Pioneering a New Era:
Designers at the Crossroads of Design and AI

Matilda Kalving

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Forewords

This thesis captures insights and perspectives on adapting tools during the changing times of early 2023 and the beginning of 2024. The compilation of literature and materials was frozen at the beginning of February 2024. Given that AI technology is advancing at a rapid pace, it is likely that numerous advancements have been made since then, even more so after the publication of this text in March 2024. Examples of such advancements that have emerged between the completion of data collection and its publication include image generator Gemini 1.0 Ultra by Google and Sora, a text-to-video AI by OpenAi.

I eagerly await what comes next, as this rich topic has been a joy to explore, and I am eternally grateful for the guidance and support of my advisors, Prof. Jonna Häkkilä and Asst. Prof. Ashley Colley. Their insights were critical in helping me navigate the complexities of this subject and kept me grounded and focused amidst the many intriguing possibilities that this field offers. Their mentorship has not only shaped this thesis but has also profoundly influenced my journey as a researcher.

University of Lapland, Faculty of Art and Design

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Abstract

The rise of Generative Artificial Intelligence (AI) has sparked public interest and widespread discussions regarding its integration into society. However, despite the rapid advancements in AI and the emerging opportunities for innovation in design, there is still a lack of understanding about how designers perceive and incorporate AI tools into their design workflows. This research aims to capture the moment when AI and design intersect and to gain a better understanding of how designers can effectively use these new tools to enhance their work.

Through a comprehensive study, including a survey (n=49), focus groups (n=6), and interviews (n=6), this research explores this shift in designers' identity and workflow. Investigating designers' attitudes towards AI, their acceptance and use of AI in their design processes, and AI's impact on their creativity.

The research found that designers perceive several benefits in adapting AI in their design projects, including enhanced creativity, improved efficiency, and the ability to automate tedious tasks. However, several participants expressed unease about integrating AI into areas that are considered deeply human, such as art. Despite these concerns, AI tools are already extensively employed in design, and AI is increasingly being depicted as a collaborator.

Based on the research findings, it is imperative to incorporate more participatory measures in order to establish ethical guidelines and increase transparency in the use of

AI in design. This research aims to bridge the knowledge gap regarding how designers perceive and incorporate AI into their workflows, offering insights into the evolving relationship between AI and design innovation.

Keywords: Design, AI, User Experience, HCI

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1 INTRODUCTION

In recent years, there have been rapid advancements in Artificial Intelligence (AI) that have impacted various industries, from office workers to artists. In 2018, AI-conceived artwork sold at the prestigious British auction house Christie's at a remarkable price of $ 432,500 (Cohn, 2018). Fast forward to 2021, and the Milan Design Week featured a 3D-printed chair that was designed using AI (Paciotti & Di Stefano, 2021). It is clear that AI technology has made significant progress, especially with the emergence of generative AI models such as Stable Diffusion (2022), Midjourney (2022), and DALL-E (2021). These tools have demonstrated the potential for AI-driven image creation, revolutionizing traditional visual design concepts Additionally, the development of ChatGPT by OpenAI in 2023 has been a notable milestone, distinguishing itself through its advanced reasoning, comprehension, and interactive abilities (C. Wu et al., 2023).

The advancement of AI is unlocking novel opportunities for innovation and redefining the landscape of design. This progression not only enhances the capabilities of designers but also broadens the horizons for creative expression and application in various other sectors. Yet, there exists a significant gap in our understanding of how designers perceive and integrate these tools into their workflows. At this juncture, it is crucial to undertake a thorough analysis that includes evaluating the best approach to seamlessly integrate these tools into the creative process, in order to establish a solid foundation for their successful implementation.

As we stand at the crossroads of AI and Design, this research captures a fleeting moment in a rapidly evolving field. This time of change provides a distinct and exciting chance for learning and discovery. This thesis is motivated by the author's own need to understand the shift, her role in it, and the need to bridge this gap, providing insights that could shape the future of AI tool development and adoption in design.

The context of this research is set against a backdrop of rapid technological advancement, making it a timely and relevant investigation into how AI is reshaping the landscape of design. The research is situated at the intersection of design and AI, at a

pivotal moment when designers are leveraging these technologies to enhance their work.

The primary objective of this thesis is to explore designers' perceptions of AI, focusing on their use and acceptance of AI tools, especially within the design process. Investigating how designers are currently employing AI tools in their design work, identifying the factors that influence the perceived acceptability of AI among designers, and examining the perceived benefits and challenges of using AI in design projects. Through achieving these objectives, this study aims to provide a comprehensive understanding of the role of AI in design practices.

This research is centred on understanding the intersection of AI and design from the perspective of designers who use these tools. These emerging concerns surrounding the use of AI technology through these three research questions:

1. What factors contribute to the perceived acceptability of AI?
   Understanding what makes AI acceptable to designers is key to building trust in these technologies. Identifying these factors can help in adapting AI tools to better meet the needs and expectations of designers, thereby facilitating smoother adoption and integration into existing workflows. Insights into acceptability can guide the development of AI tools that are more user-friendly and tailored to the specific requirements of the design community.

2. How do designers integrate AI tools into their workflow?
   How designers integrate AI into their workflows can significantly impact their efficiency and productivity. Understanding this integration can lead to better tools that seamlessly fit into and enhance existing processes. Examining how designers use these tools can reveal how AI influences creativity and conceptualization in design.

3. What are the perceived benefits and challenges of using AI in design projects?
   Understanding the benefits and challenges helps in recognizing the areas where AI can be most effectively applied in design, as well as where it may fall short or require further development. Insights into the benefits and challenges can direct future research efforts and technological advancements, ensuring that AI tools

evolve in ways that are most beneficial to the design industry.

These questions are crucial for comprehending the nuances of AI's role in the creative process and its broader implications in the design industry.

The significance of this thesis lies in its will to positively influence the future trajectory of AI development and integration in design. By understanding designers' perspectives, this research can inform the creation of AI tools more aligned with their needs and workflows, thereby enhancing creativity and efficiency in design.

Although the field of AI research is complex and involves several layers that intersect and spread into multiple subfields, understanding and learning about it was not the most challenging aspect of writing this thesis. The primary difficulty was presenting the information in a way that could benefit future generations of designers by providing them with a better understanding of this technology. AI research is a vast field that has been continuously evolving for decades. It involves highly technical and complex dimensions that are not easy to simplify. However, in the future, I am hopeful AI will help make research more accessible and less discriminatory, by language.

In the meantime, the results of this research are expected to help designers, developers of AI tools, and industry decision-makers gain a clearer picture of how AI can be effectively used in design. Moreover, this thesis lays the groundwork for further exploration and innovation in the intersection of AI and design.

2 LITERATURE REVIEW

The literature review was conducted to examine the existing studies on the intersection of Design and Artificial Intelligence (AI). The review aimed to explore the definition of AI, the evolving role of designers, and the Finnish society's approach to design while investigating how designers are incorporating the principles and practices of design into AI development to create more intuitive, efficient, and human-centric technological solutions. To achieve the study's objectives, key themes, trends, and patterns in the research were identified, and an overview of the present level of knowledge on the subject was provided. By reviewing the existing literature, gaps in the existing research and potential areas for further exploration were identified.

2.1 Design as a Noun, Verb, and Adjective

The word "Design" serves as both a noun, indicating the final creation, and a verb, denoting the act of creating (von Stamm, 2004). In recent times, the term "designer" has transitioned from being solely a noun, identifying someone who designs, to also being used as an adjective to describe items, typically suggesting quality and exclusivity (Lawson, 2006). The value of design is significantly greater than its computational size, as design is widely utilized across various fields (Lith, 2021). The paragraphs below explore and explain how the role of a designer has been continuously evolving. Also, it will discuss why and how the processes and methods have been adapted to understand better the complexities of the designer's mentality and workflow.

2.1.1 Evolution of Design Practises

Everything around us, apart from simple, untouched nature, has been designed by someone (Cross, 2021). We are constantly interacting with various designed products, from buildings and furniture to clothing and technology, including computers and smartphones. These products, along with their virtual interfaces, undergo rigorous design processes that blend artistic and aesthetic considerations. Karl Aspelund (2014) in "Designing: An Introduction", highlights the unique human tendency to adorn our tools, tracing design's evolution from primitive cave paintings to the com-

plexities of modern technology.

Over the past century, industrial design has evolved to prioritize aesthetic appeal, profitability, and user-friendliness. With the rise of computing and network connectivity, new types of designers emerged, such as interaction designers designing User interfaces (UIs) and user experience (UX) professionals. Smart devices, connected products, and the Internet of Things (IoT) have given birth to a new category of products that seamlessly integrate the digital and physical worlds. Consequently, UI and UX designers are now working on design issues that extend beyond the screen and into the physical world (King & Chang, 2016). To address the challenges of this new era, design disciplines need to break down their barriers and find ways to cooperate.

Design's purpose has shifted from mere aesthetic enhancement to crafting unique human experiences. Modern UX design prioritizes emotional engagement, considering users' experiences and expectations (F. Chen & Terken, 2022). As stated by Norman and Ortony, design is an act of communication and requires a deep understanding of the target audience (Norman & Ortony, 2003). The evolution of design practices reflects a profound shift from traditional craftsmanship to digital innovation, influenced by cultural, technological, and economic changes. Initially rooted in artisanal and industrial production, design has expanded its scope to include digital environments, user experience, and other forms of design (King & Chang, 2016).

Technological advancements in the 20th century, like the introduction of plastics and CAD (Computer-Aided Design), have significantly influenced design practices.
The digital era has ushered in iterative, user-centric design processes, enabling quick prototyping and refinements. Designers have transitioned from object creators to experience facilitators, adopting new tools and interdisciplinary methods. This evolution emphasizes continuous learning and adaptability, with a growing focus on sustainability, user-centred design, and social impact (Tuomi, 2005; Green & Jordan, 1999; Meth, Brophy, & Thomson, 2023).

Contemporary design practices are increasingly interdisciplinary, incorporating insights

from psychology, sociology, and environmental science (Sutton & Kemp, 2006). This approach aims to create solutions that are aesthetically pleasing, socially responsible, and environmentally sustainable (Vezzoli, 2008). The evolution of design reflects society's shifting needs and values, underscoring design's role in addressing global challenges.

Design has evolved from being merely about creating aesthetically pleasing objects and has now expanded to creating distinctive human experiences. This evolution has also seen a greater emphasis on sustainability, user-centred design, and social impact, reflecting a broadening of the field's of ethical and practical considerations.

2.1.2 Design Methods and Processes

The design process is a problem-solving method that involves defining problems, devising solutions, and implementing them. Over the years, various methodologies have been developed to assist designers in identifying and resolving potential issues early in the process. By doing so, these methods streamline the design process and enable designers to think critically and creatively about their work. Designers can employ these methods to detect and solve issues early on, leading to more effective solutions and improved design outcomes (Cross, 2004).

Significant influence on the design process and education has come from the German methodological tradition, exemplified by Hubka(1982) and Beitz, Pahl, and Grote (1995). This tradition advocates for a multi-staged structured process. Where designers are informed about the objectives they need to accomplish by the end of each stage, this procedure has resulted in implementing gateways and checklists, which are tools for managing design processes. These models are widespread across various industries, as they are typically taught during university studies for engineers and designers (Eckert & Clarkson, 2005).

One of the foundational methods in design is the Design Thinking process. It emphasizes problem-solving, thinking outside the box, and developing new solutions (Dam

& Siang, 2021). The methodology involves identifying human needs and creating innovative solutions using the tools and mindset of design practitioners. Tim Brown, the CEO of IDEO, one of the leading innovation consulting firms from Palo Alto, California, defines Design Thinking as a human-centred approach to innovation. He emphasizes that it leverages the designer's skill set to balance the needs of people, the potential of technology, and the imperatives of business success (IDEO, 2024).

There are many variations of Design Thinking phases that are widely used today. While the number of phases, stages, or modes may vary from three to seven, the underlying principles remain consistent across all versions. probably the most recognizable is the five-phase model proposed by the Hasso-Plattner Institute of Design at Stanford, which is also known as d.school. The five steps are Empathize, Define, Ideate, Prototype, and Test (Sakama, Mori, & Iba, 2018). The phases may not necessarily occur in a sequential order and can occur in parallel(Riener, Jeon, & Alvarez, 2022), guiding designers through a process of exploration and discovery aimed at addressing complex challenges. This approach encourages designers to think beyond traditional boundaries, fostering innovation and creativity.

Another significant development in design methods is the adoption of systems thinking. As Don Norman suggests, it is necessary to look at everything as a system and ensure that you are getting at the underlying root causes (Interaction Design Foundation - IxDF, 2016). This approach views design challenges as part of larger systems, considering the interconnections and interactions between various elements. Systems thinking encourages designers to consider the broader impact of their solutions, including environmental, economic, and social implications, leading to more sustainable and holistic designs.

