitelnost, Uživatelský zážitek, Uživatelská spokojenost

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1. Introduction

Artificial intelligence can be compared to a machine's brain that recognises speech, plays games, or gains the ability to recognise images. Algorithms are the building blocks of artificial intelligence technology; they function much like a computer's set of instructions. These algorithms utilise many data points to improve predictions and even judgements. These technologies are already part of our life. For example, Netflix uses AI to give watch recommendations to its users based on what they have watched before. AI has become essential for user experience design since it offers a significant chance to enhance the work of designers by enabling them to develop user-centred and efficient human-computer interaction (HCI) systems. AI also helps designers come up with research questions, plan research, or even double-check the research data, assisting designers to synthesise and analyse data.

In order to improve user satisfaction, user experience design prioritises creating more meaningful, effective, pleasurable, and efficient experiences. As a result, given the rapid advancement of AI technology, there is significant interest in learning how to use AI in the user experience design process in order to enhance user experiences and facilitate the work of designers.

Artificial intelligence is developing rapidly, so it can be hard to keep up. While AI technologies continue to grow, they also present new challenges and possibilities.

Furthermore, ethical considerations play an important role in this integration. Thereby, designers must find a balance between trusting AI and using AI's power and trusting their intuition by being aware of privacy, bias, and transparency concerns to ensure responsible and user-centred AI integration. The future of user experience design with artificial intelligence seems to have great potential for improving and helping user experiences. While these technologies continue developing, designers must stay informed and updated with upcoming technologies to create meaningful, effective, and better user experiences.

2. Objectives and Methodology

2.1. Objectives

This thesis aims to evaluate the impact of artificial intelligence technologies on user experience design. To achieve this, the research focuses on three specific objectives. Firstly, this thesis researches the current state of artificial intelligence technologies in user experience design. This research aims to understand AI's advancements, applications, and potential in improving user experiences. Secondly, the thesis investigates the impact of artificial intelligence on user experience design, examining how artificial intelligence technologies shape design processes, user interactions, and overall satisfaction.

Lastly, the research involves analysing and comparing the outcomes of AI-generated designs with those created by human designers, providing an understanding of the effectiveness and potential benefits of AI-powered solutions.

By addressing these objectives, this thesis contributes to a deeper understanding of the impact of artificial intelligence technologies on user experience design.

2.2. Methodology

The theoretical part is based on a collection of knowledge obtained from a systematic review of existing literature-, and case studies. Meanwhile, the practical part involves collecting data through interviews with professionals to identify the impact of artificial intelligence on design efficiency and productivity, followed by user testing to compare traditional designs against those using AI-powered solutions.

Finally, results will be evaluated based on positive and negative effects that can be applied to integrating artificial intelligence into user experience design processes.

3. Literature Review

3.1. Artificial Intelligence

The realm of intelligence (AI) delves into the realm of computer science aiming to craft machines of exhibiting human like cognition and problem solving skills [1]. AI refers to computer systems that can do things that normally require human thinking, such as seeing something, understanding a language, and making a decision or judging a situation. These technologies are inspired by humans' communication, reasoning, thinking, and emotion.

This innovative technology already greatly impacts people's daily lives by powering wide range of services including virtual assistants like Alexa and Siri, which respond to voice commands to support navigation systems that can adapt to changing conditions to product recommendation platforms that learn individual user preferences over time [2]—being used in all areas, including user experience design, to simulate human logic abilities and automate complex processes in order to increase and improve efficiency and effectiveness. This technology promises to significantly change the way people generally interact with computers and help them solve problems more efficiently and quickly than ever before. Efforts are being made to develop artificial intelligence using various approaches. Different methods of creating intelligence systems involve machine learning, deep learning, expert systems, and natural language processing [2]. Artificial intelligence is constantly evolving and driven by these important approaches. These technologies, such as machine learning and deep learning, transform how organisations make important decisions, detect fraud, and manage their resources [3]. Utilising computer vision and natural language processing it harnesses the ability to grasp user actions and preferences. Take, for instance, neural networks that empower chatbots to engage in dialogues and suggest content to users. Conversely, deep learning falls under the machine learning umbrella, drawing from networks that mimic the biological neural networks found in human brains. [6]. Artificial intelligence plays a big part in user experience design with the help of these approaches.

Among the main advantages that the combination of artificial intelligence, machine learning and deep learning promises is the ability to analyse large amounts of

data or information. Likewise, organisations can improve and transform their functionality over time as they become more efficient and valuable by allowing these technologies to improve their services and/or products.

3.1.1 History

Artificial Intelligence has been a major focus of interest in computer science since the 1950s. Technology is undoubtedly an important aspect that affects human nature, as it is an innovative tool used to help people, such as improving living conditions and solving problems, in other words, expanding the limitations and barriers of reality. The origins of artificial intelligence can be traced back to fiction and philosophy; it can extend to imagination and many other subjects, making its history complex and multifaceted.[7] Formal study started with a more statistical method of decision-making with computers, and this progressed in a sophisticated manner over time. The phrase "intelligence" was first used during the 1956 Dartmouth Conference, known as the starting point of intelligence. The event was graced by individuals, like John McCarthy, Marvin Minsky, Claude Shannon and Nathan Rochester [8]. At this conference, concepts such as machine learning, neural networks, natural language processing and possibilities for machines to exhibit human intelligence were discussed along with artificial intelligence. Many concepts were imagined, and some were developed by researchers at this conference and in subsequent years. Early AI research was optimistic about the potential to replicate and use human intelligence in machines using symbolic logic. Still, there were challenges in translating this technology from abstract to real-world. Researchers first focused on developing artificial intelligence systems that could reason and solve problems, in short, similar to human intelligence, using logical rules and symbols to simulate this, but it turned out that completely replicating these was much more difficult than expected or predicted.

The timeline of artificial intelligence research has seen many highs and lows throughout its development. The lack of progress in artificial intelligence research led to a lack of interest and entered what is known as the "AI Winter", a period of quiet and no progress for artificial intelligence in the 1970s and 80s. This field was subsequently followed by renewed interest and progress in artificial intelligence in the following years, driven by increasing computing power, big data and machine learning algorithms [9]. After a quiet period in the 1980s and 1990s, artificial intelligence began to rise with

renewed interest and advancements. Researchers have made significant progress in bouncing back from the quiet period called “AI winter” by creating algorithms that can make data-driven predictions or judgments. Advances have been made in artificial intelligence and new aspects have been seen, which has led to the long-term goal of the field evolving from simulating human intelligence to further improving it [10]. Since then, artificial intelligence has been used in many different areas, such as health, finance, transportation, and education, and is also used in different areas, such as user experience design to improve experiences through personalisation, automation and prediction capabilities. As artificial intelligence's natural language processing and emotional recognition capabilities improve, they are increasingly being integrated into user experiences by designers in more and more ways to enable personalisation, predictive insights, and automation.

From modest and small beginnings to today's virtual assistants and smart items, the integration of artificial intelligence has greatly impacted user experiences. Artificial intelligence has made significant progress in creating intelligent machines and continues improving daily. As technology continues to advance, artificial intelligence gives people great hope for the improvements and innovations it can make in the future.

3.1.2. Benefits of Using AI

Artificial intelligence has a lot of contributions to today's world. Large amounts of user data can be analysed by AI algorithms, which can then provide customised interactions and recommendations across various industries. [11]. These technologies have shown that they can do things automatically, look at data, and give helpful, useful information. Automation and artificial intelligence combined could greatly increase productivity and quality across a range of sectors [12]. This has increased productivity in a wide range of industries and changed how organisations work. Artificial intelligence-powered automation has been important to increase workflow efficiency, reduce human errors, and speed up the completion of routine tasks. This has reduced users' efforts on manual tasks, done the easy work, and made their interactions more efficient, helping people free up time and focus on more important and creative activities.

Moreover, artificial intelligence has significantly affected interaction design, too, by improving user experiences and design processes [13]. Recent advances in artificial intelligence have provided numerous opportunities to support human creativity in design.

It has changed the way users interact with systems by providing a much more user-friendly experience, allowing users to communicate using their own words, and allowing for a level of personalisation that would not be possible manually, such as the ability to automate a personalised user experience. Another great benefit is the ability to make accurate predictions and understand user needs to a large extent. Algorithms can analyse user behaviour, preferences, and historical data to predict the user's possible future actions or preferences [11]. With these predictive capabilities, it can improve the user experience by helping designers provide necessary and relevant information or recommendations, saving both time, effort and extra work. It also can help users to have a better user experience. For example, Instagram uses artificial intelligence to predict what users will likely enjoy based on their previous interactions, views, and purchases and recommend relevant posts, stories, ads, or products accordingly. Thus, it is ensured that users are happier with more personalised results.

Artificial intelligence technologies also provide digital accessibility and equal and accessible computer-human interaction for everyone. Using image and speech recognition technologies can enhance digital accessibility for individuals with hearing or visual challenges, offering valuable assistance. One notable example is the app Microsoft Seeing AI, created by Microsoft, which seeks to enhance the perception of impaired individuals about their environment using smartphones. Through the integration of machine learning, natural language processing, image recognition, and speech recognition features, this application assists in explaining the user's surroundings, reading text aloud and recognising emotions. Usage of artificial intelligence in image recognition has shown significant benefits, including high detection rates, more accuracy, and stability [14]. Image recognition enables visual search; users can search for products or information using the images they want to search for instead of typing long queries. Using speech recognition can simplify tasks since it enables individuals to interact hands free through voice commands or by speaking text to their device. These capabilities help users with disabilities by providing them equal access to technology and remarkable convenience in digital experiences.

Furthermore, AI technologies can also help designers in the design process by organising research, developing research questions, and synthesising and evaluating the data. Designers can leverage AI powered design tools to concentrate on the more strategic elements of the design process while automating mundane tasks, like producing design

alternatives or prototypes and brainstorming ideas or images [11]. The automation provided by artificial intelligence allows designers to concentrate in less time, explore more possibilities and create perfect designs, and thus, the design process is accelerated.. Designers can further improve their results by using the conveniences that artificial intelligence offers them.

As a result, the benefits of using artificial intelligence are fundamental and undeniable, from automated personalisation to natural interactions, predictive capabilities, improved accessibility and assistance in the design process.

3.1.3. Potential Future

In the future of artificial intelligence significant progress can occur with the possibility of human-level intelligence [16]. This seems impossible but artificial intelligence has a bright future and is a rapidly changing field; it may become deeper and more complex as it develops, so it will be difficult to keep up. It is expected that artificial intelligence will have great effects in the future and will be filled with many new and different potentials. Artificial intelligence's neural networks designed by taking and being inspired by the human brain as an example may develop further in the future. However, it seems difficult to achieve a similar structure in the face of the complexity of the human brain. Humanity has developed continuously throughout its two million-year history and has become smarter and harder to keep up every day. Artificial intelligence developed by humans follows a similar process and develops unexpectedly every day. Therefore, it remains unclear what will happen in the future, how far it will develop, how independent or autonomous it will be at the decision-making stage, and how its harmony with people will be shaped.

As artificial intelligence affects every field, it seems that it will continue to affect user experience in the future. Many experts predict that in the years to come, AI will play a bigger role in user experience design [17]. One of the expectations from this integration is the enhanced and better personalisation of user experiences. With the ability of machine learning to learn on its own, more and more different results are emerging every day, and it seems that this will improve in the future. Continued progress in deep learning and neural networks will likely enable more and better-advanced personalisation, user-predictive modelling, and design augmentation [5]. This can show more interesting interactions among users and technology when they feel their needs are met.

Additionally, chatbots like ChatGPT will guide a new era of conversational interfaces. Chatbots and virtual assistants are anticipated to improve in the upcoming years in terms of their capacity to understand user queries, respond to them, and engage in conversation, maybe more human likely [19]. This advancement will enable users to engage with platforms, websites and services in a manner that mirrors interaction. It appears that these applications will see development and increased usage in life due to their convenience, making them indispensable for various tasks. With these advances, there will also be some risks that come with artificial intelligence. One of the most important concerns about artificial intelligence is the possibility of algorithm bias. If the data used to train the algorithm that the artificial intelligence learns is biased, the resulting design may also be biased, which can lead to inequality or unfairness for different user groups. As artificial intelligence develops more and more every day, this concern is growing because it is unknown how much this can be prevented in the future. When integrating artificial intelligence, it should prioritise ethical consequences and ensure that human values guide its development.