Essential to design is teamwork and co-development, which are referred to using several terms, each with its background and significance: teamwork, cooperation, co-design, co-creation, participatory design, and collaborative design. Most often, these terms are used when discussing the inclusion of the end user in the product design process (Kettunen, 2013). Participatory design is often defined as an umbrella term for research

designs, methods, and frameworks that involve systematic inquiry in direct collaboration with those impacted by the issue being studied (Vaughn & Jacquez, 2020). The method brings together people with different roles in facilitated workshops to provide diverse insights. This ensures that stakeholders' perspectives and voices are considered in shaping the outcome, leading to more effective and inclusive solutions.

At the beginning of the 21st century Dubberly (2004), compiled over a hundred design and development processes from various fields like architecture, industrial design, and software development are compiled. These range from simple mnemonic devices, such as the 4Ds (define, design, develop, deploy), to more complex models like Archers 9-phase, 229-step systematic method. While some may overlap, each offers a unique perspective on design. Dubberly argues that product quality is directly linked to the processes behind their creation (Dubberly, 2004). For designers to enhance products or systems, refining these processes is essential. This means constantly reevaluating not only the products but also the design methodologies. This necessitates a deep dive into the design process to comprehend, refine, and ultimately excel in design practices.

In conclusion, while users often use the word design to describe an end product, it is ineffective to classify design based on its end product since the solution is created through the design process and doesn't often exist before it (Carbon, 2019). The reason for categorizing design in this way is more a reflection of the increasingly specialized technologies we use. Engineers and architects differ not only in their design processes but also in their knowledge of different materials and requirements. However, this specialization can limit designers and lead them to focus solely on a predetermined goal (Lawson, 2006). One could say design is a mindset of problem-solving (Kim & Ryu, 2014), and the role of the designer is moulded by the need.

2.1.3 Overview of Design Identity and Influences

Simply put, a designer's job is to create a concept, specifications, and production plan for a new product within a budget and before a deadline. However, the work of one designer can differ greatly from another, depending on the product involved. Designers need specific technical abilities for their discipline, and their knowledge of techniques

and constraints varies. Often, the basic design principles, elements, tools, and methods overlap (Aspelund, 2014).

Designers' identities are influenced by their creative philosophies, medium, and cultural context. As they engage with different projects, their identities evolve, shaping their work. Their work reflects their values, beliefs, and perspectives on design. The professionalization of design has broadened the perception of designers' roles to encompass problem-solvers, communicators, and innovators. Recognizing and developing one's design identity is crucial for a designer, as it not only guides their approach to projects but also distinguishes their work in a competitive field.

Sparke's 1983 book "Consultant Design" introduces the concept that design identity can be perceived differently across nations. The idea suggests that historically, German design has been associated with science, Italian design with art, Scandinavian design with craftsmanship, and American design with business (Koch, 2022). Identity formation, whether on an individual or societal level, is influenced by time and experience (Aspelund, 2014). Therefore, the interpretation of the design's meaning and its perception may vary depending on the experience, time, cultural or national background of the observer.

The concept of Design Thinking evolved through the years, with various models emerging from diverse fields such as design methodology, psychology, and education. This evolution has led to a comprehensive and multifaceted understanding of a complex human phenomenon. It has gained traction across different sectors, and there has been a growing demand for concrete knowledge about it, including clear definitions and a set of practical tools. However, this demand poses a challenge to the design research community, which traditionally values diverse perspectives and resists oversimplifying its subject matter, preferring instead to maintain a rich and nuanced view (Dorst, 2011).

In contemporary practice, the identity of a designer is also influenced by their specialization within the field. Whether in graphic design, industrial design, UX/UI design, or any other area, each specialization comes with its own set of practices, tools, and the-

oretical frameworks. These distinctions contribute to the diversity of identities within the design community, highlighting the multifaceted nature of design as a discipline.

According to the British Design Council report, design proficiency can be divided into three categories: people-oriented competence, problem-solving competence, and practical technical competence (Design Council, 2020). Whereas the "Profile map of higher education in design" report Boman-Björkell et al. (2020) conducted interviews with all nine institutions in Finland that offer higher education in the field of design. During the interviews, they inquired about the institutions' perspectives on future competence needs and how design education can fulfil those needs. The competence needs were classified into four categories: generic competencies, trends in the development of material and immaterial design, and the competencies required by the professional role.

Boman-Björkell et al. (2020) noted that advancing technology opens up new possibilities for content production, needs creation, and value development. To succeed, designers must stay ahead by learning, unlearning, being courageous, passionate, and attentive listeners (Boman-Björkell et al., 2020).

2.1.4 Design in Finland

As this research has been conducted in Finland and among Finnish designers, it is sensible to explore this context and briefly delve into the history of design in Finland. Prior to World War II, most handicrafts and manufactured goods in Finland were either replicas or adaptations of foreign designs, with very few having unique Finnish characteristics. However, the period from the 1950s to the 1960s is widely recognized as the golden age of Finnish design (Ashby, 2010; Koivisto, 2020; Myllyntaus, 2010). At the 1951 Milan Triennial, Finnish artists and designers received six main prizes, three honorary diplomas, six gold medals, and seven silver medals. In the decades that followed, Finnish designers earned success showcasing their innovative and unique approach to design (Fallan, 2014; Koivisto, 2020; Myllyntaus, 2010). Winners from the Triennale include Saara Hopea, Kaj Franck, Tapio Wirkkala and Ilmari Tapiovaara. See figure 1 of Tapiovaaras fanetti chair design. Despite being primarily known for

Figure 1: The photos depict the Fanetti chair by Finnish interior architect and designer Ilmari Tapiovaara. Between 1951 and 1960, he was the most decorated designer of the Milan Triennale event, receiving six gold medals (Scandinavia Design, 2024). Figure 1.a. by Tapiovaara Ilmari et al. (1955) and figure 1.b. by *Askon ruokailutilan kalustoa; mainoskuva* (1958).

exporting bulky goods and raw materials, Finland's remarkable success in producing design products across various fields played a significant role in establishing the country as a leading producer of design products worldwide (Myllyntaus, 2010).

Over the past 150 years, Finland has established a longstanding tradition of providing education in art and design. Although influenced by previous occupiers, Russia and Sweden, the emerging 'Finnish Style' was shaped by a deeper connection with nature, which remains the driving force behind Finnish design (Raulik-Murphy, Cawood, Larsen, & Lewis, 2009; Chudoba, 2022). This history shapes Finnish designer attitudes and identities into empathising with functionality, aesthetics, and the needs of end users (Lith, 2022).

The benefits of design know-how are harnessed widely, with design-intensive companies and sub-sectors found in abundance in other industries. The design industry in Finland

is divided into design-intensive industrial manufacturing, digital design, architecture and landscape management, design agency operations, and the creation of artworks The turnover of the design sector in Finland was approximately 13.5 billion euros in 2022. An estimated 13,940 companies operated in the design sector (Lith, 2022).

2.2 Demystifying AI

Artificial intelligence (AI) may be described as a system's capacity to accurately interpret external data, learn from it and apply that knowledge to achieve specific goals and tasks through flexible adaptation (Haenlein & Kaplan, 2019). This broad area encompasses several subfields, such as machine learning, computer vision and deep learning, each contributing uniquely to the advancement of AI applications and technologies. This section provides an overview of AI's historical development, from its early concepts to contemporary technologies. It addresses significant breakthroughs, including the creation of neural networks, generative AI, and initial AI applications in design fields. The goal is to arm readers with the terminology and tools necessary to comprehend complex AI concepts. Above all, it discusses what has led us to the present moment in history, where the intersection of AI and design is of great consequence.

2.2.1 A Glimpse into the History of AI

AI has evolved from simple computational functions to complex deep learning models. In visionaries like Alan Turing began laying the theoretical groundwork for creating intelligent machines, despite early technical and financial hurdles. Initially, AI research was exclusive to top universities and tech giants, relying on substantial endorsements for funding. The first AI program, the Logic Theorist by Allen Newell, Herbert A. Simon, and Cliff Shaw (Newell & Shaw, 1957), emerged in the mid-1950s, symbolizing the field's potential at the Dartmouth Conference, which spurred two decades of exploration (Moor, 2006).

From the late 1950s to the mid-1970s, AI research flourished with advances in computing, algorithms, and notable projects like ELIZA, backed by governmental support

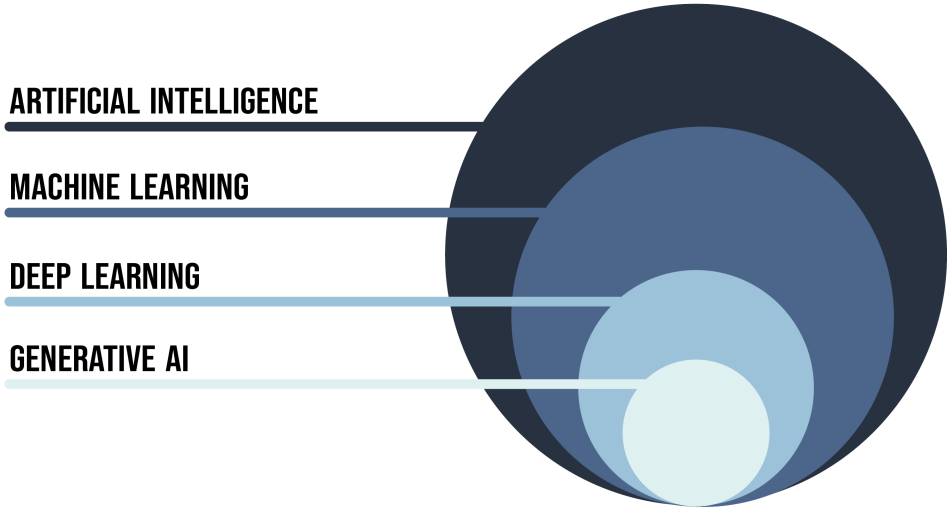

Figure 2: Describes the terminology and technology required to enable Generative AI. This graphical representation draws inspiration from similar models (Tandon et al., 2020; Lu et al., 2022; Khan et al., 2021).

from the United States and the research organization of the United States Armed Forces, DARPA. Expert systems gained momentum in the 1970s, with Dendral (1965) and MYCIN (1976) as pioneering examples. Dendral focused on chemical analysis, while MYCIN, designed for medical diagnosis, showcased the potential of rule-based systems(Lenat, 1984). However, expert system research encountered difficulties due to the narrow application areas, knowledge acquisition challenges, reasoning mechanisms, and other defects of artificial intelligence (Tan, 2017). The 1980s saw a revival in AI interest due to new algorithms and increased investment, highlighted by Japan's Fifth Generation Computer Project (times, 1984). The 1990s and 2000s witnessed significant milestones, including IBMs Deep Blue's chess victory and progress in speech recognition, showcasing AI's growing capability in complex tasks (Chandrasekaran, 1997). Since then, the development of deep learning and neural networks has paved the way for exponential growth and breakthroughs in AI.

The slow development of AI underscores the importance of computational power. However, with the recent advancements in computational technology, we have finally surpassed the threshold, and AI can now be used in various sectors to solve complex problems by utilizing vast data and computing resources.

2.2.2 The AI Landscape

The following section examines the key areas, highlighting notable fields and developments. Although not exhaustive, it offers a broad perspective on the development of AI. It paves the way for subsequent sections, providing essential terminology, clarifications, and a model framework to simplify the discourse on AI. It aims to demystify AI by breaking it down into more digestible segments. A key feature of this section is Diagram figure 2, which employs an Euler diagram to elucidate the relationships and intersections among AI, Machine Learning (ML), and Deep Learning (DL). offering a visual guide to understanding the hierarchical structure within AI research and its subfields.

Artificial intelligence (AI), can be defined as "a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation (Haenlein & Kaplan, 2019). This broad field encompasses several subfields, each contributing uniquely to advancing AI applications and technologies. The following are key definitions of areas within the domain of AI:
Artificial Narrow Intelligence (ANI) also known as Weak AI, refers to intelligent systems that are designed for specific tasks such as speech recognition (like Siri, Alexa, and Google Assistant), recommendation systems (which are algorithms used by popular media entertainment platforms like Netflix, Amazon, and Spotify), email filtering, or facial recognition. ChatGPT 3.5 and 4 represent examples of narrow AIs that can generate human-like texts but require human assistance.
Artificial General Intelligence (AGI) is a type of artificial intelligence that aims to create machines capable of possessing broad intelligence (Pennachin & Goertzel, 2007), with an ability to understand, learn and apply knowledge across a wide range of tasks, much like a human being. AGI was the primary focus of the research community. However, researchers later avoided it due to its demonstrated complexity (Pennachin & Goertzel, 2007). AGI represents a promising but challenging direction for the development of artificial intelligence. While its development requires significant investment and expertise, the potential benefits are vast and could lead to a new era of intelligent machines capable of performing tasks beyond current AI capabilities.
Artificial Super Intelligence (ASI), also known as Super AI. Bostrom (1998) de-

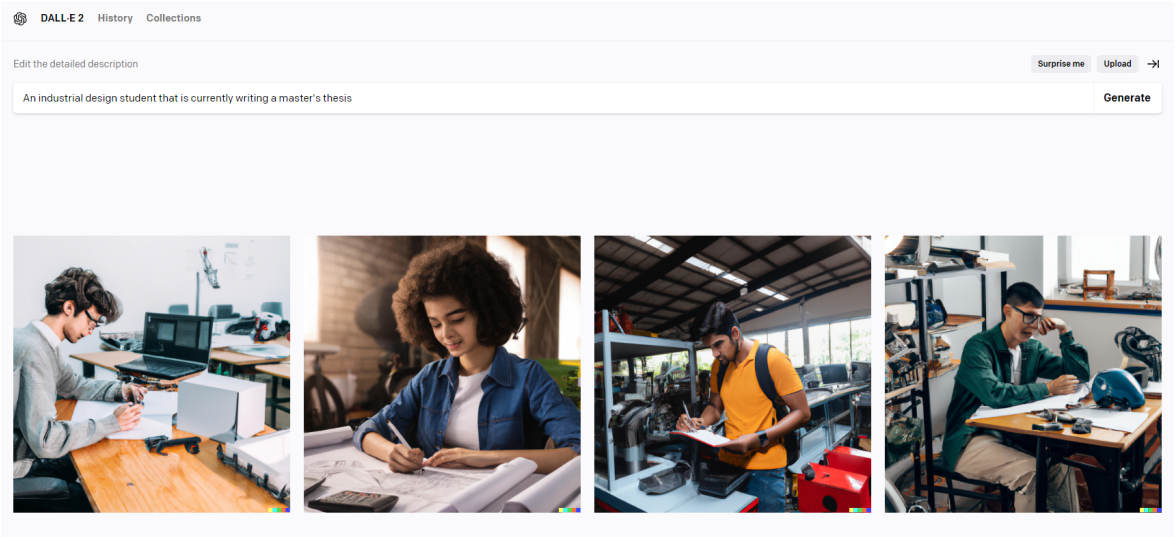

Figure 3: DALL-E 2 generating images with the prompt "An industrial design student that is currently writing a master's thesis".

fined a superintelligence as an intellect that outperforms human brains in every field, including creativity, wisdom, and social skills. This definition leaves open the possibility of implementing superintelligence in various forms, including digital computers, networks of computers, cultured cortical tissue, or other mediums (Bostrom, 2003). It is characterized by its ability to manifest cognitive skills and develop thinking abilities of its own, thereby rendering it the most advanced, powerful, and intelligent type of AI.

Computer vision (CV) is a field of AI that trains and equips machines with the ability to understand and interpret visual information from the world (Cipolla & Pentland, 1998). For example, it can be utilized to apply artistic filters to self-portraits, detect medical anomalies, and identify irregularities in diagnostic imaging (Ayache, 1995). It provides machines with a semblance of human vision and enables them to react to visual inputs.

Robotics is an interdisciplinary field where AI is playing an increasingly big role. Robotics integrates AI with mechanical and electronic engineering to produce robots (Ghallab & Ingrand, 2020). AI plays a critical role in robotic navigation, decision-making, and adaptation to their environments, showcasing the synergy between AI and robotics in manufacturing, healthcare, and service industries.

Machine learning (ML) is a crucial aspect of AI development. ML is the field of study that involves programming computers to optimize a performance criterion using example data without being explicitly programmed (Alpaydin, 2020). This process enables AI to make autonomous discoveries and gain new insights. The image generator DALL-E (see figure 3) is an example of machine learning in action. It can create an image based on your input prompt by interpreting its meaning. For a more precise breakdown of how DALL-E works, please refer to the explanation provided at the end of the section (Understanding the complex field). ML algorithms are used to model and understand cyber events, predict future outcomes, and detect anomalies for preemptive action. The field is advancing rapidly thanks to improvements in algorithms, hardware, and storage, resulting in increased task efficiency and precision that was previously unattainable (Sen, Mehtab, & Engelbrecht, 2021).

There are three main categories of machine learning techniques: supervised learning, unsupervised learning, and reinforced learning.

Supervised learning involves training a computer to predict labels that are provided by humans (Manning, 2022). For example, it can be used to teach a computer to identify dog breeds by using a set of labelled dog pictures.

Unsupervised learning is a machine learning approach where the machine receives only inputs and does not get any feedback from the environment. Two examples of unsupervised learning are clustering and dimensionality reduction. Clustering involves grouping similar data points, while dimensionality reduction aims to simplify the data by reducing the number of features used in a dataset (Ghahramani, 2003).

Reinforcement learning is a form of machine learning where an agent learns to take the most appropriate actions to gain the highest possible reward. In other words, the agent is trained to learn the best possible sequence of actions based on whether it receives a reward or punishment (Mahadevan, 1996).

At the core of many modern machine learning (ML) advancements is deep learning, a subset of ML techniques:

Deep learning utilizes multi-layered neural networks to analyze complex datasets (LeCun, Bengio, & Hinton, 2015). DL is significantly advancing capabilities in image

Biological Neural Networks	Artificial Neural Networks
Stimulus	Input
Receptors	Input Layer
Neural Net	Processing Layer(s)
Neuron	Processing Element
Effectors	Output Layer
Response	Output and an entry

Figure 4: Similarities between biological and artificial neural networks by Guresen and Kayakutlu, 2011.

and speech recognition and natural language processing (NLP). The term "Deep" in the context of deep learning refers to the utilization of multiple layers within a neural network (Amirifar, Lahmiri, & Zanjani, 2023).

Neural networks, also known as artificial neural networks (ANN) that mimic the human brain's information processing, form the foundation of ML (Alzubaidi et al., 2021). The concept of ANNs draws from the realization that the human brain's approach to information processing is distinctively different from that of traditional digital computers (Haykin, 1998). ANNs represent an advancement in AI (Guresen & Kayakutlu, 2011), enabling the modelling of complex patterns and solving predictive problems. Figure 4 illustrates how ANNs are influenced by the structural and functional aspects of biological brains, showcasing their significance in emulating human cognitive processes.

Natural language processing is a field of study that focuses on how computers can understand and process human language to perform useful tasks (Cambria & White, 2014; Chowdhary & Chowdhary, 2020). It includes tasks such as sentiment analysis, language translation, and question-answering (Williams, Nangia, & Bowman, 2017).

Large language models (LLM) like GPT-3 are AI models that fall under NLP. The models are pre-trained on significant amounts of text data and can be fine-tuned for specific NLP tasks (Panchbhai & Pankanti, 2021; Mosbach, 2023).

Generative AI refers to algorithms and models that can create or generate new data that resembles the training data. Generative AI encompasses a broad range of applications, such as NLP. Generative AI includes generating realistic images, videos,

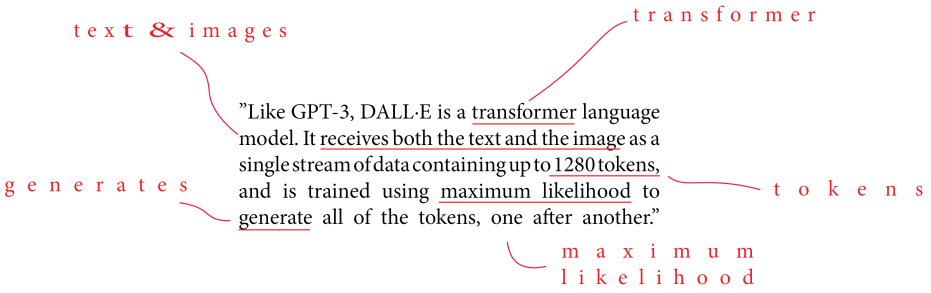

Figure 5: The definition of DALL-E by OpenAI, it can be further deconstructed to facilitate comprehension.

texts, and sounds that were not previously seen. The power of generative AI lies in its ability to understand and replicate the complexities of the input data, making it possible to produce novel content.
It has vast applications, from creating art and designing new products to simulating real-world scenarios for training autonomous systems.

Understanding the complex field of AI can be intricate due to the various technical terms and disciplines involved. Breaking down the terms into their components and presenting them in separate sentences can greatly facilitate the understanding of AI, as in figure 5. By doing so, we can demystify the technical jargon and enhance the comprehension of AI. For example, OpenAI explains DALL-E as "Like GPT-3, DALLE is a transformer language model. It receives both the text and the image as a single stream of data containing up to 1280 tokens and is trained using maximum likelihood to generate all of the tokens, one after another". More simply, but longer explained, DALL-E is an AI model that employs computer vision (CV) to understand images and natural language processing (NLP) to interpret and generate text. It is based on the transformer architecture, which is also utilized in other models like GPT-3.

Transformers are a type of neural network architecture that excels in handling sequential data, such as text or a combination of text and images. Visual transformers break down input images into local patches and then calculate representations and their relationships (Han et al., 2021). In AI models like DALL-E and GPT-3, tokens represent

the basic units of data the model processes. Text is segmented into tokens, which can be words, parts of words, or punctuation marks, while image data is converted into a format that the model can interpret and process as tokens. This token concept allows these models to uniformly handle various types of input data. DALL-E can process up to 1280 tokens per input, enabling it to manage complex prompts and create detailed images. The model is trained using the maximum likelihood principle to produce coherent and relevant images based on text prompts. The model then predicts each token based on the previous ones, maximizing the probability of the sequence. This allows DALL-E to create coherent and contextually relevant images based on the text prompts it receives. Breaking down explanations helps comprehend the technical language.

2.2.3 AI enters the Public Discussion

With the rapid growth of Generative AI (Gozalo-Brizuela & Garrido-Merchan, 2023) and the advancement in large language models (LLM), AI was brought into common knowledge. (Witt, 2023). LLMs are advanced Natural Language Processing (NLP) models trained on vast amounts of text data. Large language models often refer to calculating the likelihood of a sequence of text tokens (Shannon, 1948), where each token represents a text unit such as a word, subword, character, byte, etc (Mielke et al., 2021).

In the last century, LLMs, including BLOOM (Scao et al., 2022), T5 (Raffel et al., 2020), and GPT-3 (OpenAI, 2023), have marked significant progress in this field. These tools are further explained in table 1. Among these, ChatGPT gained notoriety and a high level of public visibility in 2022 and 2023 (Roose, 2022). It is an advanced version of InstructGPT, designed particularly for interactive and conversational tasks (C. Wu et al., 2023). The specialized training of ChatGPT equips it to keep track of conversational context, address follow-up queries, and self-correct responses.

In 2021, OpenAI introduced DALL-E, a platform that seamlessly merged computer vision and natural language processing. Enabling users to effortlessly create coherent and contextually appropriate images using simple text commands, also known as prompts, with remarkable ease (OpenAI, 2022).

Name	Description
T5	A (Text-to-Text Transfer Transformer) language model developed by Google. it is designed to convert all NLP tasks into a text-to-text format, where input and output are consistently represented as text strings.
GPT-3	Developed by OpenAI, this is the third iteration of the Generative Pre-trained Transformer series. It excels at generating coherent, relevant text based on input.
BLOOM	An abbreviation for "BigScience Large Open-science Open-access Multilingual Language Model." it is a large language model similar to GPT-3, but with a focus on multilingual capabilities and developed as an open-science project.

Table 1: Notable LLMs

In 2022, a new platform called Midjourney emerged as a similar competing platform accessible to the general public. Shortly after, Stable Diffusion launched an open-source text-to-image platform that anyone could use. These tools empowered users to craft images instantly using plain and straightforward instructions. While initially designed for digital art creation, they were also adopted for other uses, such as medical images for research (Wray & Yeh, 2023).

The tools were quickly adopted by the public and were a fun gimmick to try, but not all were thrilled. Karla Ortiz, an illustrator residing in San Francisco, discovered her work in Stable Diffusion's data set (Heikkilä, 2022). Ortiz has drawn attention to concerns surrounding copyright in AI art along with other artists. They are worried that they may lose income as people begin to use AI-generated images based on copyrighted material for commercial purposes. Ortiz argues that art is intimately linked to the person

who creates it, making Art theft a personal issue that could raise data protection and privacy issues. She says that a coalition is developing among artists to find ways to address or mitigate this problem (Heikkilä, 2022).

Some artists have poisoned their artwork by manipulating machine learning models at training time to introduce unexpected behaviors. Shan, Ding, Passananti, Zheng, and Zhao(2023) suggests that an attack on generative models that use text-to-image and have massive training datasets would require injecting millions of poisoned samples into the training pipeline. Professor Ben Zhao led a team at the University of Chicago that created a tool named Nightshade, which allows artists to make invisible changes to the pixels in their artwork before uploading it online (David, 2023). The team has also developed a tool named Glaze, which helps artists protect their distinctive styles from being replicated by AI. Glaze works similarly to Nightshade, altering image pixels imperceptibly to humans but affecting machine learning models in a different way from the actual representation (Hill, 2023). They are developed to disrupt upcoming versions of image-generating AI models like DALL-E, Midjourney, and Stable Diffusion (Heikkilä, 2023). Making some of the outputs from these models useless, such as hats turning into cakes, dogs turning into cats, and cars turning into cows. Disrupting the results with unrelated prompts undermines the trust of the entire model (Shan et al., 2023).