In addition, major developments are expected in the future in the user experience design process of artificial intelligence. It is thought that with everyday development of the help they do in the design process, designers in the future will direct more artificial intelligence and make their work easier. Therefore, Designers need to keep up with the latest tools and trends in artificial intelligence technologies in order to produce useful and enjoyable user experiences.

In general, there is great promise from the future of artificial intelligence. However, seems its full implementation will depend on user requests and technological developments.

3.1.4. Machine Learning

Artificial intelligence's subfield and application, Machine Learning (ML), has recently gained attention and popularity through the things it has been able to do. This fast-growing, developing field is at the intersection of computer science and statistics. It describes how a computer program learns or picks up certain tasks and becomes more proficient by developing them over time with exposure to new knowledge or experiences. Computers can efficiently apply learned data from a training set to new data. This application provides many more real-world applications, such as product

recommendations and personalised and enhanced user experience by analysing user behaviour and preferences. Machine learning impacts the UX design process, with growing potential for applications and also challenges [23]. Designers can use machine learning to personalise content, mitigate cyber threats, and predict user satisfaction. For example, a user experience design system with machine learning can analyse user interactions to adapt the interface better to suit their needs. This could involve modifying the website layout and content or providing personalised recommendations.

Machine learning is a valuable tool in situations where human expertise is scarce, or it is difficult to explain a specific problem. It has the capacity and ability to learn and develop automatically, and it has been used in various applications such as outcome prediction and image and voice recognition.

3.1.5. Neural Networks

Neural networks are a machine learning method widely used in various applications such as pattern recognition, data classification, function approximation, and time series prediction. They play a role in the realm of intelligence, drawing inspiration from the structure and operation of the human brain [5]. In user experience design, neural networks can be utilised to provide computer vision and natural language processing capabilities, which helps to understand user behaviour and preferences better. For instance, chatbots can use neural networks to guide conversations and recommend relevant content to users. These systems are computer-based systems (or mathematical models) that are intended to perform tasks similar to those carried out by the human nervous system. A neural network provides a framework for a variety of machine learning algorithms to collaborate and handle complex input data. In these systems they typically learn how to complete tasks by looking at examples than having rules programmed for the task. As this field advances and gains attention the opportunities are limitless.

3.1.6. Natural Language Processing (NLP)

Regarding natural language processing (NLP), in machine learning it concentrates on examining text and speech to enable computers to comprehend interpret and make sense of language [36]. This domain falls under artificial intelligence, which aims to design methods and algorithms to help computers understand and process human language. It includes various applications such as machine translation, text processing,

summarisation, user interfaces, information retrieval, speech recognition and artificial intelligence. The main focus is to enable computers to understand, interpret and produce human language in a better way, and it is related to improving computer-human interaction in a natural language.

Moreover, the incorporation of natural language processing in user experience design significantly influences user involvement and participation [24]. Allowing for more natural and user-friendly interfaces is important in the design process as it enables machines to understand and clarify human language. This technology can power chatbots, virtual assistants and other conversational interfaces, making it easier for users to interact with technology more naturally and humanly. By using the power of natural language processing, these interfaces can facilitate seamless communication between humans and machines. Decently, ultimately leading to a more efficient and satisfying user experience.

3.2. User Experience Design (UX Design)

User experience (UX) refers to a person's feelings and attitudes towards using a product, system, or service. Therefore, user experience design plays an important role in product design because it provides a meaningful experience for the user and cares about its provision. The practice of focusing on better understanding and improving users' needs, values, abilities, limitations, and ways of experiencing things is known as user experience design (UXD). This process includes different aspects such as branding, design, usability, various features, and functionality. Since it involves understanding user expectations and motivations, user experience design is important to creating effective, successful and targeted designs [25]. The term was coined by Donal Norman, who worked for Apple in the early 1990s. It is a multidisciplinary discipline that involves various stages such as user research, behaviour understanding, and prototyping that plan how something looks and works to make using it easy and enjoyable. This discipline involves various stages such as user research, behaviour understanding and prototyping and also calls for various skills, including management and business knowledge [26].

User experience design ensures that the designed products and services are user-friendly and aims to create a useful product or service for the user and other relevant groups. In order to ensure user satisfaction, factors must be taken into account, such as emotions, social and cultural aspects, and product reliability, basically the diversity of

individuals [37]. An exemplary user experience design meets the needs of the customer or user, aims to improve the quality of the experience and the satisfaction of the user's interaction with a product, system or service, and provides a positive experience without confusion. Even a simple operation can hinder the user or give a bad experience, and therefore, user interfaces should aim for successful results while they are already at the concept stage. The more user-friendliness a website or product has, the more users can concentrate on accomplishing their objectives without being distracted. Human-centred design aims to reduce complexity and irritation while empowering and supporting users. In order to reduce obstacles, confusion, or extra steps, as well as to increase user satisfaction, extra work that does not contribute to the user experience should be avoided. This satisfaction is achieved through user research, creating user personalities, and designing user-friendly and easy-to-use interfaces.

Furthermore, evaluation is also important in user experience design. User feedback and usability testing are tools, for pinpointing usability issues and providing insights, for enhancing design through changes [27]. These evaluations and improvements contribute to the overall effectiveness and efficiency of the design. Important steps in user experience design include understanding users' needs, conducting user research by designing intuitive interfaces and interactions, testing prototypes with users, and developing recommendations to adapt technical solutions to people's thoughts, feelings, and behaviours. It involves understanding user behaviour, creating personas, and prototyping applications [26]. In user experience design, three key factors come into play: meeting users' needs, ensuring ease of use and learnability, and providing users with a sense of freedom. When designing for users, it is important to consider everyone's differences and uniqueness of individuals. What may seem simple and straightforward to one individual may seem perceived as challenging or complex to by another. Additionally, the visual appeal of the user interface is taken into consideration because designs that captivate users can greatly influence initial impressions and emotional engagement, ultimately enhancing the overall user experience.

In general, user experience design aims to ensure that the user's experience with the product is as good as possible and provides a seamless experience for users, for example, by making the process from the moment they enter a site, from the home page to the journey of purchasing the product, as easy, simple and enjoyable as possible.

3.2.1. The Potential Future of User Experience Design

The future of user experience design holds exciting possibilities as technology develops and user expectations grow. Designing a modern user experience requires considering continuous development and, most importantly, finding a balance between new trends and established practices. Artificial intelligence is one of the main keys to the future of user experience design. These technologies can serve as tools for design practices and provide opportunities for designers to explore new creative expressions.

The future will likely see improvements in personalised and adaptive experiences. UX designers may use user data to develop customised experiences that cater to each person's wants and preferences, thanks to the growing availability of data and AI technology [28]. It also helps designers save and make better use of the time that would have otherwise been spent researching different options before making important decisions, thus improving efficiency while delivering better customer service overall. Personalisation of content, interfaces, and interactions is also included to improve user satisfaction and interaction. As artificial intelligence becomes more common in assisting and working autonomously, the role of UX designers is expected to shift towards managing AI or focusing on the needs of producers. With the evolution of user experience design there is a growing emphasis on considerations. To adapt to these changes designers now need to be more conscious of biases and ethical issues in their work and strive to create responsible experiences. In the future of user experience design we can anticipate increased collaboration between AI and designers dynamic research and testing processes personalized experiences as a heightened focus, on ethics. Adopting these trends allows UX designers to build meaningful and impactful experiences that meet users' developing needs and expectations.

3.3. Integrating Artificial Intelligence in User Experience Design

3.3.1. The Role of Artificial Intelligence in Enhancing UX Design

Advancements in the realm of intelligence have offered fresh possibilities to enhance human creativity in design and streamline the design journey for designers. The increasing prevalence of tools has underscored the importance of user experience design in crafting products and services. AI's capacity to acquire knowledge and adjust

accordingly transforms it into a tool. Using AI's full potential, countless opportunities can be discovered to improve the user experience and the design process.

Advances in artificial intelligence and user experience design are witnessing a shift towards automation and machine learning, where design software tools help reduce the user's workload. Thanks to these tools, designers can save time by delegating repetitive tasks to automation while maintaining creative control over their projects. It has transformed the way designers create, analyse and improve experiences. Many tasks that designers do today are automated. Moreover, the use of artificial intelligence has opened up such opportunities that were previously unimaginable, making it possible for designers to efficiently and quickly perform many tasks that require time and effort.

Additionally, AI algorithms can help designers find the best solution by quickly comparing millions of alternatives, enabling personalisation and predictive features in systems and services for a better experience. For example, integrated information gives designers more time to focus on the most important issues.

Artificial intelligence significantly impacts personalising user experiences. AI can dynamically adapt the interface based on real-time user interactions using machine learning algorithms, creating a more personalised and engaging user experience. This level of customisation can significantly increase user satisfaction and ultimately improve business results. To provide personalised content, product recommendations and user experience, these technologies analyse user behaviour, preferences, and past interactions. Similar to how Facebook and other social media companies utilise these algorithms to forecast user interests and display customised information in feeds. This predictive strategy ensures that users are shown relevant content, increasing satisfaction and interaction. This personalisation improves user interaction and satisfaction by giving relevant content and making users satisfied.

On the other hand, AI technologies also allow for more emotional and conversational interactions with users. It is used to improve the usability and accessibility of interfaces through voice interfaces, voice search, and language-based interactions. The next aspect involves incorporating AI driven chatbots and virtual assistants into websites and applications to offer assistance and feedback, to users. AI driven image recognition facilitates searches, enabling users to search for products or information using images, than text. These chatbots and assistants can improve user interactions, meet user needs,

and help customer support processes. For instance, Google Assistant and Apple's Siri offer users more conversational and practical interaction.

Moreover, with automated design tasks and prototyping, design tools like Adobe Sensei can automatically generate design variations and layouts based on user preferences and constraints. This also helps designers by saving time.

The relationship between UX design and AI is important. AI tools are currently improving user experience by providing innovative solutions to create personal, efficient, and emotionally deep interactions with digital products and services. By working together, designers can create more natural, interactive and user-centred experiences that can meet users' needs, preferences and desires.

3.3.2. The Role of Machine Learning in Enhancing UX Design

In the realm of user experience design, machine learning, a component of intelligence, plays a role in improving user interaction through its ability to analyse data intelligently and recognise patterns. By using machine learning algorithms, designers can sift through user data to uncover patterns, preferences and issues that can guide design choices and enhancements. The significance of machine learning in elevating user experience design is broad-ranging. Holds influence as indicated by the sources provided. Amershi et al. (2014) emphasise the importance of recognising the significance of human interaction with machine learning systems. There are certain design factors and dimensions that have an impact on human interaction with these systems. This underscores the need for a user-focused approach when integrating machine learning into UX design. This will ensure that human interaction with these systems is effective.

Users use evaluation techniques like cross-validation and real-time evaluation to iteratively improve trained models, emphasising their active role in interactive supervised learning. This marks the significance of involving users in evaluating machine learning models to enhance UX design. Among machine learning's most important contributions is the capacity to build predictive models that foretell user activity and modify the UI appropriately.

By analysing historical user interactions, machine learning algorithms can predict future user actions, allowing for preemptive adjustments to the interface to optimise user engagement and satisfaction. Machine learning can be leveraged to gain insights into user satisfaction and inform UX design decisions.

3.3.3. The Role of Natural Language Processing in Enhancing UX

Improvements in natural language processing are opening the door to more conversational and intuitive human-machine interfaces. Instead of forcing users to adapt to technology, NLP allows systems to understand and respond to natural human communication styles. It is expanding in user experience, powering chatbots, voice assistants, sentiment analysis tools, and content creation systems. Voice-based tools like Amazon Alexa integrate NLP to understand the intentions through users' speech and take requested actions via dialogue.

Such as text classification, to automatically identify emotions and opinions in unstructured, open-ended feedback. The tools driven by NLP can produce natural language descriptions or summaries that mimic human-like rhythm and tone.

3.3.4. Challenges and Complexities in Integrating AI in UX Design

Integrating AI technologies in UX design has brought new possibilities, benefits, challenges, and complexities. It is necessary to state the critical challenges with the use of it. There are also some uncertainties about AI's capabilities, and these uncertainties and unpredictabilities can make it difficult for designers to predict and understand and can lead to challenges in designing processes and users' expectations. There are difficulties in evaluating AI-based UX design since the performance and unique characteristics of AI systems may require modifications to standard evaluation techniques [28]. Despite its advanced capabilities, AI still struggles with comprehending and simulating common reasoning processes that occur in everyday life. The complexity of outputs causes challenges in designing interfaces, which can affect systems' reasoning and decision-making processes. The output complexity can range from simple recommendations to complex adaptive behaviours, making it challenging for designers to ensure transparency and explainability. Designers need to understand AI concepts and methodologies well and keep up with them because it can be challenging for those not specialised in this field. Understanding the significance of natural language processing is important as it allows machines to understand and engage with language. The teamwork between UX designers and AI experts is crucial in understanding these obstacles and ensuring the integration of AI technologies into UX design [11]. Another limitation is the potential bias and ethical considerations. The ethical considerations, such as privacy, security, and accountability, need to be carefully addressed to build trust and user acceptance by designers [29]. AI

algorithms are trained on large datasets, and if these datasets contain biases, these systems can carry on and add to those biases in the user experience. When designing AI-driven experiences, it is crucial for designers to be more mindful because of biases by prioritize fairness and inclusivity to ensure that the final product is accessible to all [30]. In essence, while artificial intelligence tools offer opportunities to enhance the design process, designers must also navigate through limitations and obstacles with caution. Clearing up confusion about what artificial intelligence technology can do, promising transparency and explainability, removing biases, and considering ethical issues are critical for using artificial intelligence successfully. Working together, designers and AI professionals can overcome these limitations and make the most of these technologies to create and develop better, user-centred experiences.

3.4. The Current State of AI in UX Design

Artificial intelligence technologies have changed different industries, including UX design, by introducing designers with new solutions and increasing the efficiency of design processes. AI is a trendy topic right now, and the need for technical product management may make user-centered design less important, which could cause problems down the road. It seems that customers are becoming increasingly demanding in their expectations. UX specialists should promote user-centred design in their organisations and be ready for any challenges that AI may present. Similar to other domains, the design industry is rapidly embracing artificial intelligence, as it can effectively tackle numerous design challenges. With machines becoming more developed and advanced in understanding the various human needs, user experience designers must have the very best insights available to ensure that they can meet the needs of their users. The current state is now going through both advancements and challenges and is marked by a shift towards automation and the need for new design methods and tools. These technologies offer more efficient, personalised, and adaptable interactions that have the potential to greatly enhance the user experience [31].

Current applications focus on supplementary AI assistance and deep learning. Companies like Google and Facebook use AI to help create comprehensive data profiling of different types of users to identify patterns and trends, which may help designers to profile and understand different user groups. Designers can then use this information to

more accurately create "personas" of various user types within the designs, identify areas of the design creation process or user journey that could be more user-focused, and, lastly, provide a set of testing and evaluation criteria to ensure that designs are valid as they are being developed. Artificial intelligence also helps design the development process by providing powerful tools and applications to improve the designer's capabilities. One such example is Figma's new feature, FigJam AI, which launched in 2023, integrates generative AI into its design tools, which helps designers work faster and be more creative by doing tasks like automating tedious tasks, generating templates using simple text prompts and summarising the contents.

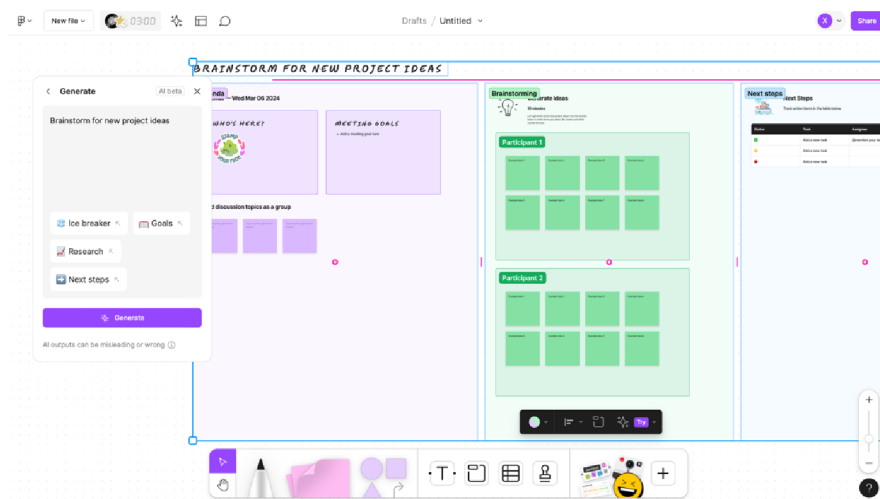


Figure 1: Figma's FigJam [41]

With the improvements day by day in the field, it is reasonable to anticipate that the user experience design industry will employ AI in new and creative ways, simplifying the process of creating websites and applications while incorporating innovative technological developments. For instance, AI technologies in eye tracking and machine learning will greatly boost the "in-the-moment" data and user interaction experience within virtual and augmented reality environments. Not only will these technologies be able to better analyse user interaction—for instance, by tracking how long a user focuses on a specific area of the screen—but they will also be able to give UX designers immediate feedback and insights, allowing them to modify and improve designs based on actual user interactions and visual focal points. This development demonstrates how AI and UX design may work together more effectively and what the industry's next steps should be when utilising this technology. For example, Maze uses fast testing and AI to

analyse user interactions, providing actionable data and real-time insights. It allows designers to make well-informed choices about the focus on specific screen areas and navigation patterns based on user behaviour.

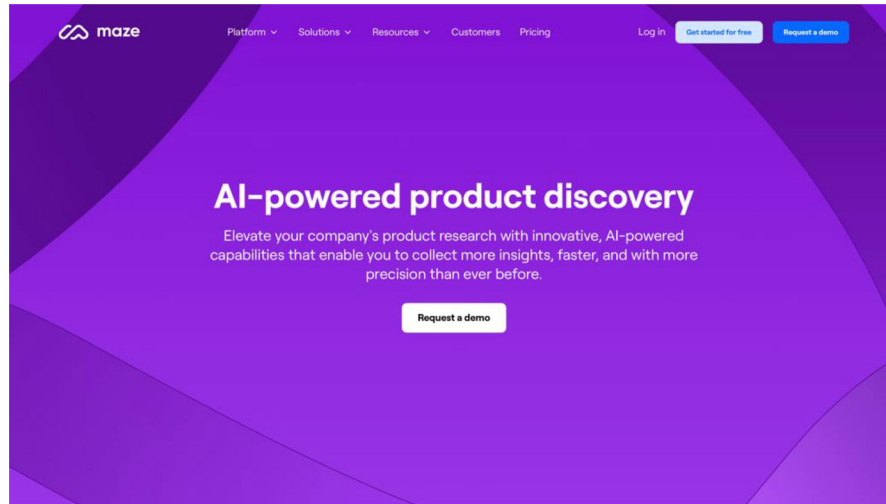


Figure 2: Maze's homepage [42]

Current use of AI in the UX design process is mostly involved with automating and expediting the procedure. Some of the ways to streamline the design process are digitising hand-drawn wireframes and creating interactive multi-screen prototypes using simple text prompts. These allow designers to easily add and develop their ideas, making visualising and refining the final product easier. For instance, Uizard launched Autodesigner in 2023, a tool that generates editable multi-screen designs from text prompts.

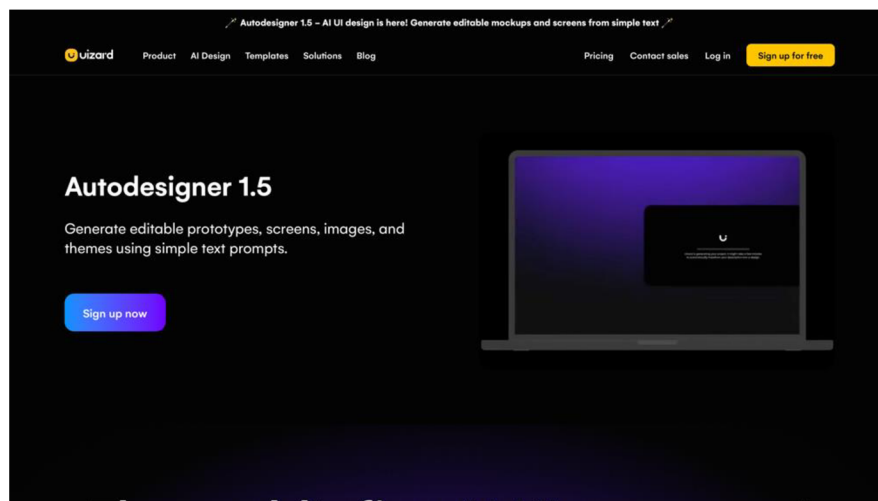


Figure 3: Uizard's Autodesigner [44]

By using a text-based approach, designers can quickly iterate on their ideas without getting bogged down by complex design tools or coding. Another example is, Khroma, which is a colour selection tool powered by a trainable neural network that filters colours to enhance visual aesthetics and inspire unique colour combinations, thereby saving time in colour selection. This tool is designed to assist designers in creating infinite colour combinations for their projects.

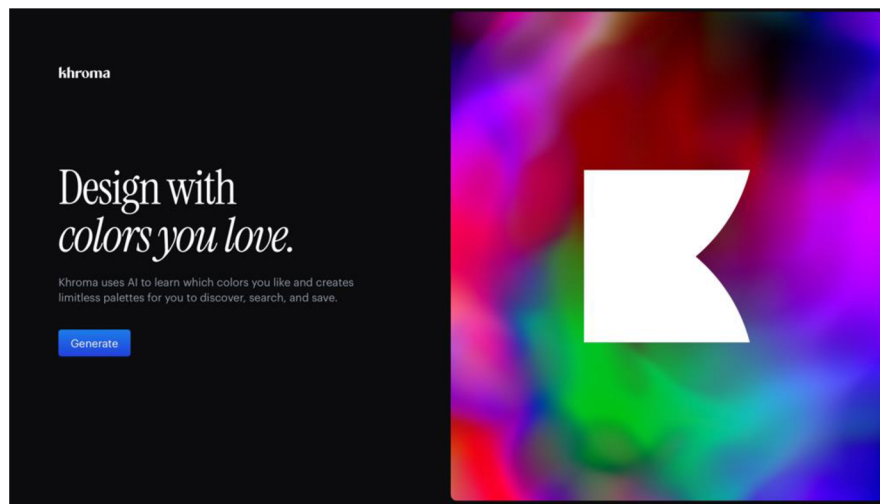


Figure 4: Khroma's homepage [43]

However, a few current challenges also need to be mentioned. One difficulty with AI systems is their ability to produce a wide range of answers, from straightforward recommendations to intricate adaptive actions [11]. Designers are also trying to be sure about the transparency of tasks, know the balance between trusting AI and its power, and fairness, which are essential for building trust and user acceptance. Designers must remain up to date on industry advancements and best practices in order to produce AI-powered designs that are effective. Instead of prioritising AI, it's important to maintain the user at the centre of the design process. Designers should prioritise understanding user needs and preferences before incorporating AI to enhance user experience.

While AI has the potential to improve UX significantly, it is crucial to understand challenges and uphold design practices to use its benefits in UX design. [31]. However, with the continuous development of AI in UX design, the future holds exciting opportunities for creating even more enjoyable and user-centred experiences.

3.4.1. Artificial Intelligence Tools for User Experience Design

AI tools and technologies are rapidly advancing the field of user experience design. Recent studies have explored the potential of AI in UX design tools, with a focus on its role as a creative partner and assistant in mundane tasks [38]. It provides designers with a range of capabilities to help them create interfaces that are easy to use and engaging. AI-driven automation tools for design are transforming the interface creation process. These tools can be categorised based on their functionality.