The discussion on the ethics of artificial intelligence is not limited to artists alone. Beckstead et al.(2013) discuss in their policy brief study on the existential risks AGI poses. Artificial general intelligence "underlies human capabilities in strategising, social manipulation, hacking, technology research, and economic productivity. Meanwhile, future-proofing is challenging because data that seems harmless now may become sensitive. Research suggests that given the unpredictable nature of technological progress, it is crucial to implement proactive policy measures and regulatory frameworks to minimize the associated risks. This is important even if no imminent risks are foreseen (Gill, 2016).

2.2.4 Integration of AI in Design Practices

According to Muller et al.(2023), emerging generative AI methods have the potential to produce creative outputs that are unique, valuable, and unexpected in a given context. This means that AI can facilitate creativity in various forms, such as images, text, music, video, code, and other forms of design. The collaboration between humans and AI varies across domains, with humans leading creative, strategic, and compassionate tasks while AI leads routine optimization tasks where compassion is not necessary (Z. Wu et al., 2021).

As designers have been using computer-aided design (CAD), digital typography, and user interfaces to create designs for several decades now. It is debatable whether AI art has been around as long as computers or digital art (Manovich, 2019). The progress of technology in the past decades and new AI tools has led to the development of sophisticated design tools (Zhu, Liapis, Risi, Bidarra, & Youngblood, 2018) that can automate certain aspects of the design process (Faruqe, 2023) and revolutionise the creative landscape. This not only makes image generation more accessible but also greatly expands the possibilities and capabilities of visual productivity across various domains. For instance, graphic designers utilize AI tools to augment their understanding of semiotics, typography, and layout. This helps them to create visually appealing works such as banners (Baker-Brunnbauer, 2021) and magazines (Zheng, Qiao, Cao, & Lau, 2019). UI and UX designers, on the other hand, make use of AI to design digital tools like interfaces (Mozaffari, Zhang, Cheng, & Guo, 2022), websites (Zhang, Brown, & Shankar, 2016), mobile applications (Deka et al., 2017), streamlining tasks, offering valuable insight (Nguyen, 2023) and other digital tools (Shi, Cao, Ma, Chen, & Liu, 2020). Similarly, industrial designers use AI to ideate and improve their skills in sketching (Li, Pan, Bousseau, & Mitra, 2020), manufacturing, materials use, and ergonomics when designing products such as vehicles (Pan, Burnap, Hartley, Gonzalez, & Papalambros, 2017) or furniture (Sung, Su, Kim, Chaudhuri, & Guibas, 2017). This shift requires the designer to adapt and integrate AI knowledge into their skill set, ensuring they remain relevant in a rapidly evolving market (Parish, 2023).

In building an AI-powered design system for designers, a critical aspect to consider

is its autonomy and capability range. Zhu et al. (2018) developed the "Spectrum of Initiative", classifying AI assistance levels. At the lowest level, AI only activates upon request, aiding in tasks such as on-demand analysis. The next level involves greater AI independence, enabling it to suggest approaches, create preliminary designs, and identify potential risks. The most advanced level positions AI as collaborators, actively participating in the design process alongside human designers. This differs from the current focus of the research community, which is on enhancing human-AI interaction from the designer's viewpoint instead of AI for designers (Shi, Gao, Jiao, & Cao, 2023).

2.3 Measuring Perceived Acceptability of AI

The emergence of new technologies demands the creation of innovative methodologies; however, disregard for established principles results in poor usability outcomes (Norman & Nielsen, 2010). It has been observed within the realm of technological advancement that, amidst a rush to develop, the established and meticulously tested standards of design have increasingly encountered disregard and violation (Norman, 2010). To gain a better understanding of the challenges and impacts of AI implementation, it is necessary to explore factors that influence the perceived acceptability of AI. These factors include ethics, user experience, transparency, explainability, and the implementation of AI tools.

To make accurate predictions for development, it is essential to understand the users' mindsets and activity contexts. Different methods have been developed, borrowing from ethnography, dramaturgy, theatre, and quantitative studies based on questionnaires (Salovaara & Tamminen, 2009). According to Adell (2010), definitions of acceptance in research can be classified into five different categories. The first category defines acceptance using the word "accept". The second category is concerned with the system's usefulness in meeting the needs and requirements of users and stakeholders. The third category defined acceptance as the sum of all attitudes, implying that emotional attitudes are added to the evaluation of the usefulness of the system. The fourth category focuses on the will to use the system, which aims for a behavioural change and is based on the earlier categories. The fifth category emphasizes the actual

use of the system, which is influenced by the will to use it.

To evaluate quantitatively the levels of acceptance of AI, researchers have employed methods such as The Technology Acceptance Model (TAM) (Davis, 1985; Sánchez-Prieto, Cruz-Benito, Therón Sánchez, & García-Peñalvo, 2020; Kelly, Kaye, & Oviedo-Trespalacios, 2022), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003; Nicolescu & Tudorache, 2022), and, more recently, the AI Device Use Acceptance model (AIDUA) (Gursoy, Chi, Lu, & Nunkoo, 2019). However, these quantitative instruments are quite substantial and may not be appropriate for conducting qualitative research, where the aim is to gain actionable insights. As such, many studies exploring acceptance in HCI have used self-defined questionnaires (Koelle, Ananthanarayan, & Boll, 2020) or rating scales (Kieslich, Keller, & Starke, 2022).

Measuring and understanding the level of trust people have in machines is a critical and complex issue that is still an active area of research in psychology (Colton et al., 2015). Although initial works exploring trust in AI exist (Glikson & Woolley, 2020), additional studies are needed to understand how the developers of AI systems can establish trust, identify the specific aspects of AI technology that users find trustworthy, and examine the multitude of factors that can affect people's trust in AI such as user acceptance. Trust in itself is already a difficult concept, as it carries different definitions across various disciplines (Kaur, Uslu, Rittichier, & Durresi, 2022). Grandison and Sloman define trust as the strong belief that something will work reliably, securely, and consistently in a specific situation. Related to technology, trust means that users are ready to rely on its functionality because they believe the technology has the right features to take care of their needs (McKnight, 2005). Trust has been demonstrated to directly impact whether users continue to use a product or service (Chang, Liu, & Shen, 2017). Hence, the level of trust in AI significantly influences the acceptance of AI technology (Kelly et al., 2022). The trustworthy AI framework explores a working definition of trustworthiness as the ability to meet stakeholders expectations in a verifiable way (*ISO/IEC TR 24028:2020 - Artificial intelligence Overview of trustworthiness in artificial intelligence*, n.d.).

Earlier research has demonstrated that when intelligent systems are trained on biased data, they can make biased decisions (Arnold, Chauncey, & Gajos, 2018). For example, ML methods created at a university hospital to estimate patient-reported outcome measures, which are usually recorded by younger, white individuals with higher incomes, may not be relevant when employed at a community hospital catering to mostly low-income, minority patients (Gianfrancesco, Tamang, Yazdany, & Schmajuk, 2018). When a database is incomplete, it can also pose a threat because the absence of certain entries can result in the loss of simplicity and efficiency in closed-form solutions (Ramoni & Sebastiani, 2001). Additionally, incomplete data sets create difficulties in accurately estimating probabilities. Even after addressing the correct data, task and evidence for its use, users may resist embracing a tool if they lack a complete understanding of its intended purpose, capabilities, or advantages compared to current methods (Cai, Winter, Steiner, Wilcox, & Terry, 2019). Inconsistent data quality in healthcare may impede the successful integration of AI systems.

The use of noninterpretable "blackbox" algorithms in AI presents a significant challenge to current regulatory practices, as the inner workings of these algorithms remain hidden even to their developers (Price & Nicholson, 2017). In order to ensure the ethical use of AI, it is crucial for developers to communicate the general logic behind AI-based decisions. Effective integration is crucial for realizing the potential of AI (Maddox, Rumsfeld, & Payne, 2019).

While AI can drive significant societal change that has monetary value, its widespread implementation raises ethical concerns that cannot be ignored. In discussions around acceptance and trust in AI, ethical considerations are a recurring theme. However, there are instances where the push for AI integration is at odds with the company's ethical actions. For example, Microsoft incorporated AI into its products in 2023 (Marr, 2023). This swift shift in focus was accompanied by a massive layoff, which included the entire ethics department (Bellan, 2023). The pursuit of AI innovation should be balanced with a commitment to ethical principles. To address these concerns, researchers are focusing on ethics codes and developing new ones, as well as

exploring ways to use AI for a positive impact (Berendt, 2018).

Most ethical principles for ethical guidelines (Ryan & Stahl, 2020) (Jobin, Ienca, & Vayena, 2019) intended for developers and users that have been developed are determined through a process of analysis and synthesis of existing guidance documents. Although there is a considerable amount of work focused on developing ethical AI, surprisingly, there is not much research examining how the general public perceives these ethical dilemmas. As such, there are limited mentions of participatory design methods used in creating guidelines, nor are they reviewed with the guidelines with the general public. These methods have been proved useful in developing culturally sensitive guidelines (Häkkilä, Paananen, Suoheimo, & Mäkikalli, 2022) and could benefit the creation and adaptation of ethical guidelines for AI. At the same time Kieslich et al. noted that fostering even a modest level of confidence in the capabilities of AI may result in increased involvement with ethical design dilemmas. This implies that community outreach efforts could be beneficial in promoting public awareness and understanding of AI ethics.

The legal frameworks that deal with AI-generated content are still developing, as Ballardini, He, and Roos noted in their writing that there are several challenges in determining authorship and inventorship in this new era. With the advancement of AI technology, the traditional roles of author and inventor are becoming less clear. As a result, established copyright and patent laws need to be re-evaluated. It is a complex question whether an AI can be considered an author or inventor, and it is difficult to answer at this stage.

In public discussions, there has been a suggestion to distinguish between the formal role of an author of a scholarly manuscript and the broader concept of an author as the writer of a document. Some scientific associations, such as Nature and arXiv, have recently released policies that advise against or forbid identifying text generation tools as authors due to their inability to be held responsible. As the use of AI tools is increasing and the legal framework is still evolving, so is the sense of authorship. Draxler et al. conducted a study indicating that individuals who use AI-generated text do not

experience a sense of ownership over the content, yet they still acknowledge themselves as the authors. The study suggests a need for greater awareness and understanding of the complexities of authorship in these scenarios, as well as clear guidelines around how to attribute credit and ownership in human-AI collaborations.

3 METHODOLOGY

The methodology section describes how the research was conducted. The primary goal of this study was to comprehend the changing role of designers and the impact of AI on the field. Prior to conducting the research, several factors, such as the purpose of the questions, the target audience, and expected outcomes, were taken into consideration. Moreover, it was essential to plan a broad range of data analysis techniques to use once the data was collected (Adams & Cox, 2008). Various approaches were considered before settling on the methods used during the literature review and subject familiarization.

3.1 Methodological Approach

Research methods can be broadly categorized into two or sometimes three main groups: qualitative, quantitative, and mixed methods. However, these approaches are not entirely distinct from each other. Qualitative and quantitative methods should not be viewed as opposite or contradictory; instead, they represent different points on a continuum (Newman & Benz, 1998). This study utilizes a mixed methods approach, combining both qualitative and quantitative research methods (Teddlie & Tashakkori, 2011). Using the mixed methods approach helps to obtain a better understanding of the research problem and capture the complexity of the human phenomena (Clark, Creswell, Green, & Shope, 2008; Doyle, Brady, & Byrne, 2009), and to leverage the strengths of both approaches while taking into account their respective weaknesses.

The survey method allows researchers to collect data from a large number of people quickly and efficiently (Biffignandi & Bethlehem, 2021). On the other hand, focus groups involve gathering individuals to discuss their views and experiences concerning the product or service under study (Blandford, Furniss, & Makri, 2016). These sessions are facilitated by a researcher who encourages open-ended discussions to delve deeper into the topic. Using research interviews allows for more personalized and in-depth information collection than other methods, as Lazar, Feng, and Hochheiser has pointed out in their book about research methods.

Each of these methods proved to be invaluable for this research. The online survey was particularly useful for collecting quantitative data, such as diverse user perspectives. Focus groups, meanwhile, offered qualitative insights, shedding light on how users interact with a product or service and their opinions on its various facets. Interviews added depth to the research, allowing for a comprehensive understanding of how the different themes intersected and influenced user experiences.

3.2 Surveys: From Drafting to Data Discover

Similar studies were examined, and the most suitable questions and scales were utilized to construct a user-friendly survey. This was done so the researchers could collect both qualitative and quantitative data. The online survey was tested twice on different participants before the mass collection. These results were excluded from the overall results since the survey was still being developed at that stage.

The survey was methodically administered to second-year design students at one of the two renowned art and design universities in Finland, among the seven (7) institutes that provide design education. The choice of this demographic was strategic, aiming to capture insights from students who are midway through their academic journey, potentially harbouring fresh and innovative ideas about their future in design.

Determining the sample size was crucial for the study's validity (Biffignandi & Bethlehem, 2021). Engaging a full year of students from one of the universities ensured a representative cross-section of the future design workforce. This approach provides a comprehensive understanding as the survey results aimed to explore the perspectives and visions of these emerging professionals, understanding their potential impact on the design field.

Prior to participating in the online survey, participants were required to sign a consent form. The role of a consent form is to ensure their privacy and that the research was ethically conducted (Karegar, 2018). The survey began with filling out a set of background questions on the second page. The first questions included the participant's age, occupation, and gender, which are typical background information items

collected from the participants in a survey (Spiel, Haimson, & Lottridge, 2019). The next question focused on the participant's ownership of electronic devices, including a smartphone, drone, smartwatch, laptop, tablet, drone, fitness tracker, smart home device (e.g. smart speaker, smart thermostat), desktop computer, virtual reality headset, or none of the above. This was done to assess their technical abilities. The second set of questions asked if the participant had previously acquired technical knowledge in fields such as IT, engineering, mechanics, or other technical areas, with the options of yes, no, or other with an explanation. The third question asked if the participant had heard of AI, with the options of yes, no, or I'm not sure. If the participant responded negatively or with uncertainty, they were not asked any further questions. However, those who answered positively were asked to describe AI to a friend in an open-text response format. This required the participant to explain the concept of AI in their own words.

Next, the participants were presented with the definition of AI from the Oxford Dictionary (Dictionary, 2021), which stated that it involves the theory and development of computer systems capable of carrying out tasks that typically require human intelligence, such as decision-making, visual perception, speech recognition, and language translation. Participants who had previously described the concept of AI were then asked if their understanding of it had changed after reading the definition. On the other hand, participants who had no prior knowledge of AI were asked if they now understood what it was after reading the definition. Afterwards, they were asked to list all the tools they could think of.

On the next page, participants responded to a series of Likert scale and open-text questions, modelled after the study by Kieslich et al., which aimed to gauge their approval of various AI ethics system configurations. The respondents were asked to rate their use of AI tools, services, and products, followed by evaluations of trust, ethics, and morale. Each scale was accompanied by an open-text response box. They were then asked to provide their thoughts on the future use and progress of AI, followed by summarizing their overall feelings toward the technology. Lastly, on the final page, they were given the option to express their interest in participating in a follow-up study at a future time.

On average, it took participants 14.6 minutes to complete the survey, ranging from 11.02 minutes to 23.07 minutes. The survey was conducted online through the Webrobol survey tool. After the data was collected, it was processed and analyzed anonymously, meaning the participants' names or other personal information was not linked to their responses. it is important to note that participants had the option to withdraw from the study at any time, but once they submitted their responses, the data was anonymized, and it was impossible to differentiate the participants. This meant that the researcher would not be able to track the identity or data of the participants even if they decided to withdraw later on.

The initial step towards analysis involved exporting the survey data to an Excel spreadsheet. This included quantitative data from Likert scales and qualitative responses from open-form questions. Using Excel allowed for efficient organization of the data, setting the stage for detailed analysis. Likert scale responses, which measure degrees of agreement or frequency, were analyzed quantitatively within Excel. This involves calculating averages, medians, or mode scores to determine the consensus on specific statements or questions. This step helps quantify participants' attitudes, satisfaction levels, or self-reported behaviours, providing a numeric representation of user perceptions and experiences. Thematic analysis was used to examine the qualitative data obtained from open-ended inquiries. This involved a detailed examination of the responses to identify common themes, patterns, and categories that emerged. Thematic analysis is a flexible method that allows researchers to identify and interpret the subtle nuances in participants' feedback. By coding the data and organizing it into themes, researchers can understand the deeper meanings, opinions, and experiences shared by the participants. Combining quantitative analysis from Likert scales and qualitative thematic analysis of open-form questions provides a comprehensive view of the user experience. This dual approach enables to not only quantify user attitudes but also explore the reasons behind those attitudes. It sheds light on users needs, preferences, and the issues they encounter, offering insights that are crucial for the researchs objectives.

3.3 Focus Groups: Insights Through Collective Voices

Focus groups are often used alongside surveys and in-depth interviews (O'Donnell, Scobie, & Baxter, 1991) to gain richer qualitative data. After conducting the survey, it became evident that certain use cases and situations required further clarification. As a result, participants were recruited randomly from the university for two focus group sessions.

The participants were asked to provide informed consent and fill out a background questionnaire about their previous experiences with AI. The discussion was led by the researcher, who moderated the pace to ensure that everyone could participate. After completing the consent and background form, the timeline for the focus group sessions was as follows:

1. **Prompt: ChatGPT**
2. **Prompt: Self-Driving Bus**
3. **Prompt: Medical AI Diagnosis**
4. **Exercise: Mapping Use-Cases**
5. **Exercise: Considerations for Developing AI**

In the course of the conversation, the participants were asked to recollect the initial AI tools they had utilized and the ones they currently use on a frequent basis. They were also motivated to provide reasons for their selection of regularly using or not using certain AI tools. The discussion was guided to focus on three topics (figure 6), 1) Use of ChatGPT (B. X. Chen, 2022), 2) autonomous buses (Hall, 2023), and 3) AI use in medical contexts (Niiler, 2023). For each topic, a newspaper article was presented to initiate the discussion (figure 7). Following the discussions, participants used Post-it notes to record their thoughts on AI use in the home, work, and medical environments. Finally, participants summarized five points that they would like developers of AI systems to take into consideration.

To analyze the qualitative data collected from the focus group discussions, the first step involved recording the sessions. This was necessary to ensure that all participants' responses and interactions were captured in their entirety. Once the recording was

Figure 6: Headings of the articles used in the focus group.

complete, the spoken words were transcribed into written text. This step is crucial as it creates a tangible and analyzable dataset from the qualitative data collected during the sessions. Once transcribed, the texts underwent a process of anonymization to ensure participants' privacy and confidentiality. This means that any names, locations, or other identifiable details that could potentially reveal the identity of participants were removed or altered. The anonymization process is essential for adhering to ethical standards and ensuring that the data can be used without risking personal privacy. After ensuring that the transcribed data were fully anonymized, the original transcripts were deleted. This action further reinforces the commitment to maintaining participants' privacy by eliminating any source material that might inadvertently contain identifiable information.

The anonymized data were then analyzed using Atlas.ti, which is a software tool designed for qualitative research. This involved coding the data, which means labelling text segments with tags that denote themes or concepts identified by the researcher. By grouping these coded segments, organizing the data thematically, making it easier to identify patterns, trends, and insights within the participants' responses. The final step involved identifying the main themes within the data. This process helps weigh how often certain ideas or topics were mentioned across the focus groups, indicating the prevalence and significance of these themes. The result was a conclusion on the collective perceptions, experiences, and opinions of the focus group participants.

3.4 Interviews: From Narratives to Insights

Open-ended interviews can be an effective method to conduct exploratory studies. When interviewees are given the opportunity to answer questions that encourage re-

Figure 7: Focus group tasks in action: brainstorming AI integration and discussing trust with autonomous busses.

flection and consideration, they may offer in-depth responses, generating ideas and sharing insights that might have been overlooked through other means. However, the challenge is to manage potentially unbounded discussions, which can be more difficult to conduct (Lazar et al., 2017).

In this study, they were employed to explore the experiences of the designers' methods and processes. The focus was to understand how designers in the field utilized these tools, the challenges and opportunities they encountered, their perceptions of AI's acceptability in design, and their suggestions for improvements. Designers working in the field were randomly selected based on their experience in design and familiarity with AI tools. Criteria included years of experience, diversity in design fields, and extent of engagement with AI in their projects.

Interviews were conducted face-to-face and remotely via Microsoft Teams. Each interview lasted approximately 20-30 minutes and was recorded with the participants' consent. The interview consisted of a set of open-ended questions that were intentionally designed to encourage detailed responses about the participants experiences with AI. The interviews were recorded, transcribed and made anonymous.

For this study, various analytical methods were explored, yet many fell short of providing the depth and engagement desired from the analysis. Eventually, the data approach

was refined by adopting two innovative methodologies, each contributing uniquely to the analysis, as seen in figure 8.

Firstly, inspiration was drawn from Cognitive Mapping, a technique aimed at visually representing complex mental models and concepts. This method allows for the intricate mapping of thoughts and ideas, making abstract concepts more tangible and understandable (Heinze-Fry & Novak, 1990). However, the backbone of the analysis strategy was Affinity Diagramming. This technique is centred around the physical organization of ideas or data points, typically noted on paper and spread out across a flat surface. Each data point is written on a separate note and placed on a table or wall. Through an active process, the notes were arranged according to their affinity (Harboe & Huang, 2015), which refers to their similarity or relevance to a shared theme. The process involved analyzing each note and grouping it with others that share a similar idea or concept. This process results in the formation of labelled clusters, which are then refined repeatedly. The iterative nature of this method allows for the emergence of a high-level overview, transforming a chaotic collection of items into a structured and insightful assembly.

By integrating these methodologies, the analysis examined the complex datasets to achieve a fuller and more immersive comprehension. Combining affinity diagramming with cognitive mapping ended up being a successful process whereby organizing data based on observable themes (affinity diagramming) while also considering the underlying mental or conceptual frameworks that influence how those relationships between the themes are perceived or constructed (cognitive mapping). This innovative blend established a solid foundation, uncovering insights and producing research findings that are not only insightful but also well-informed. Through this multifaceted approach, the complexities of the dataset were navigated, unveiling rich, nuanced understandings that contribute significantly to the field of study.

The practical application of these methods began with the transcription and analysis of the interviews. The researcher then engaged deeply with the material by visually arranging connections on a 2x2 meter board, as seen in figure 8. This initial arrange-

Figure 8: Interview analysis boards.

ment was further refined on a larger 3 x 2-meter whiteboard, with certain aspects being revisited on smaller 1 x 0.5-meter whiteboards. This process allowed the researcher to visually identify and contemplate the main themes and connections within the material. Following this intensive analysis, the research questions were revisited with a critical eye to identify any underlying assumptions or biases in the transcripts. This meticulous approach led to the formulation of the research findings, ensuring they were both robust and enlightening.

4 RESULTS

The field of AI is constantly evolving, which can make it challenging for researchers and designers to keep up with the latest developments. This section provides a detailed analysis of the results obtained from the survey, focus groups, and interviews. The current findings emphasize the crucial role of transparent and participatory tool development. While some of the results presented may soon become historical anecdotes, the findings about the process of integrating new tools into the design process can transcend industry barriers and guide future development.

4.1 Overview of Data Collection

The survey was completed in spring 2023 by 49 participants, revealing a diverse group predominantly composed of young adults with a median age of 23 years. The gender distribution among respondents was notably varied, including 38 women, three (3) men, four (4) non-binary individuals, and four (4) who chose not to specify their gender. All participants were students at an Art and Design university, highlighting a specific interest and background in creative disciplines.

In addition to the survey, two focus group sessions were organized in spring 2023, each attended by three (3) participants. These sessions were exclusively comprised of women, averaging a median age of 23.6 years. The focus group participants were all design majors, demonstrating a strong inclination towards creative fields. Despite lacking formal education in technology, they were technically proficient and equipped with essential modern tools such as laptops and smartphones, indicating a blend of artistic and digital literacy.

Furthermore, six interviews were conducted in December 2023 and January 2024 to deepen the understanding of the subject matter. These interviews featured a balance of perspectives, with two (2) participants identifying as women and four (4) as men. The median age was 29.5 years, ranging from 23 to 57 years old. Each interviewee had completed their education in design or was actively employed in roles related to their field, such as product designers, design researchers, and 3D visualizers. This provided

Data Collection	Study Participants	Sample	Purpose
1. Online Survey	Art & Design students	49	Gaining a broad perspective on the issues related to AI by collecting quantitative data from diverse user perspectives
2. Two Focus groups	Design students	6	Gain insights into designer perspectives and user experiences to understand product/service interaction and opinions
3. Interviews	Working professionals in the field of design	6	To gain a comprehensive understanding of how different themes intersect and influence user perspectives and experiences

Figure 9: The data collected within this research.

valuable insights from professionals actively applying their creative skills in the workforce.

This comprehensive data collection effort illustrated in figure 9, encompassing a survey, focus groups, and interviews, offers a rich, multifaceted view of the intersections between art, design, and technology from the perspectives of creatives and professionals in the field.

Survey respondents' rating scale answers are summarised in figure 10, which sums up how participants rated their use, trust and ethical concerns regarding AI tools. Respondents perceived use of AI tools was broadly distributed, with some participants reporting regular use of AI tools whilst others reported no use. Participants reported trust in AI tools was similarly broad-ranging. In contrast, almost all participants recognized ethical issues surrounding using AI tools. The majority of participants reported a desire to increase their usage of AI tools in the future. However, 3 participants (6%) expressed a strong desire not to use AI tools. Whilst most participants felt a lack of influence over the future direction of AI tools, almost 17% of the participants reported feeling some control over the future of AI.