Automated User Testing and Heatmaps

AI-powered automated testing tools allow for efficient and effective evaluation of digital interfaces' usability, functionality, and performance. These tools simulate user interactions, identify issues, and provide actionable insights for optimisation with AI algorithms.

Hotjar:

- This application offers useful insights into user activity by combining visitor records, heat maps, and automated user surveys.

Crazy Egg:

- Visual reports like heat maps and scroll maps illustrates user behaviours on a website.

Chatbots and Virtual Assistants

Chatbots and virtual assistants can streamline the processes and offer personalised and better guidance and prompt support.

Adobe XD:

- This tool utilises AI to provide features such as automatic animation and responsive resizing for creating prototypes.

ChatGPT:

- Designers can come up with ideas for user research and inspire design with content with text prompts. It can also help designers to create appealing content.

Content Creation

Using NLP and machine learning to analyse data, trends, and preferences to generate personalised and relevant content that engages the target audience.

Adobe Spark:

- The software offers AI-powered design suggestions that can assist users in creating graphics, web pages, and video stories.

Canva:

- It has several AI design tools to assist with image cropping, background removal, and design recommendations, improving the creative process

Design Prototyping

Designers can quickly create interactive prototypes, mockups, and wireframes using AI algorithms to generate design variations, test interactions, and gather feedback from users, stakeholders, and team members.

MidJourney:

- It is a generative AI platform that specialises in visual creation. It rapidly produces logos, cover art, pictures, and wireframes for various themes through text-to-image prompts and offers image variations based on image prompts.

AutoDraw:

- Using machine learning to transform simple sketches into professional illustrations and doodles into impressive art pieces.

3.5. Ethics

Ethics are essentially the standards that influence how individuals behave or how tasks are executed. The increasing use of AI in UX design brings the necessity for thoughtful, ethical considerations. The first and most prominent ethical issue in the context of AI technology is the question of the right to harm. The use of AI systems can introduce biases in the design process. If such biases are learned from the input data, they can result in unfair design decisions. Key ethical issues in AI-powered user experience

design include privacy, algorithmic bias, user autonomy, and explainability of AI decisions. Equal opportunity is a commonly discussed standard of fairness. This means that the likelihood of a favourable outcome in a design should be approximately the same for every group member, while a relevant indicator known as a "protected attribute" should be considered. This attribute refers to characteristics such as gender, age, or race, which cannot legally be the basis for discrimination. While minimising design biases stemming from input data is essential, there is still a lack of clarity in defining the procedures for ensuring fairness. As a result, creating solutions that are highly effective in ensuring fairness can be challenging. Providing clear explanations for why AI made a particular decision or recommendation can encourage appropriate trust and allow users to identify potential biases. The other problem is data privacy. Ensuring the privacy of data is a concern, in safeguarding information in the digital world. While data privacy covers a wide range of topics within AI-driven UX design, the most crucial aspect would be the user-generated data and the analysis drawn from it. The information stored within a system may encompass a range of topics, like shopping patterns, personal details or even private aspects of life [22].

An approach centred on humans prioritises values such as transparency, clarity, equity, responsibility, confidentiality and human oversight of automated systems. Maintaining standards is essential in the creation of AI technologies to build confidence, among users.

3.6. Summary

This study analyses the impact of AI technologies on UX design in terms of different techniques used, its current status, the AI tools for user experience design and ethics. While technology can aid the design process, it cannot replace human input. AI applications lack the human element that gives design its purpose and meaning. Machines lack personal goals or desires and will always work to achieve humanity's goals rather than their own. Therefore, a designer is needed to help an AI-based system understand which type of design is appropriate and which is not.

Despite this limitation, new technologies have provided designers with several opportunities to explore new creative expressions. AI technologies can be used as tools for artistic practices and can automate repetitive tasks, such as generating design

variations or prototypes. They can also improve accessibility and assist in the design process. These technologies have the potential to enhance accessibility and assist with the design process, making it more efficient and effective. Although it is possible that AI studies and techniques may transform in the future, it is clear that they offer new opportunities for creative expression and discovery. Supporting designers who will pioneer these new opportunities is necessary for design development.

User experience design will be shaped in part by artificial intelligence. As data and AI tools become more accessible designers have the chance to create enhanced experiences tailored to preferences. Rather than viewing AI as a negative force, it is essential to consider it as a chance and opportunity to create and explore new possibilities. AI's ability to learn and adapt holds the possibility of transforming it from a mere computational tool into a creative media platform.

The integration of AI technology with the design industry presents several opportunities. However, ethical considerations such as biases, transparency, and fairness must be recognised.

4. Practical Part

Two research methods have been used to evaluate AI technologies for UX design: interviews to understand designers' perspectives and experiences with integrating and evaluating AI in design workflows and user testing to compare AI-generated and traditional, human-powered designs.

4.1. Semi-Structured Interviews

Interviewing is a way to gather a lot of insights, about a topic. Interviews allow one to delve deeper into the information gathered by seeking justifications and additional details, making it an ideal option for exploring sensitive or intricate matters. Semi-structured interviews will be conducted to gain firsthand perspectives from professionals integrating AI. This method is particularly useful for exploring complex issues and allowing participants to develop new topics in order to help and give more information on the interview results [32]. It includes obtaining insights into the interviewee's opinions, perceptions, attitudes, background, knowledge level, or expertise.

To gain a deeper understanding of the benefits and challenges of AI in UX, its impact on designer roles, and the future of this integration, three individuals with different professional backgrounds were interviewed semi-structured. Standard questions were asked to gather information about the interviewees' personal experiences and opinions.

4.1.1. Participants

The first participant is one of the visiting professors who came to the school; another participant, who has 6+ years of experience, works as a UX and Product designer in a company where a classmate works and was introduced through this; and the last participant was found from a company in Cyprus. Each participant was presented with open-ended questions that they should answer by e-mail. The interviewees were asked identical questions (the questions can be found in Appendix 9.1), which included their experiences, current occupations, and personal views.

Table 1: Interviewees

Participants	Experience	Profession	Gender
R1	10+	Associate Professor at University of Aegan	M
R2	6+	UX/Product Designer at Make HQ	F
R3	3+	UX Designer	M

4.1.2. Interview Procedure

The data collection process involved semi-structured interviews. Semi-structured interviews are a valuable research tool that can offer unexpected, extra insights through a conversational approach [33]. The interviews were guided by open-ended questions, allowing participants to express their insights freely. The process of identifying potential participants was thorough and involved reaching out to various channels such as professional networks, schools, and online platforms. Invitations were sent either through email or in person, providing the participants with a comprehensive overview of the research objectives. Interested individuals were given the opportunity to express their willingness to participate by responding to the email. The interview questions were designed to cover key themes such as the future of user experience design and AI's impacts, benefits, and challenges associated with it. This process was essential to obtain valuable information for the research project.

4.1.3. Interviews

This chapter thoroughly examines the findings obtained from the in-depth interviews carried out with participants. The interviews were conducted with the goal of delving into the participant's viewpoints regarding the incorporation of intelligence technologies in user experience design. During these interviews, participants had the chance to share their thoughts on the obstacles, possibilities and potential impacts of

integrating AI technologies into user experience design. The responses from the interviews are scrutinized question by question to offer a view of the participants' perspectives.

Future of UX

User experience design holds exciting possibilities; interview results revealed an overall optimistic view of artificial intelligence's growing role in improving user experience design.

Interviewee A predicts that UX design will progress quickly influenced by advancements, in technology and evolving user expectations. They mention, "*With the advancement of technology and the changing expectations of users UX designers will have an impact, on shaping the experiences that impact our daily lives.*"

Interviewee B anticipates expansion and mentions "*Artificial intelligence is expected to continue growing and advancing at a pace faster than we can keep up with. Every tool and software now incorporates AI in some manner. Many companies are competing to introduce the 'next big AI innovation.' It will just grow from here.*"

Interviewee C expects design to evolve towards more personalised and adaptive experiences and adds, "*As technology advances, I expect a stronger integration of AI to create more intuitive and context-aware interfaces.*"

Experiences with AI Technologies in UX Design

Both interviewees, A and C, highlighted the increasing significance of artificial intelligence and machine learning in user experience design. Interviewee A says, "*AI and ML play an increasingly significant role in UX design, automating tasks such as data analysis. This allows UX designers to focus on higher-level creative and strategic work, while AI handles the more mundane tasks.*"

Interviewee B characterised the matter; "*I think AI is all around us, especially in the creative fields. Moreover, in UX design, that is no exception. I use AI to generate text prompts, populate designs with images, create colour combinations, etc. I only see this trend becoming more and more considerable as the months and years go on, and I believe it is our responsibility to learn how to work with it. These technologies can help us speed up our work and be better designers focusing on what matters, which is design thinking.*"

Interviewee C specifically noted the enhancement of user experiences by incorporating artificial intelligence technologies like machine learning and natural language processing.

Projects with AI Impact on UX

Interviewee A provides some specific examples of projects where artificial intelligence played an important role in improving user experience;

“1. Amazon Alexa acts as an assistant driven by intelligence, allowing individuals to control smart home gadgets, listen to music, schedule reminders, and perform additional tasks. Helpfully responds to user commands making it a popular choice, for those seeking a convenient hands free interaction with their devices.

2. Google Translate stands out as a translation tool that uses AI technology to seamlessly translate text across an array of languages exceeding 100. It has also been used to facilitate real-time language translations during conversations among individuals speaking different languages.

3. Duolingo emerges as an app for learning languages that leverages AI to personalised user learning journeys.

4. Facebook's recommendation algorithms have garnered acclaim for their effectiveness in keeping users engaged and well informed.

Interviewee B highlighted the benefits of using artificial intelligence in copywriting: *“Every project that requires general copy can make use of AI - as these copywriting tasks can be a bit time-consuming. It is super beneficial for us to use AI for the copy to better communicate our design ideas even at a wireframe level.”*

Interviewee C gave the example of using machine learning algorithms to *“analyse user behaviours and provide customised content recommendations”*.

Key Benefits of AI in UX Design

All three interviewees highlighted increased personalisation as a major benefit. The interviews revealed that artificial intelligence is helping automate repetitive tasks like data analysis and copywriting, allowing designers *“to focus on higher-level creative and strategic work”* (Interviewee A).

Interviewee A also highlighted the impact of incorporating intelligence in user experience design, stating that *“it is transforming the industry by providing advantages and opportunities for improving user experiences and streamlining design procedures. AI’s capability to process volumes of data, recognise patterns and trends, and forecast outcomes based on user interaction provides UX designers with valuable resources to develop more user-friendly, customised, and impactful experiences.*

1. *Data-driven decision-making*
2. *Personalisation and customisation*
3. *Automated tasks and efficiency*
4. *Predictive analytics and forecasting*
5. *Continuous improvement and iteration.”*

Interviewee B thinks that AI can speed up the design process and adds, *“It can help us get rid of tedious tasks and focus on solving actual problems; it can help us communicate our ideas better.”*

Interviewee C stated that key benefits include improved personalisation, efficiency, and predictive capabilities. Also agreed that artificial intelligence allows designers to anticipate user needs and unique experiences and automate repetitive tasks, contributing to a more effective and user-centric design.

Challenges and Mitigations

While interviews expressed enthusiasm for artificial intelligence’s potential, concerns around issues of bias, transparency, and ethics were also raised. Interviewees A and C both emphasised the need to mitigate risks such as bias and breaches. As interviewee A stated, designers must *“maintain their human connection and adopt a human-centred approach”* in utilising artificial intelligence technologies responsibly. Also addressed some challenges,

- “ 1. *Data quality and bias*
2. *Explainability and transparency*
3. *Ethical considerations and user privacy*
4. *User acceptance and trust.”*

Interviewee C also agreed and stated, *“Challenges have included addressing bias in artificial intelligence algorithms and making sure about transparency. To mitigate these issues, thorough testing, diverse data sets, and constant monitoring are really important for us designers. Clear communication with users about artificial intelligence functionalities also helps build trust.”*

On the other hand, interviewee B advised caution in incorporating AI into designs and added, *“It is a great tool, but sometimes we need to verify that the information is correct. I personally have not faced any problems, but I am aware that these might come.”*

Artificial Intelligence’s Impact on UX Design

It appears that the use of intelligence is significantly influencing the design of user experiences. These technologies are viewed as a resource that streamlines tasks allowing designers to concentrate on more advanced creative thought processes. However, Interviewee A cautioned against the risk of de-skilling if designers excessively depend on AI. They mentioned, *“While AI streamlines tasks and offers data-based insights to empower UX designers to focus on thinking and innovative problem solving, there is a concern that continued reliance on AI tools may diminish the critical thinking, creativity and user empathy skills of UX designers over time. It is essential for UX professionals to preserve their touch in the design process and ensure user-centric utilisation of AI.”*

However, Interviewee B sees artificial intelligence as an opportunity and stated, *“The designer's willingness to learn and work with these tools enriches the potential by 100%. Otherwise, it is possible to face the risk of being left behind.”*

While acknowledging that AI can automate certain routine tasks, Interviewee C believes that this automation allows designers to direct their focus towards more strategic and innovative aspects of the user experience. This perspective supports the general notion that AI, when used appropriately, can increase creativity and foster deeper engagement with individuals and users.

Future Impact

Looking ahead, Interviewees B and C provided forward-looking perspectives. Interviewee B envisions a future characterised by more iterations, faster concepts, and overwhelming yet ultimately beneficial impacts on design workflows.

Meanwhile, Interviewee C anticipates “*AI playing an even more significant role in UX design*”. Also thinks that integrating artificial intelligence can lead to more seamless and predictable experiences, making products and services more intuitive and customised to individual users.

Overall, interviewees all agreed that integrating artificial intelligence brings new capabilities yet also obligations. Results underscore the potential and influence of artificial intelligence in user experience design while also highlighting the importance of addressing challenges and ethics to ensure responsible and human-centred integration.

4.2. AI-Generated vs Traditional Designs

The partial objective of this thesis is to design AI-generated and traditional designs in order to compare them with user testing. Two different prototypes were prepared to compare these two different design rounds. While the first prototype followed the traditional design process, the second prototype was prepared due to the prompts given to artificial intelligence. The important factors compared in these two designs were aesthetics, clarity, user satisfaction, design efficiency and task completion time. The traditional website created as part of the study was designed and built using Figma throughout the entire process. Figma is an online tool for digital project graphic editing, prototyping, and user interface design. Due to its compatibility with all platforms, cloud-based infrastructure, open source library, and ability to easily prototype on mobile devices, Figma was the chosen choice for application development. On the other hand, Uizard was used for AI-generated design. Uizard is a tool that uses AI technology to generate designs. By inputting prompts, an AI-powered auto designer creates the desired design. The main advantage of Uizard is that it is entirely automated, and AI can complete all design tasks.

4.2.1. Research Question



- How does integrating artificial intelligence into design processes compare to traditional methods in terms of aesthetics, efficiency and overall satisfaction?

4.2.2. Comparative A/B Testing

A/B user testing, also known as A/B testing, a commonly used method in digital contexts, has been the subject of various improvements and adaptations. It is a method used to evaluate user engagement or satisfaction with a new service, feature, or product [39]. It determines which of the two design iterations is superior by comparing them side by side. Also, it is able to quantify even minor statistically significant variations in performance. It is inexpensive and comes with two concurrently prepared design options.

4.2.3. Personas

User personas, as defined by Humphrey (2017), are fictitious representations of target users created to aid in user experience design. Personas can be extremely useful in the field of user interface design, as they help to clarify the needs of end users, making it easier to design an effective product. In this way, the user becomes a primary focus of the design process, which is a common approach in many other disciplines. The user, however, is a subjective variable rather than a fixed, objective component of the process, in contrast to other aspects. The user essentially represents a human being, and each human being has unique needs and aspirations in addition to emotional, perceptual, and cultural aspects. Designers assess the distinctions between them through experiences because it is impossible to measure these differences in each individual with a hundred per cent accuracy.

MICHAEL SMITH	ALEX BOND
 <p>Age: 30 Occupation: Software Engineer Hobbies: Playing rugby, watching movies Gender: Male</p>	 <p>Age: 25 Occupation: Architect Hobbies: Running, dancing Gender: Female</p>
<p>Typical Day: Michael starts the day with a simple skincare routine. After skincare he takes a quick shower. As a software engineer, he spends most of his day in front of a computer. He prefers grooming products that offer quick and easy application, allowing him to maintain a professional appearance without much effort. After work he heads to the gym for a workout. Post-workout he takes a shower and goes to home. Before bedtime, Michael follows a simple nighttime skincare.</p> <p>Short History: Michael's interest in grooming developed during his college years when he started experimenting with different styles. As a software engineer, he values efficiency, and this reflects in his grooming choices. Michael believes that grooming is an essential part of presenting oneself in a modern professional environment.</p>	<p>Typical Day: Alex gets up at 9pm and has a quick breakfast before her dancing class. After dancing class, she takes a quick shower and goes to work. As an architect, Alex's day is filled with design meetings, site visits, and creative brainstorming. The makeup may evolve throughout the day, reflecting different moods and occasions. Alex enjoys experimenting with artistic makeup looks, drawing inspiration from architectural forms and patterns.</p> <p>Short History: Alex's fascination with beauty and architecture intersected during university years, influencing both career choices. The desire to express creativity in various forms led to a unique approach to beauty.</p>

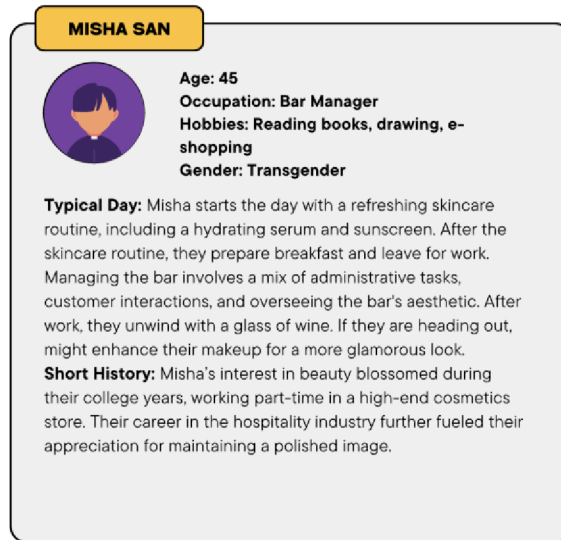


Figure 5: Personas

4.2.4. Design Process

The aim of the user testing is to compare two design prototypes, developed with artificial intelligence and traditional, that is, everything made by human power. The use of prototypes in UX design is a crucial aspect of the human-centred design process, allowing for the exploration and evaluation of design ideas, as well as the communication of design decisions [35].

The similarity between the two design prototypes was significant. That's why the same scenarios and the same pages were prepared for the two prototypes. The process started with developing a plan and identifying target areas. This requires careful consideration of a number of constraints, including financial, schedule, technological, and human resource limitations. The idea was to design a standard e-commerce beauty store website focused on beauty products for all genders. In an e-commerce beauty store, it is important to incorporate the following web page types: home, product, shopping cart, and sign-up pages. Recognising that it is difficult to satisfy every user demand, it is also critical to take a realistic approach. For traditional design, first, a hand-drawn version of the prototype was prepared. Approximately an hour was spent in order to make the sketches follow a flow based on how the user would interact, from opening the design to doing daily tasks.

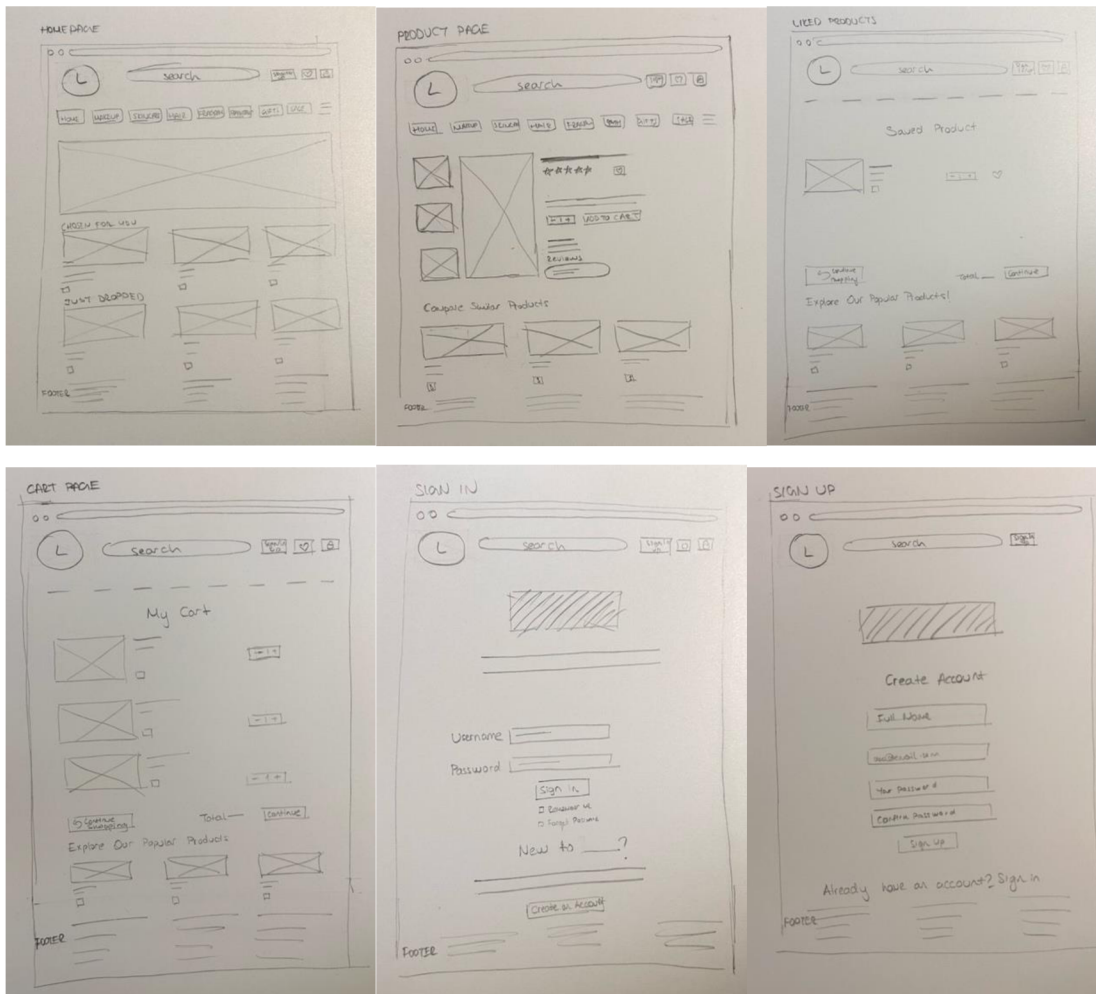


Figure 6: presents the sketches, the author's creation

The design process started by using Figma. Every element of the design, such as pictures, writings, colours, etc., was individually investigated without the use of any artificial intelligence. Initially, a decision was taken regarding the colour scheme of the design. It was concluded that a warm, memorable and visually appealing colour would be the best choice. Consequently, the design was made primarily in orange, taking into consideration the impact of the orange colour. Then, a design was created that mainly incorporated the orange colour. The interface elements were strategically placed in a way that would capture user attention, and the layout was carefully balanced with proper spacing and alignment. The specific placement of buttons, texts, and images was also taken into consideration. Icons and images were chosen based on their ability to be representative, easily recognisable, and relevant. All the images were found one by one on the Internet to support the content. Subsequently, tasks for user testing were decided, and links and interactions between pages were created. Connections and buttons were

ensured to work as expected for an easy and smooth user experience. The traditional design preparation process took one week, with working three hours everyday.