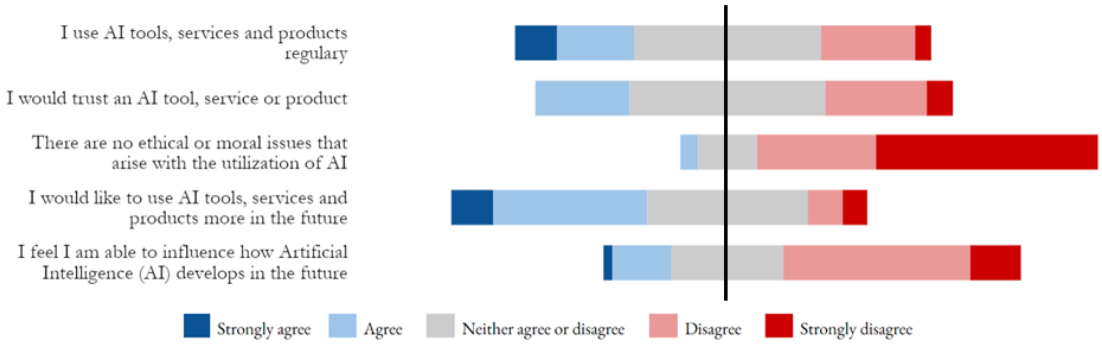

Figure 10: Survey respondents' ratings (n=49).

4.2 Survey Insights

Of the 49 participants, 43 respondents (79%) considered that they knew what AI was, and the remainder were less sure. Provided definitions of AI ranged from metaphorical expressions such as, "Good servant, bad master"(P9) to more technical explanations, e.g., "...machine learning... identifies patterns and detects errors" (P8). Most participants primarily referred to text or image creation in their descriptions, i.e. generative AI. This is likely due to the high media coverage around tools such as DALL-E 2, Midjourney, and ChatGPT at the time of the survey.

One-quarter of survey respondents (26%) mentioned that they lacked awareness of when they were using AI and an understanding of how to utilize AI tools. As one respondent expressed, "I probably am not even aware how much I use them" (Respondent 27). 14% of the respondents (7/49) noted that they had no need or interest in AI tools. This was explained as being due to their lack of intuitiveness, education, or bad experiences, e.g., "I worked on my [job application] cover letter with Bing Chat, and it gave some ideas, but most of them were terrible, ... and I figured I'll just do it myself" (R3).

Two survey respondents (4%) mentioned they would trust AI more than humans, stating, "People always want something out of you and AI cannot yet deceive you"(R10). Four participants (8%) held contrasting views, that they did not trust AI's outputs, one writing, "The problem at the moment is that the chatbots will confidently lie to you"(R3). Four respondents (8%) noted that the use case affected trust in an AI-integrated tool, service, or product, e.g., "I wouldn't trust AI on medical issues or

anything related. I would trust and use AI in photo editing"(R19). User experience, transparency, and the knowledge of the developer were each mentioned by 8% of respondents as factors contributing to trust, e.g. stating, "Knowing who has developed the AI and their value systems" (R50). When asked about the ethical issues surrounding AI, copyright and security issues were noted by over half of the participants (54%), mentioning concerns such as art theft, social media data extraction, and audio surveillance. Other less frequently mentioned issues were bias (6%), war (2%), and the spreading of misinformation (2%). As one participant wrote, "If/when AI is developed further and there are bigger possibilities for its implementation, there is a possibility of its usage in wars.

Four survey respondents (8%) mentioned in the open question about what tools they could see themselves using in the future, that they would not have any specific use of AI in the future, one of these felt like they would only use it if forced, and one expressed reluctance to adopt additional tools but feared of falling behind in studies. Contrasting, two respondents expressed their willingness to use tools in the future explicitly for learning purposes. Six respondents (12%) mentioned a desire for tools to ease various aspects of their lives. For instance, one respondent felt that tools were needed to ease overworked sectors. Another respondent highlighted the potential for inventions to assist in situations where ageing individuals lack assistance and require support. Some other use cases were displaying information in public spaces (2%), ideating (6%), food suggestions(2%), research tools(2%), IoT (6%), and Robotics(6%).

4.3 Focus Group Discoveries

The study explored the participants' acceptance of technology based on their own gadgets. The ownership of technological devices varied among the participants, providing a diverse range of technology usage. Half (3/6) of the participants owned a smartphone and a laptop. The fourth participant had a tablet in addition to the basic setup. The fifth individual owned a smartphone, laptop, tablet, and smartwatch, indicating an advanced interest in technology. The sixth participant owned all the previously mentioned devices and also had a fitness tracker. The distribution of device ownership among the participants provided a balanced representation, ranging from those who

maintained a basic technological set-up to those who displayed a heightened interest in a wide variety of gadgets.

Tools that produced AI-generated visuals, images, and videos were mentioned by two-thirds (67%) of participants, e.g., DALLE, Midjourney, and Diffusion Bee.
Participants' perceptions of Artificial Intelligence (AI) varied. Two participants viewed AI as a tool for generating ideas, content, or images. One participant provided a detailed definition, describing AI as a program that generates content using algorithms that mimic human thought processes. Another participant simplified it, describing AI as a program that can learn, analyze, and produce outcomes without human intervention. A third definition emphasises AI as intelligent technology that can be educated or programmed to improve the quality of life. This theme recurred throughout the discussions.

Two participants mentioned AI chatbots like ChatGPT and AI friends that can be found on platforms like Discord servers. They also talked about virtual assistants and AI-based text-to-speech technology. One participant specifically highlighted search engines, mentioning Bing. Another participant mentioned AI-integrated music guides, like those used in Spotify. Similar to the survey respondents, participants were unsure if they were using AI or not. For instance, one participant said, "I used this text-to-speech tool, and I didn't know if it was AI-generated or something." (Participant 1).

Participants discussed their usage of text-generation AI tools in response to a newspaper article about ChatGPT. One participant mentioned using ChatGPT to summarize academic articles and save time. e.g., "Currently, I'm regularly using ChatGPT because I need to read a lot of references of academic articles. So that's the thing, I used the function to summarise the article so that I can read one article in a shorter time" (P2). Another participant added, "[I use it to] Generate an answer or little explanation if I don't understand it[a long text] myself"(P1). Participants mentioned that the initial societal excitement surrounding these tools also, but it also sparked feelings of insecurity and fear about losing their jobs. However, as time went by and the participants had discussed their fears with their peers, they realized that AI is just

a tool and won't replace them. As one participant said, "Then, when we discussed it, I got a bit of a feeling that, well, yes, it is probably just a tool. It won't take my job"(P4). The same participant felt that they were more skilled than the tools "We tested it in one class, and we asked DALL-E to create a similar jewellery stand for us, which is pink in colour and has leaves, and then what it suggested that well, I can do better as an industrial designer than this". While they were open to text-based AI tools, they expressed discomfort when it came to integrating AI into creative fields like art. They felt that robots should focus on physical work rather than creative pursuits to ensure that work remains enjoyable and fulfilling for humans.

One participant pointed out the contrast between robots taking over laborious tasks and the potential loss of enjoyment in work. They stated, "Robots have already started taking over laborious tasks that used to be done by humans. it is interesting to think about how AI is now capable of writing poems and articles and creating music and paintings, which were once considered high-level creative pursuits. Perhaps in the future, we should focus on directing robots toward physical work rather than taking away jobs from labourers. it is important to consider how we can ensure that work remains enjoyable and fulfilling for humans, rather than solely focusing on automation" (P2). Overall, the participants expressed the desire to avoid visual AI tools, but they were more open to using text-based AI tools.

Prompted by the robotic bus service article (Figure 6), participants expressed hesitation about using automated bus service services until they had reached widespread adoption or upon hearing positive experiences from friends. In focus group 1, participants desired human influence on the bus, such as having an emergency stop button that could be operated by passengers or a human driver that was only assisted by the AI. Focus group 1 felt that they would trust the bus if It were going on tracks, but not if it navigated independently. As one participant said, "I will feel safer because it follows their own road and nothing can come in front of it" (P3). The lack of human empathy outside the core task of driving the bus was noted e.g., "If ... the bus just left a second ago, a human driver might stop and let them in, but an automated bus wouldn't" (P6). Participants noted that automation might be unable to detect crimes,

accidents, and emergencies. They suggested that providing more information could increase their sense of control and safety. For instance, they recommended displaying the bus route on the side of the bus to help passengers know where they are going.

Participants felt secure in allowing AI to analyze their personal data but were uncertain about whether they could fully trust its conclusions. One participant vividly imagined a scenario, saying, "I can envision a situation where we'll soon have a machine named Jaakko that diagnoses leukemia, but it would create a paranoid situation where doctors might not trust it, and I wouldn't be entirely sure if I was sick or not" (P4). This led to a discussion where participants stated they would trust the AI's results only if they were verified by a doctor, e.g. "If the machine said there's no problem and I feel like I'm going to die, then it would be nice if I could still see a doctor so that they wouldn't be replaced with these [referring to the article], but they would just be an extra" (P4). One participant noted that it reminded them of using a search engine, "it feels almost the same as Googling". In support of AI, it was considered that AI would be more precise, objective, and less biased than a human.

Interestingly, focus group 1 expressed the belief that a diagnosis of an acute disease from AI was easier to believe than a report of good health. As one participant pointed out, "If it gives me a death sentence, I'm more likely to believe it than to believe that I'm fine" (P1), another adding, "...it is belittling saying that you are fine (P3)". This indicates a main concern that AI would potentially miss or misdiagnose a serious condition.

During discussions on the future development of AI, participants had diverse views on who could produce trustworthy AI. Some believed that technologically advanced nations, such as America, might be more capable. A debate emerged regarding trust in government regulation versus the free market, with a consensus emphasizing the need for transparency in AI development as crucial for building trust.

Overall, participants in both focus groups felt they had limited influence over the advancement of AI. One participant acknowledged that as an individual, their impact on the vast data landscape involved in AI development might be minimal, express-

ing uncertainty about their ability to influence AI advancements. They speculated that their past actions might have had an unintended influence on a larger scale, akin to a butterfly effect. Another participant pointed out the impact of collective actions, citing public protests like "Artists against AI" as examples where individual powerlessness could be counteracted by collective action, potentially influencing AI development.

As a final task, participants were instructed to write down potential use cases of AI on post-it notes for three different scenarios: medical, home, and work. Suggestions included the implementation of AI in medical settings for signage and information sharing, monitoring unconscious patients, and facilitating the administration of pain medication. The work scenario produced more results compared to the other scenarios. The use cases included scheduling assistants, analyzing the suitability of individuals for new tasks and promotions, automated package delivery vehicles, and accounting applications. One participant wrote on the Post-it, "The aim is to enhance the lives of the workers and employers". In the home scenario, potential use cases of AI included the development of elderly care systems, monitoring vehicle conditions, utilizing IoT devices, energy monitoring, and generating personalized meal ideas based on individual preferences and schedules for the following week.

As the focus group participants expressed a perceived lack of influence in the development of AI, they were prompted as a last task to envision a scenario where they could influence and were asked to provide three suggestions for AI developers. These suggestions incorporated points mentioned earlier in the conversation, such as the inclusion of a "stop" button to maintain control and transparency, avoiding the autonomy of AI systems, and addressing copyright concerns. They also offered more idealistic recommendations, including utilizing AI exclusively for benevolent purposes, leveraging AI to enhance the overall quality of life, and reducing work hours.

To summarize, the study shows the diverse perspectives and experiences of participants with technology and AI. Participants were interested in text-based AI tools for practical applications, but apprehensive about AI's role in creative fields and its potential to replace human jobs. They expressed mixed feelings about automated services, prefer-

ring human-in-the-loop intervention, meaning human oversight or influence to ensure safety and empathy. The findings touch on societal and ethical considerations of AI development, including transparency, collective action, and ethical considerations in different settings. Overall, the study provides a nuanced view of technology and AI's integration into daily life, balancing excitement for innovation with critical reflections on its implications for work, creativity, and societal well-being.

4.4 Interview Results

After analyzing the results of the survey and focus groups, it was noted that AI presents ethical dilemmas, and its value is uncertain. It also highlighted the importance of human oversight. To explore these themes further, a set of interviews was conducted. The subsequent study confirmed and expanded upon the previous findings, leading to a new set of results and a proposal for a tool adoption framework in the discussion. This study focused on participants who were somewhat regular AI tools.

Most participants (5/6) noted they used text-based tools regularly, including, but not limited to, ChatGPT, Microsoft Copilot, and Bing. Almost all participants (5/6) also engaged with image creation tools, such as DALL-E, or utilized visual editing software like Adobe Photoshop or their smartphone's built-in options. Additionally, a third (2/6) of participants mentioned using software designed for creating layouts or design elements that incorporated AI tools, such as Canva. None of the participants had formal training in the use of AI tools; they educated themselves about AI tools from newsletters, lunch table talks, community forums, YouTube and social media. As one participant mentioned, "I usually pick up a tool from Instagram, from another designer and try it out for fun; if I like it, I'll use it more" (P6).

The most common purpose and explanation for AI in the interview background form was to reduce manual cognitive efforts. This involves utilizing AI-powered tools and technologies to automate less desirable tasks. As one participant noted, "Preferably a tool to help you reduce annoying tasks"(6) and "AI is a computer brain that thinks for you" (P3).