Figure 7: presents the traditional design interactions, author's creation

After completing the initial traditional design, the process of creating an AI-generated design began. Uizard's Autodesigner was used in this process, which allowed the desired website elements to be prepared using prompts given to artificial intelligence. This eliminated the need for a hand-drawn sketch. The prompts given to artificial intelligence contained the criteria required on a traditional website.

Which device are you designing for?

Mobile Tablet Desktop

Describe your project in plain English Try example

create a website of e-commerce personal care and beauty store for all genders; includes such as makeup, skincare, hair, fragrance, bath&body, home page, products page, liked products page.

189/300

Describe a design style, pick keywords, or both

a warm, memorable and visually appealing colour

48/150

Light Dark Modern **Artsy** Tachy Young

Corporate Formal **Elegant** Hand-drawn

[Generate my project](#) Beta

Figure 8: prompt given to Uizard's Autodesigner by author

By turning the prompt into multi-screen models, Autodesigner was able to produce it quickly and easily in a matter of minutes. In addition to generating multi-screen, Autodesigner also created interactivity between the pages.

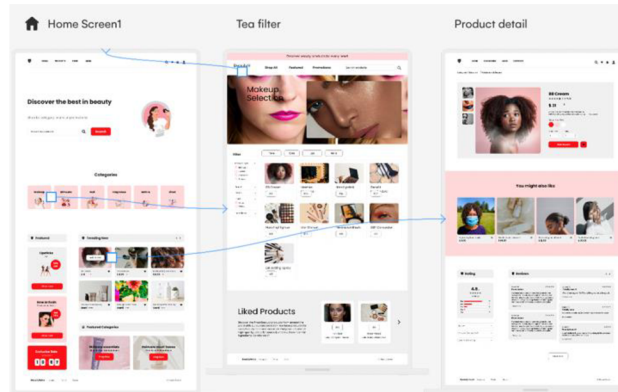


Figure 9: presents the interaction given by Autodesigner

Auto designer generated 5 pages with the given prompts; these pages were the home page, filter page, and product detail page. Three of them were used because the other two of them were not relevant. Later, in order to create the same tasks as traditional design, the auto designer was given prompts to create a cart page, products page, sign-in/sign-up page and pages where liked products are displayed. Autodesigner automatically created all the pages along with images and texts. Only the interactions of the pages created by Autodesigner were done manually, and nothing else was touched on the layout in order to make a proper comparison.

4.2.5. Participants

Nielsen (1993) suggests that the purpose of the usability test should be taken into account and is important when determining the number of participants. If the aim is to test the product or detect problems in the application, it is considered statistically sufficient for at least five users to participate in the test, while if the aim is to obtain important data about user interaction, it is recommended to have at least twenty participants. Since two different prototypes will be compared in this test, priority was given to the prototype of the application. Eight users were included in the test to obtain reliable results. In the selection of users, only their understanding of technology and gender were taken into account, without any other factors.

Table 2: Participants

	U1	U2	U3	U4	U5	U6	U7	U8
Gender	Male	Male	Male	Male	Male	Female	Female	Female
Age	18-24	18-24	18-24	18-24	25-34	25-34	18-24	18-24
Education	Bachelor	Bachelor	Bachelor	Bachelor	Bachelor	Bachelor	Bachelor	Bachelor

4.2.6. Tasks Used in The Study

The plan involves tasks that mirror common user actions on e-commerce sites. The task list, which includes the scenarios that test participants would complete based on the objectives, was briefly reported as the first step in the test design. The tasks on the list consist of:

- Add liked products.
- Add goods/ products to the cart and see it in your cart.
- Examine the shopping cart.
- Account access.
- Apply product filters.

Add Liked/Saved Products

Use Case

The user expects to see:

- A clear and accessible option to like products for later on the product listing or detail page.

Scenario

The system will display:

- The system will display a 'heart' icon next to each product on the listing page.

- After clicking, visual changes the icon to show that the item has been added to the user's saved products.
- The system updates the 'Saved Products' list, which users can access through their account or the heart icon on the page.

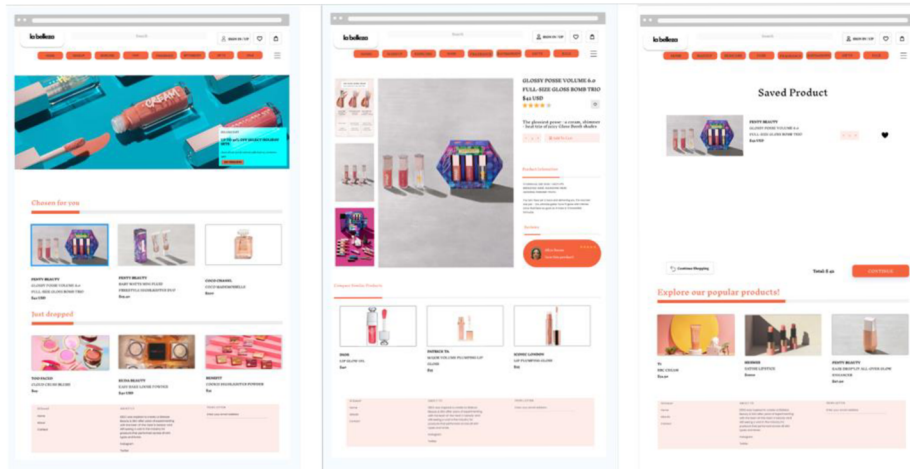


Figure 10: Traditional design, created by the author

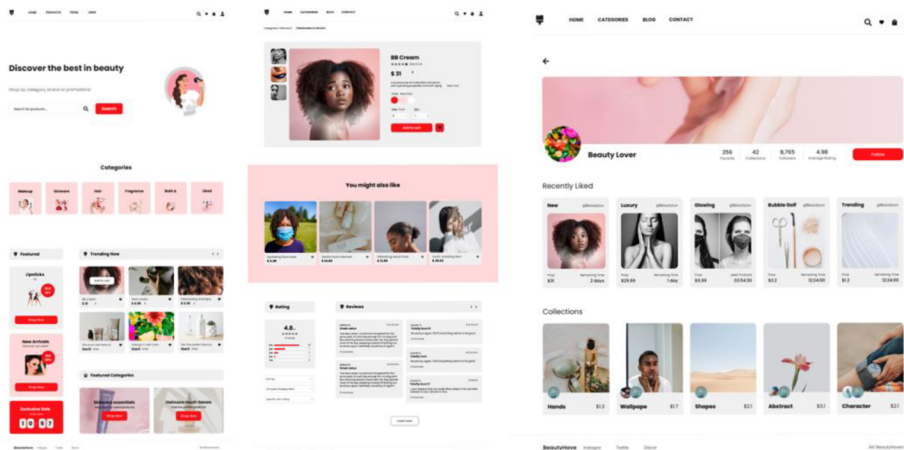


Figure 11: AI-generated design

Add Goods/ Products to the Cart

Use Case

The user expects to be able to:

- Go to the website and browse through products.
- Add the product to the cart.

Scenario

The system will display:

- Each product has an "Add to Cart" button visible on the product listing or detail page.
- After clicking on the cart button, it will be added to the cart and the user will click on the cart icon in the upper right corner of the page to see the cart.

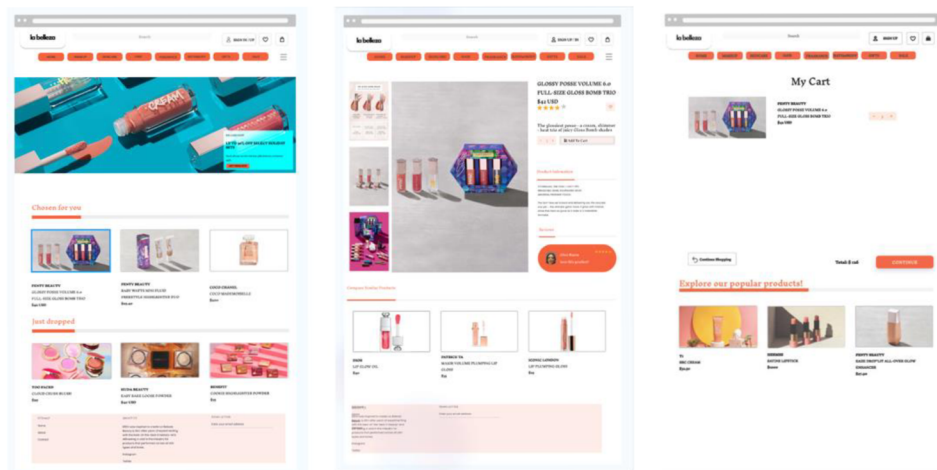


Figure 12: traditional design, created by the author

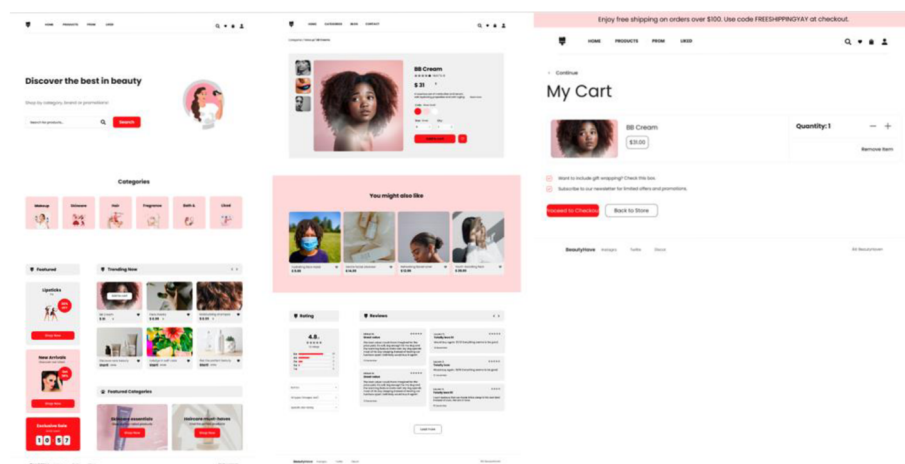


Figure 13: AI-generated design

Examine the Shopping Cart

Use Case

The user expects to see:

- Name, price of each product, number of products,

- Change the quantity of the products in the cart,
- Total price,
- Remove selected product/s from the cart,
- Possibility of a continue shopping button,
- Place the order button.

Scenario

The system will display:

- Remove the button to remove product/s from the cart.
- Button for continue shopping.
- Button for going back to the home page.
- The system shows the total price and individual price for each product, which is next to the related product in a vertical order.
- Button for placing the order,
- After clicking, the system goes to the payment and shipping section

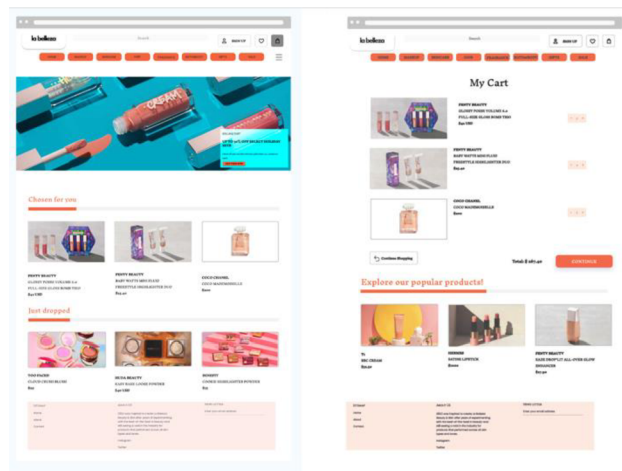


Figure 14: Traditional design, created by the author

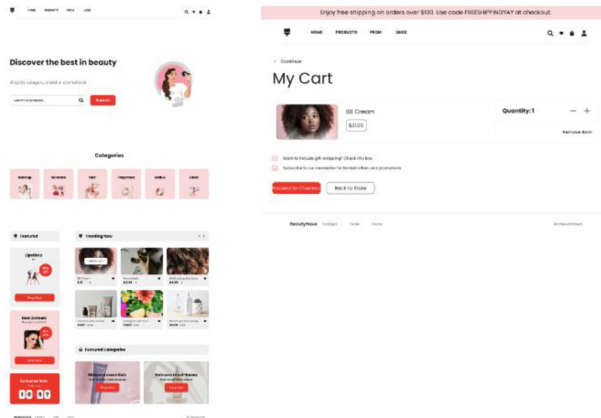


Figure 15: AI-generated design

Account Access

Use Case

The user expects to see:

- The user expects to sign in by;
- Username and password
- Or Google, Facebook and Twitter for AI-Generated Design
- The user expects to sign up by;
- Username, e-mail and password

Scenario

The system will display:

- The sign In/ Up silhouette button is located right above the home page.
- This is a form with fields for email, username, password, and confirm password, as well as buttons and checkboxes for 'remember me' and 'forgotten password'.
- A sign-up page with details on how to create an account and fields for username, email, password, and password confirmation.
- Sign in: The system checks the credentials and logs the user in
- Sign up: The system creates the account and logs the user in

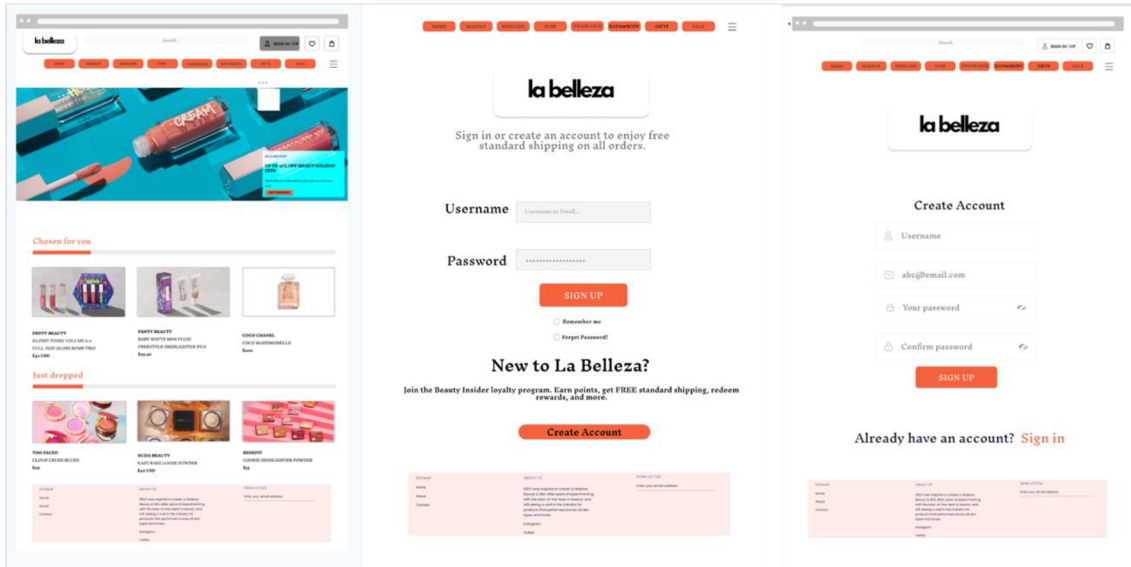


Figure 16: Traditional design, created by the author created by the author

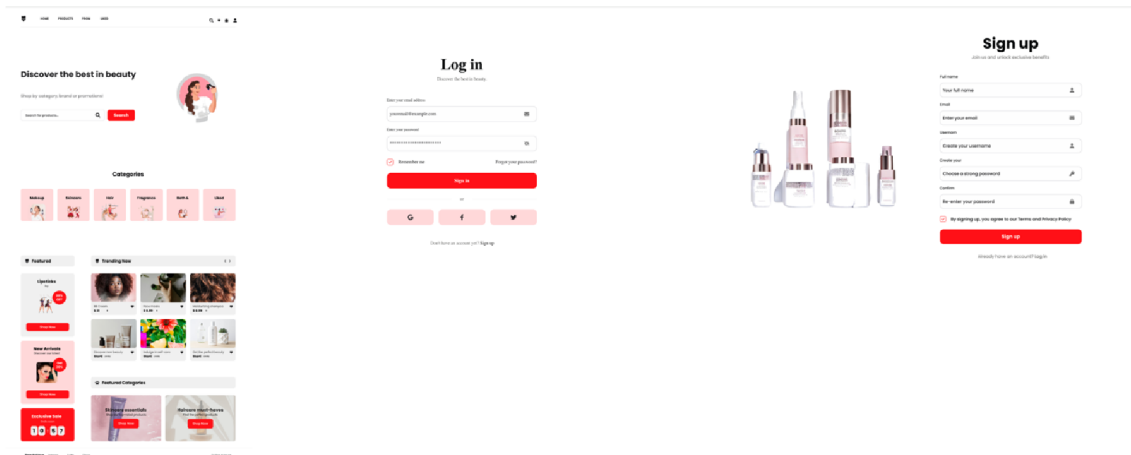


Figure 17: AI-generated design

Apply Product Filters

Use Case

The user expects to see:

- A set of filter options, such as categories, brands, price range, etc., to refine the product listings.

Scenario

The system will display:

- A dropdown menu with various filter options that the user can select or clear.

- After clicking, the product listing page refreshes, showing only the products that match the selected filter criteria.

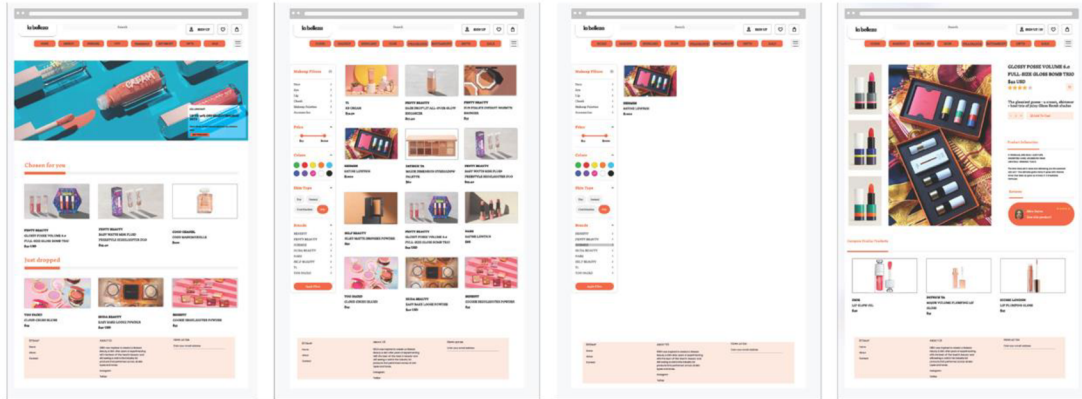


Figure 18: Traditional design, created by the author

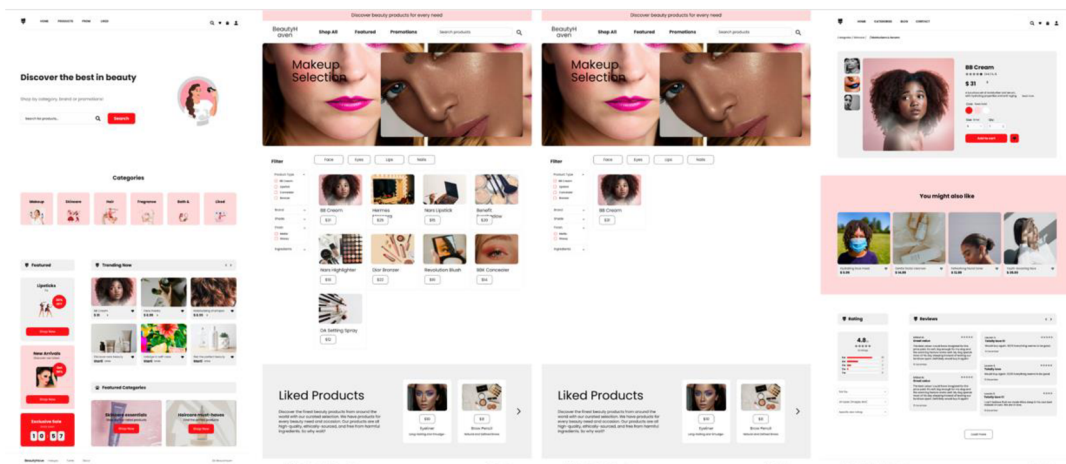


Figure 19: AI-generated design

After finishing each task, users were asked to rate the designs on a 5-point scale from 1, meaning very unsatisfied, to 5, meaning very satisfied, in order to compare them. The following are the Likert scale numbers expressed:

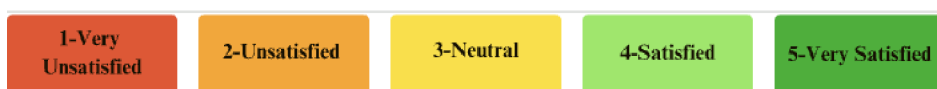


Figure 20: 5-point Likert Scale

Every participant was asked to assign points based on the Likert scale to each statement.

- How would you rate the overall ease of use of the website?
- How would you rate the visual appeal and aesthetic quality of the design?
- Were the functions and features within the application clear and easy to understand?
- How efficiently could you complete your tasks using the design provided?
- Considering all aspects, how satisfied are you with the application?

Table 3: The user satisfaction rate for Traditional design

	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	Total
How would you rate the overall ease of use of the website?	4	5	4	4	4	5	4	4	34
How would you rate the visual appeal and aesthetic quality of the design?	5	5	4	5	3	2	4	3	31
Were the functions and features within the application clear and easy to understand?	4	4	3	3	4	3	4	5	30
How efficiently could you complete your tasks using the design provided?	4	4	4	3	4	3	4	4	30
Considering all aspects, how satisfied are you with the application?	4	4	5	4	5	4	4	5	35

Table 4: The user satisfaction rate for AI-generated design

	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	Total
How would you rate the overall ease of use of the website?	3	4	3	3	4	3	4	5	29
How would you rate the visual appeal and aesthetic quality of the design?	2	3	3	2	4	3	3	4	24
Were the functions and features within the application clear and easy to understand?	3	4	4	4	3	4	5	5	32
How efficiently could you complete your tasks using the design provided?	5	4	5	3	4	4	3	5	33
Considering all aspects, how satisfied are you with the application?	3	4	4	3	4	3	4	5	30

5. Result and Discussion

The results of the literature review in this study indicate that artificial intelligence technologies have an impact on user experience design accompanied by their own set of challenges. Nowadays, AI has emerged as a tool that not only transforms the design process but also influences the design outcomes. Previously designers relied on their imagination, creativity and instincts to enhance interactions and create designs. However, the integration of intelligence technologies into user experience design has revolutionised this approach. Depending on the task at hand different technologies and techniques are utilized by intelligence. Some examples include machine learning, neural networks and natural language processing. Through machine learning algorithms, computers can autonomously. Make decisions without intervention. This technology streamlines data analysis for designers while reducing errors that humans might overlook. A class of machine learning algorithms known as neural networks mimics the composition and operations of the human brain. By learning from data and assessing its interaction with a system to generate predictions, neural networks facilitate the development of prototypes that respond to user input in real-time – offering a more accurate representation during testing phases. Employing networks can enhance user satisfaction, with products they engage with. Natural language processing empowers machines to comprehend, interpret and translate language effectively.

This technology has the ability to automatically generate text content for design based on the user's needs, saving time in creating content interfaces. The influence of intelligence on user experience design is significant, streamlining designers' tasks and enhancing design outcomes through data analysis and predictive capabilities. However, it also introduces challenges related to ethics, bias, inequality and privacy. To mitigate these issues designers must utilize intelligence effectively and responsibly while approaching their work with caution.

5.1. Interview Results

The world and technology are constantly developing and shaping several areas at the same time, and this will continue in the future. The interview results show an optimistic outlook on the role of artificial intelligence in shaping/improving the future of user experience design. All interviews pointed to customisation powered by massive affordance. Interviewees A and B both foresee a rapid change, tying it to technical advances and changing user expectations.