The participants were increasingly incorporating AI into their workflows, and they were using it for inspiration, benchmarking, and speeding up and enhancing the creative process. They found that AI is now replacing or partially replacing previous tools such as Pinterest and Google, as Participant 2 (P2) said, "So, whereas previously I've just used Google search for background work, now in parallel to that, I'll also use ChatGPT for prior works on certain topics in early stages of the benchmarking". Interestingly one participant also noted (P1) "I used to seek inspiration from other people's designs, but asking an AI tool for inspiration feels less like copying." While unexpected results, made them mistrust some tools the AI generated hallucinations where also seen as positive unexpected results, as one participant (P6) pointed out, "actually, might be a positive thing that it sometimes does things a bit stupidly. That there's like a possibility for some random uniqueness." Another participant (P1) said, "It might give me a table with only two legs. Innovations, something I couldn't think of. It is like when you ask a child to draw a chair. I feel like this aspect makes it superior for things I can't think of."

During the interviews, a few participants shared that they use AI-generated visuals as placeholders in their designs, similar to how "lorem ipsum" is used for text. This helps to make the design process more efficient. One participant mentioned, "I recently had to create a poster without any visual references, which made it difficult as the concept was still in its early stages. To help me with this, I used an AI generator to create images based on the description of the concept. I then used those generated images as sketches to show my early ideas for the poster" (P3). Another participant shared, "I have experimented with AI-generated content occasionally, particularly when I need a certain photo but don't have one on hand. But I rarely use them in my professional work, as I end up remaking them myself. Sometimes I use parts and draw over them to speed up the process" (P6).

During the interviews the participants discussed how much of a transformative role AI tools play in collaborative work settings, specifically pointing out their utility in the initial stages of planning and idea generation. As one participant noted, "In the early planning phase, I talk a lot with ChatGPT about ideas. It is kinda replacing the need for a human or another designer to discuss with" (P5). The participant contin-

ued describing how conversing with ChatGPT about ideas is starting to obviate the need for human collaboration at this early phase, effectively standing in for another designer or colleague. This perspective suggests that AI tools like ChatGPT are not just augmenting but in some cases replacing traditional human roles in professional environments.

Another participant elaborated on the efficiency and objectivity brought about by AI in the workplace. They contrasted their experience of discussing projects with an AI, such as ChatGPT, to that with human supervisors, noting the AI's lack of personal opinions and biases as a significant advantage. "I find it is faster discussing with the AI than with my actual supervisor because the AI doesn't have, like, it is own opinions that much, so it keeps track of the idea based on what I've said and does not have its own idea of where it should go" (P3). This participant appreciated how the AI facilitated a more straightforward and objective discussion process. Furthermore, the same participant acknowledged the complexity of design work, "Design work can be quite complicated, and you have to take a lot of things into consideration, so sometimes it can be helpful to discuss it with someone, or in this case chatGPT" (P3). This insight underscores the potential of AI tools to serve as valuable partners in the creative process, offering a unique form of support that complements human intellect and creativity.

However, this integration is not without its challenges. Concerns over the lack of supervision of AI-generated content and ethical considerations about the use of AI was again mentioned by 4 participants (4/6). The absence of clear guidelines and transparency in AI processes raised questions about the authenticity and morality of AI-assisted creations. During several interviews, participants expressed concerns about the potential harm caused by deepfakes and AI-generated images. They specifically pointed out that vulnerable individuals, such as the elderly, may be easily deceived by these images. The participant noted that some elderly people may not fully understand that the images are not real and may take negative and harmful actions based on them. They said, "The elderly may not really understand that this AI is created like this and played with intentionally negative phenomena. They take it seriously" (p5).

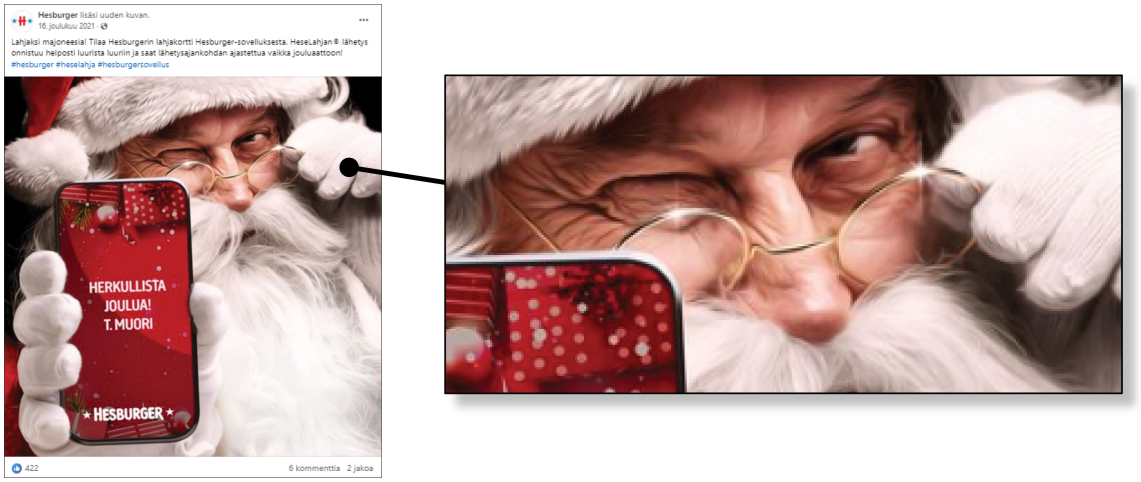

Figure 11: The Hesburger Christmas advertisement photo for 2021, 2022 and 2023 mentioned by an interview participant features a Santa Claus with stretched features, possibly generated by AI (Hesburger, 2021).

One participant expressed moral objections to the use of image creation tools in advertisements, citing the example of Hesburger's Christmas ads (figure 11), which they deemed horrendously ugly and appalling because they could recognize it was generated with AI. They felt that "The laziness in using AI for colourizations, even in advertisements targeting children, is disheartening. This general misuse of technology makes it hard to trust these techniques. I see no moral justification for it, given how it is been demonstrated that people use them and the harm it causes to workers and artists. If used properly, it wouldn't be the case" (P4). Underscoring a desire among designers for human creativity to remain at the forefront of artistic expression. One participant advocated for protest while also acknowledged their heavy use of AI tools, stating vWe need guidelines to guide technology for the common good" (P6).

The interview participants felt that designers are beginning to realize the potential of AI in design despite ethical concerns. AI can automate tedious tasks, improve creativity, and increase efficiency. As one participant noted on the novelty effect wearing off, "After all the magic started to fade away and we got actually usable tools, we all started to use them, it is not a gimmick anymore, I'm actually using them" (P1). However, some felt that they were still lacking in regards to competence. "I can do better, I just use it to save time, but most of the tools don't produce yet good enough

results for regular use" (P4).

During the interviews, two participants strongly felt that the role of the designer would change, while the others were aware and only one opposed the idea of designers always being needed. "It can't do what a human can; a designer will always be needed" (P1). The two who spoke strongly about a change mentioned that the role of designers was evolving, with a shift towards supervisory and facilitating roles over AI and the design process as a whole. "The immediate output that you get out of these tools is aesthetically very nice. So, designers value has kinda disappeared" (p2). One participant noted, and in a similar theme another participant said, "I think we will need to focus more on soft skills, like empathy, interaction and listening to everyone, which are crucial when dealing with multiple stakeholders. But not just from the perspective of what is expected of us. We will need to take on a facilitator role, acting as a moderator. But will it be designers who get hired for this role? I don't know, but I believe it's important that we channel our expertise here. I do believe that traditional UI design will disappear. Those who continue to do it will need to be really good. Unfortunately, we may see a lot of visual workplaces disappear, which is a real pity"(P6). This evolution points to a future where manual labour is minimized, and designers play a crucial role in guiding the ethical and creative use of AI in their field.

In summary, the experience of designers with Visual AI tools is marked by a complex interplay of challenges and opportunities. As the design community navigates this new territory, the focus remains on harnessing the potential of AI to enhance creative processes while maintaining a vigilant eye on ethical considerations and the preservation of human creativity.

5 DISCUSSION

In his 1845 report to the US Congress, Commissioner of Patents Henry Ellsworth expressed that the continuous progress in the arts year after year challenges our belief and suggests the approach of a time when human advancement may reach its limits (Dreyfuss, 1959). Remarkably, he made this statement before significant technologies such as electric light, cars, the internet, and AI were invented. It has been 178 years since then, and we are still experiencing substantial progress. This prompts us to consider the unpredictable nature of our future. When humans look back 178 years from now, will AI have contributed to human progress as significantly as phones and the internet did? Or are these all just small steps in a larger picture?

The following section will discuss the integration of AI in the workplace as a collaborative tool alongside human oversight. Additionally, it will explore how AI can be used in design to enhance human capabilities and why ethical guidelines are crucial for responsible development. Finally, it will suggest a tool adaptation framework aligned with exploring users' needs and ethical standards. Building up to these discussion points has beenparticularly intriguing to me, as I have devoted a considerable amount of time to exploring the intricacies of AI, as evidenced by my earlier participation in research focused on explainable tangible AI (Colley, Väänänen, & Häkkilä, 2022). As such I am hoping these discussion points will enhance and add to the fastly evolving field of AI.

5.1 AI as a Collaborative Force in the Workplace

The discussions in this research, especially in the focus groups, indicated a preference for a "human in the loop" approach to AI integration, as seen in figure 12. Participants expressed a desire for human influence, such as emergency stop buttons on autonomous vehicles, highlighting the importance of maintaining human control over AI systems. Additionally, the interviews revealed that AI tools like ChatGPT are beginning to replace traditional human roles in professional settings, suggesting a shift towards viewing AI as a co-worker rather than just a tool. This shift underscores the evolving relationship between humans and AI in the workplace, with a focus on bal-

Figure 12: Study participants expressed a need for more control over AI and suggested human involvement or supervision. The figure illustrates a journey from the use of AI to collaboration, with a robotic bus driven by AI and allowing for human intervention.

ancing AI integration with human oversight and input.

Based on the interviews conducted, it appears that there is a growing trend of considering AI as a co-worker or collaborator in the creative process, illustrated in figure 13. This reflects how designers are incorporating AI into their workflows, using it for inspiration and to expedite and enhance the creative process. Designers are acknowledging the shift towards a supervisory role for themselves, where AI handles more of the manual or tedious tasks. This suggests a future where AI acts as a co-worker, augmenting human capabilities rather than just being a tool under direct human control.

The results from the focus group highlight that the presence of a human-in-the-loop boosts trust in AI systems. The focus group discussions, in particular, revealed the importance of sensing a human element in the service interface, giving the perception that actions are not solely AI-driven. This presents ethical concerns, such as services feigning human involvement to gain trust when, in fact, they are entirely autonomous.

In Zhu et al. Spectrum of Initiative", the most advanced level positions AI as a collaborator, actively participating in the design process alongside human designers. To emphasize the importance of balancing AI integration with human oversight and input, a fifth layer should be added to the spectrum. The participants in the interviews also mentioned that AI could make the designer's job easier, with the designer playing a facilitating role. Therefore, the fifth layer would involve the AI doing the job but still keeping the human in the loop.

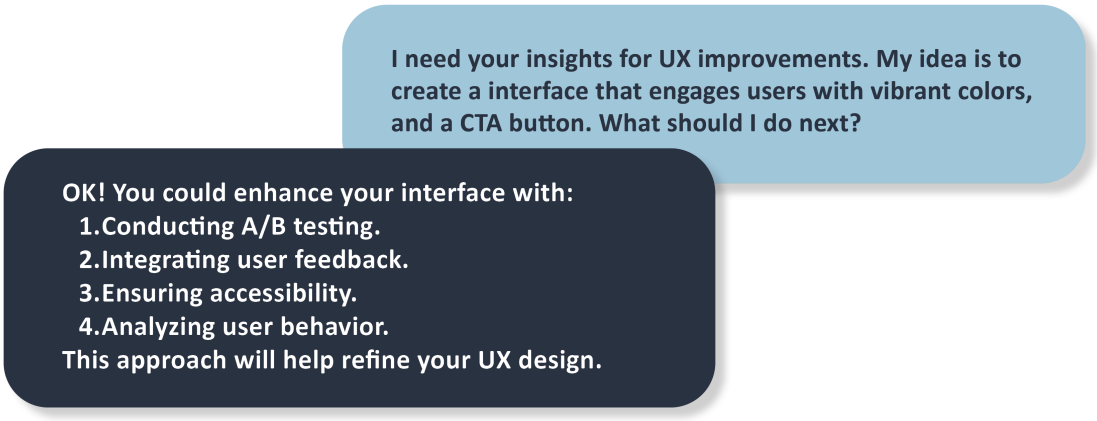

Figure 13: An illustrative depiction of a theoretical discourse involving an AI system perceived as a collaborator rather than a mere instrument.

5.2 Invisible AI Integration

The gradual integration of AI into our daily lives is taking place, as it has already penetrated everyday tools, e.g., in the ranking of Google search results, voice interaction with Siri, and image recognition. Using AI without knowing it may provide a seamless user experience with the service but may also potentially weaken the trust of the online service systems as a whole.