The growing importance of artificial intelligence and machine learning in user experience design was highlighted, with particular emphasis on automating tasks such as data analysis, allowing designers to focus on a higher level of creativity. Furthermore, the important role of user experience designers in creating or developing digital experiences that adapt to changing technology and user expectations was also highlighted. The narrative was further expanded by incorporating artificial intelligence into various design aspects, anticipating its continued growth. The discussion also touched upon improving user experiences by utilising technologies such as machine learning and natural language processing, drawing from real-life experiences. However, cautionary advice was given regarding the potential deskilling of designers if they rely on artificial intelligence tools extra, emphasising the importance of maintaining critical thinking, creativity, and user empathy skills in the design process. Rather than threatening the status of human artists, the increasing use of computer technology in creative work offers an opportunity to explore new ways of collaboration between artists and artificial intelligence. This collaboration can push the boundaries of creativity, expand perspectives and possibilities, and create new expressions.

Interviewee A cited real applications of artificial intelligence improving user experiences, ranging from virtual assistants like Amazon Alexa to learning apps like Duolingo. Interviewee B expands on the usage of AI in copywriting, emphasising the benefits even at the wireframe level. Interviewee C contributes to the topic by highlighting the use of machine learning algorithms for personalised content recommendations. All three interviews underscore increased personalisation as a major benefit of the integration. The key benefits mentioned, such as data-driven decision-making, personalisation, automated tasks, and predictive analytics, provide a solid framework for understanding the positive influence.

However, despite the enthusiasm for artificial intelligence's potential, professionals equally highlighted concerns and challenges around bias and transparency as important to address. Maintaining human connection and emphasising user privacy was important to ensure responsible and ethical adoption. Responsible use of AI in the design is critical to minimising negative legal, financial and ethical impacts on designers. In conclusion, it should be underlined that artificial intelligence can contribute significantly to the design process, but this must be done responsibly to avoid negative impacts on designers.

5.2. User Testing Results

Part of the practical part involves conducting user testing to compare traditional designs against those using AI-powered solutions. To create the prototypes, Figma and Uizard tools were used. The traditional design process involved starting with hand-drawn sketches, followed by creating page designs one by one using Figma. On the other hand, the AI-powered design was created using Uizard's Autodesigner. The purpose of this user testing was to compare the two prototypes based on criteria such as ease of use, aesthetic appeal, clarity, design efficiency, and overall satisfaction to answer the research question:

- How does integrating artificial intelligence into design processes compare to traditional methods in terms of affecting user aesthetics, efficiency, and overall satisfaction?

5.2.1. Test Scenario

The test started by introducing each participant briefly about the test, the scenarios, having two different prototypes, and its purpose. It was then carried out according to the following scenario. Participants were given five different tasks to meet the comparison criteria and research question.

Tasks:

- **Task 1:** Select and add products to your list of favourites.
User can find it: Homepage > Click on the example product > Click on the heart button > Click on the heart icon in the upper right corner of the page> See your liked products

- **Task 2:** Choose products to add to your shopping cart and review them on the cart page.
User can find it: Homepage > Click on the example product > Add to cart > Click on the cart icon in the upper right corner of the page > See your cart
- **Task 3:** Inspect the items in your shopping cart to review quantities and prices.
User can find it: Homepage > Click on the cart icon in the upper right corner of the page > See your cart
- **Task 4:** Create a new account or log in to an existing one
User can find it: Homepage > Click on the Sign Up/In button in the upper right corner of the page > See Sign In Page > Click on “Create Account” button > See Sign Up page
- **Task 5:** Use filter options to refine product searches
User can find it: Homepage > Click on the “Makeup” > Add the filter > Apply the filter > See the filtered page > See the product

5.2.2. Testing Process

The tests were planned to take place in person. Eight people participated in the test, which required them to complete five traditional design tasks and five AI-generated design tasks. Each participant evaluated the interface on a laptop. The tests started with a short description of the topic and the prototypes. The purpose of this testing is to evaluate and compare user perceptions of aesthetic appeal, clarity, design efficiency, ease of use and overall satisfaction between AI-generated and traditional UX designs through the given scenario. After finishing each task, users were given a questionnaire and asked to rate the designs on a 5-point scale from 1, meaning very unsatisfied, to 5, meaning very satisfied, to measure their satisfaction rate. Identical questions were asked of the users for both tests to compare them fairly. After all the tasks and the questionnaire were completed, users had the opportunity to give feedback and comments about their overall impression of the designs.

5.2.3. Results of Testing

Important opinions and comments of the participants were collected during the testing of the designs created to compare the designs produced by artificial intelligence with traditional designs. These insights and feedback help identify the strengths and weaknesses of AI technologies for user experience design. Here are the results of some important tests:

For the Traditional Design:

- Tasks 1, 3 and 5 were completed successfully by all participants.
- All participants completed Task 2 successfully, but one participant stated, “A product displayed on a white background is not appealing to users” on the products page.
- Most participants completed Task 4 successfully. However, one participant had trouble finding the "Create New Account" button, as they were expecting to see it labelled "Sign Up.”
-

For the AI-Generated Design:

- Tasks 1, 3 and 4 were completed successfully by all participants.
- All participants completed Task 2 successfully, but one participant stated that the total price was not visible on the cart page.
- Most participants completed Task 5 successfully, but one participant reported issues with image relevance due to irrelevant pictures.

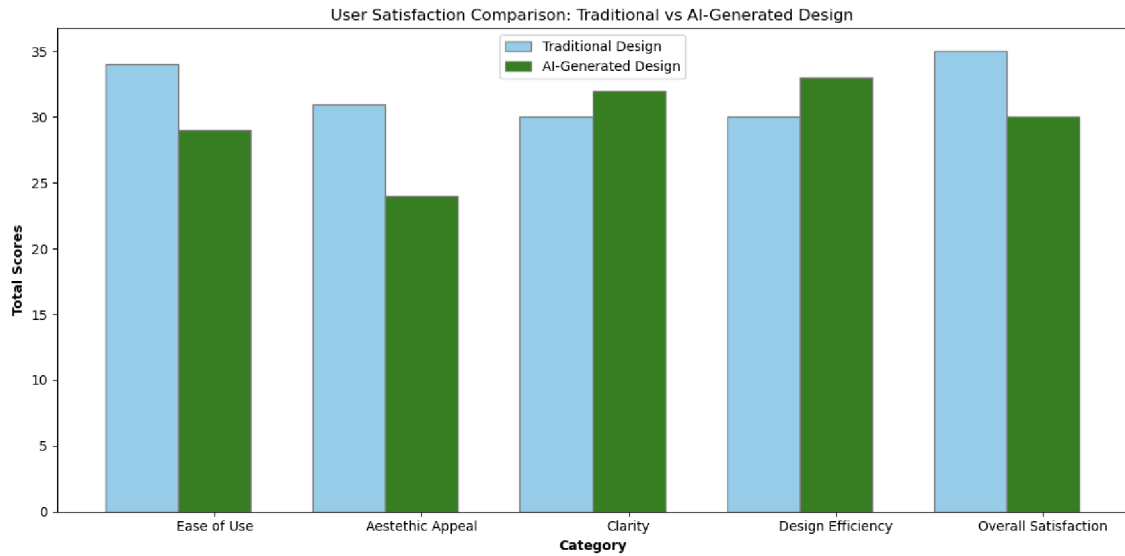


Chart 1: Questionnaire results chart

The results of the questions were looked at and examined one by one. Based on the questionnaire results:

Ease of Use:

As the chart shows, users generally rated the traditional design as easier to use. This suggests that users generally find the traditional design more intuitive or simpler to navigate.

Visual Appeal:

The AI-generated design scored lower than the traditional design in terms of visual appeal. Users showed a clear preference for the aesthetic qualities of traditional design.

Clarity:

Clarity of functions and features saw the AI-generated design slightly ahead in total scores, suggesting that when users did understand the design, they might have found it marginally clearer or more straightforward.

Design Efficiency:

The AI-generated design had a higher overall score for design efficiency, indicating that many users were able to accomplish their tasks faster or easier using this design.

Overall Satisfaction:

When all aspects of the designs were considered, users reported higher levels of satisfaction with the traditional design, as evidenced by both total and average scores. This implies that, overall, users felt more content with their experience using the traditional design.

General Feedback:**Traditional Design**

- User stated that the menu is too close to the brand name, making it look cluttered and not simple.
- Another user stated that the product displayed on a white background is not appealing.

AI-Generated Design

- User stated that the layout appears cluttered, especially where there are five items in a row, which is distracting.
- Users suggest that sections like "you might also like" and "reviews" should be placed differently for better distinction.
- A user stated that the filtering page has limited options.

Overall, the feedback indicates a preference for simplicity and clarity in design, easy navigation and the importance of distinguishing between sections and features to enhance user experience. It also underscores the importance of a clean, intuitive design to facilitate easy navigation and a more engaging user experience.

5.3. Discussion

The incorporation of intelligence into user experience design marks not a technological advancement but also signifies a shift in how designers approach creating and enhancing user experiences. The impact of AI technologies on user experience design has aspects; it presents opportunities like personalized experiences for users and increased efficiency, for designers while also necessitating careful scrutiny of outcomes regarding ethical considerations and biases. Comparing these findings with existing literature reveals consensus on the potential of AI to revolutionise user experience design but also underscores the need for a robust ethical framework to guide AI technologies, using it well and with consideration for its consequences. The complexity of integrating AI in a way that respects user rights and social norms, including potential biases in algorithms and data privacy concerns, needs to be underlined. As the field evolves, the dialogue between AI and user experience design promises to provide greater insight and advancements while heralding a new era of user-centred design that leverages AI to meet and exceed user expectations in increasingly sophisticated ways.

5.4. Limitations

- The traditional design was prepared by the author, lack of professional design experience.
- Eight users participated in user testing for this study. More participants will be needed for a more meaningful result, and more in-depth statistics can be obtained with more users.
- The possibility of learning bias: If users tested one design first, they might have been quicker with the second due to familiarity, not efficiency.

6. Conclusion

The primary goal of this study is to evaluate the influence of intelligence (AI) technologies on user experience design. When not used cautiously, artificial intelligence can impact user experience design positively or negatively. The notable effect of AI technologies on UX design is clear, leading to a shift towards personalised and innovative design approaches. By harnessing intelligence capabilities like machine learning, neural networks, and natural language processing, designers can surpass design constraints through swift data analysis and automation while dedicating more time to their creativity. To support this notion, data was gathered through interviews with industry professionals and experts to determine the effects of intelligence on design efficiency, productivity and challenges. Two different designs, traditional and artificial intelligence-supported, were created. User tests were conducted to compare traditional designs against AI-generated solutions and gather user feedback and opinions.

Despite the advancements that AI offers in user experience design, it also introduces obstacles and issues such as ethics, biases and privacy concerns. When dealing with these, designers must tackle these obstacles and guarantee that incorporating intelligence into UX design enriches the user experience responsibly without sacrificing ethical principles. While AI can handle tasks effectively, it is unable to fully replicate human designers' creativity and emotional insight. As AI increasingly influences the design field, designers will adapt to collaborating with AI to enhance their work and streamline their tasks.

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[41] Figma's FigJam: <https://www.figma.com/figjam/>

[42] Maze: <https://maze.co/ai/>

[43] Khroma: <https://www.khroma.co>

[44] Uizard: <https://uizard.io/autodesigner/>

8. List of Pictures, Tables, Charts and Abbreviations

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8.4. List of Abbreviations

UX: User Experience

AI: Artificial Intelligence

NLP: Natural Language Processing

9. Appendix

9.1. Interview Questions:

1. What is your current professional role, how many years have you been involved in the design field?
2. How do you anticipate the progression of UX design in the next few years?
3. What experiences or insights do you have around incorporating AI technologies like machine learning or natural language processing into UX design? What impacts have you seen?
4. Can you share specific examples of projects where AI played a significant role in enhancing the user experience?

5. In your view, what are the key benefits or opportunities of integrating AI in UX design? How does AI contribute to the overall effectiveness and efficiency of UX design?
6. What challenges or pitfalls have you faced when integrating AI into your design workflows or products? How should UX designers mitigate issues?
7. How do you think incorporating AI affects the role of UX designers? Does it enrich the role or potentially deskill practitioners over time?
8. How do you anticipate AI impacting UX design in the future or already now?