During the interviews, it became clear that the designers were utilizing the tools that were most intuitive and adaptable to their workflow. They envisioned a future where AI advancement would play a significant role in most programs. The participants wished for seamless integration of these tools to increase their usability. They suggested that these tools should be designed for the user rather than expecting the user to adapt to them, as mentioned in the Shi et al. (2023), we should strive to design AI for the user, instead of making the user adapt to the AI

Although the interview participants appreciated the seamlessness, the unknown value of AI especially arose in focus group discussions. Participants perceived that they did not know enough to understand the value of AI in services they might wish to use – beyond the obvious generating images and text. It was verbalized how they felt they could create the best results themselves without any AI input. This highlights the

importance of practical benefits for AI acceptance, a core element in earlier acceptance models (Gursoy et al., 2019) When AI usage isn't evident to users, its advantages and subsequent acceptance remain unnoticed. It is likely that the most significant effects of AI on individuals arise from these inconspicuous AI applications, which may introduce biases or influence user behaviour.

5.3 Ethical Complexities of AI

Ethical and moral dilemmas were prominently featured in the participants' responses. The survey participants identified ethical issues like art theft, social media data extraction, and audio surveillance as major concerns. Moreover, it highlights moral objections to the use of image-creation tools in advertisements and the potential harm caused by deepfakes and AI-generated images, especially among vulnerable populations like the elderly. These findings reflect the ethical quandaries posed by AI, stressing the importance of developing AI responsibly and with consideration for its societal impacts.

All the survey, focus group and interview participants were aware of ethical dilemmas connected with the use of AI services. In the Focus groups especially, they considered ethical issues, such as copyright concerns and trusting an AI system without understanding its reasoning or background knowledge. As discussed in the literature review, the ethics of AI has gained significant attention beyond artists and designers, and its impact on society is presently under scrutiny (Baker-Brunnbauer, 2021). In the studies, participants raised practical ethical concerns, like the absence of references in AI-generated content. However, the broader research discussion on AI ethics delves into deeper issues, such as biases in training data creating stereotypes or AI suggesting legal but immoral actions (Baker-Brunnbauer, 2021). Prior research has emphasised that algorithms replacing humans in social roles should ensure responsibility, transparency, auditability, and predictability, and avoid causing frustration (Bostrom & Yudkowsky, 2018).

As noted in the results, in the interviews, one participant used the example of Santa Claus in a Hesburger hamburger advertisement that they perceived as appalling and morally questionable figure 11. It is partially interesting because the company Hes-

burger is engaged with AI and digital technologies beyond their advertising strategies. In 2020, the company acquired a minority stake in Taiste, a Finnish technology firm that specializes in digital services. This acquisition shows that Hesburger has a broader ambition to improve its capabilities in data analytics and AI technology. The ad was used in 2021, 2022, and 2023, indicating that it was generated in 2021 at the latest. As the technology is advancing rapidly, it may not be as obvious AI generated if it was generated in 2024 versus a 2021 version; It still raises the question of whether the advertisement was appalling only because it is noticeable and reminded them of ethics or because of the moral questions it possesses as the participant who mentioned it does use AI tools. Since Hesburger has continued to use advertisements over the years, it seems like they are not concerned about ethical questions but rather invested in the development of technology.

Throughout this research, it has become apparent that integrating AI into design requires the use of participatory methods, as suggested in the literature review by positive examples from other fields (Häkkilä et al., 2022). These methods help establish ethical guidelines, increase transparency in AI operations, and achieve harmony between AI-generated content and human creativity. Additionally, it is crucial to develop AI to discern any feelings of appalling or disgusting content.

5.4 Navigating Shifts in Designer Identity and Role

There is a growing awareness that certain design tasks, which can be automated by AI, may become less significant. However, participants in the interview found that the elimination of manual labour was a positive aspect of this trend. While human creativity and the unique perspectives that designers bring to the table will remain invaluable, they may need to adapt to new roles. These results suggest that AI can enhance the design process, but it cannot fully replicate the nuanced understanding and emotional depth that human designers contribute.

The evolving design identity will emphasise the importance of skills that AI cannot replicate, such as empathy, cultural understanding, and the ability to interpret complex human emotions and societal trends. It highlights a shift towards more strategic

and conceptual roles, where designers act as curators, editors, and integrators of AI-generated content, focusing on the overarching narrative and emotional impact of their work.

In conclusion, the advent of AI in design does not diminish the importance of a designer's identity; instead, it expands it. It forces designers to adapt, innovate, and re-evaluate their unique contributions to the field. By embracing AI as a collaborator, designers can redefine their identity, blending traditional creative skills with new technological competencies, and in doing so, they can shape a future where human creativity and AI coexist to enhance the design process in unprecedented ways. In the future, designers are expected to leverage their soft skills to guide and shape the ethical use of AI in design practices.

5.5 Initial Framework Suggestion for Adapting AI tools

In the rapidly evolving landscape of design and technology, the integration of community feedback and iterative development has become crucial for the creation of tools that are both innovative and aligned with user needs. In the earlier studies and interviews, it became apparent that users were selecting tools based on community recommendations. They would test these tools before using them for serious work. The interviews confirmed that if they found the result satisfactory, they would share their experience with the community through lunch conversations, social media, and various platforms. Based on the research, this section proposes a model of how designers adapt and start using new tools and technologies, which operates in a continuous loop comprising four key stages: Community Recommendation, Usability Assessment, Iterative Development, and Product Release. During this process, technical, practical, and ethical standards are discussed and analyzed.

The model figure 14 illustrates the process through which designers choose an AI tool based on recommendations from the community. They then carry out a usability assessment to ensure that the tool meets their specific needs and ethical standards. The designers engage in iterative development with the help of the AI tool, discussing

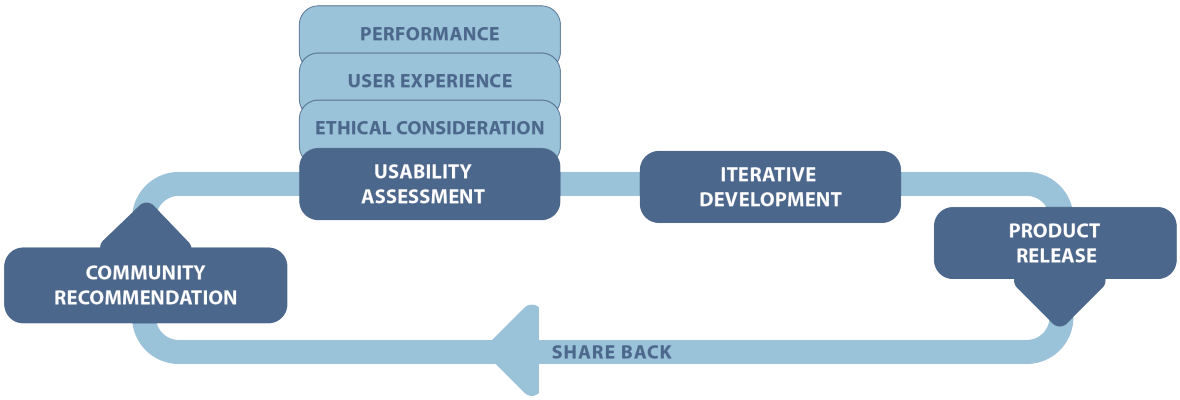

Figure 14: Loop: The process includes gathering recommendations from the community, assessing usability, iterative development, and sharing the product with the community if deemed good. This loop is repeated with another design task or another AI tool if it doesn't pass the first stops of the loop.

the product with an AI and making necessary changes until the final product is ready. Once completed, the product is either published, dropped or goes through another loop with another tool, depending on the feedback and result. If the tool is successful, it is often shared back with the community and goes through another loop with another user or design task. However, if the tool is found lacking at any point, it will not go through the loop and will be deemed unworthy.

5.6 Reflecting on the Topic

The crossroads AI and Design presents a multifaceted domain ripe with challenges and opportunities, prompting a reevaluation of methodological approaches and the skill sets required for designers. This juncture highlights the potential for significant differentiation between traditional methodologies and those that incorporate AI-driven design principles, suggesting a pivotal moment for the field.

After spending considerable time exploring the intricacies of AI in the fields of Design and Human-Computer Interaction (HCI), I have developed an appetite for innovation and technological advancements. In my previous research, the focus was on the development of explainable tangible AI (Colley, Kalving, Häkkilä, & Väänänen, 2023) and the creation of an AI-generated chat application for an interactive gravestone (Häkkilä,

Colley, & Kalving, 2019). Previous investigations and the results of this research have revealed the complex and evolving nature of this interdisciplinary field, demonstrating is full of potential for exploration and discovery.

Given its potential to redefine how we interact with and experience technology, ongoing exploration and inquiry are necessary. I have been pleasantly surprised by the depth and complexity of this topic, which has further piqued my curiosity about the rapidly evolving field. I firmly believe that we can gain more insights by conducting further research into the intersection of Design and AI. Both fields share a common goal of problem-solving, with designers relying on empathy and AI streamlining repetitive tasks. By combining the best of both worlds, we have the potential to create amazing outcomes.

6 CONCLUSION

The aim of this research was to investigate the influence of AI on the field of design. The research focused on understanding the relationship between AI and design, with a particular emphasis on the perspective of designers who use these tools. The three research questions are especially addressed in this section: what factors contribute to the perceived acceptability of AI, how do designers integrate AI tools into their workflow, and what are the perceived benefits and challenges of using AI in design projects?

It is evident from the literature review and results that the role of designers is constantly changing, and it is crucial to comprehend the impact of AI to remain relevant in the ever-changing world of design. As AI becomes more prevalent, designers must decide whether to resist, influence or embrace it to stay ahead of the curve. Those who embrace AI may have an advantage over those who do not.

6.1 Factors Contributing to the Perceived Acceptability of AI

The perceived acceptability of AI among young creatives and design professionals is influenced by a variety of factors, including trust, ethical considerations, and personal experiences with AI tools. Trust in AI tools varies significantly among users, with some participants expressing confidence in AI's capabilities while others remain sceptical about its reliability and the potential for AI to produce misleading or inaccurate outputs. This research has found that ethical concerns, including copyright and security issues, bias, and the potential misuse of AI in critical areas such as warfare and misinformation, have a notable impact on its acceptability. The diverse opinions on trust and ethical considerations reflect the complexity of integrating AI into creative practices and the need for transparent and responsible development of AI technologies.

A critical element in the acceptance of AI tools is the awareness and comprehension of their functionalities. A significant number of participants admitted to having insufficient knowledge about the use of AI tools and were unaware of their implementation. This knowledge gap and lack of awareness can lead to a reluctance to utilize AI tech-

nologies and, in some cases, distrust. Moreover, personal experiences of AI, whether positive or negative, influence individuals' perspectives and acceptance of AI tools. Positive encounters, such as AI tools augmenting productivity or creativity, can instill a positive outlook, while negative experiences, such as substandard AI suggestions, can result in frustration and skepticism.

The impact of AI on the future of work and creativity is another factor influencing its acceptability. Participants expressed concerns about the potential for AI to replace human jobs, especially in creative fields. However, discussions and reflections among peers have led to a more nuanced understanding of AI as a tool that augments rather than replaces human creativity. This evolving perception underscores the importance of dialogue and education in shaping the acceptability of AI.

The participants' desire for control over AI tools and the future direction of AI technology indicates a need for empowerment in the digital age. Despite feeling a lack of influence over the advancement of AI, the expression of specific concerns and desires, such as the need for transparency, ethical guidelines, and a focus on enhancing human well-being, highlights the critical role of user input in the development of acceptable AI solutions.

In summary, the acceptability of AI is a multifaceted issue influenced by trust, ethical considerations, awareness, personal experiences, and perceptions of AI's impact on the future. Addressing these concerns through transparent development practices, ethical guidelines, and education can enhance the acceptability of AI tools among young creatives and professionals in the design field.

6.2 Integrating AI in Design Practices

The research findings highlight a growing trend of AI integration in professional practices, especially in tasks requiring intensive ideation and planning. AI tools are used for a variety of purposes, including inspiration, benchmarking, and speeding up the creative process. Designers are replacing or augmenting traditional tools like Pinterest and Google with AI tools such as ChatGPT for researching and generating ideas.

This shift indicates a growing reliance on AI for creative exploration and conceptual development, highlighting AI's role in the initial stages of the design process.

AI-generated visuals and text are utilized as placeholders in designs, facilitating a more efficient design process. This approach allows designers to quickly visualize concepts and iterate on ideas without the need for final visual assets. The use of AI in this manner mirrors traditional design practices, like using "lorem ipsum" as a placeholder for text (Dena, Douglass, & Marino, 2005), but extends it to visual content, underscoring AI's versatility as a design tool.

The integration of AI tools is also transforming collaborative work settings. AI tools, particularly those capable of generating ideas or engaging in dialogue, are beginning to replace the need for initial discussions with human colleagues. This shift suggests that AI is not just a tool for automating tasks but is becoming a collaborative partner in the creative process. The objectivity and speed of AI in providing feedback and generating ideas are valued by designers, who appreciate the absence of personal biases and the efficiency it brings to project discussions.

In conclusion, designers are integrating AI tools into their workflows to enhance creativity and efficiency while also navigating the ethical and practical challenges posed by AI. The adoption of AI in design practices reflects a broader shift towards embracing digital tools that can augment human creativity, with a focus on maintaining ethical standards and ensuring the integrity of design work.

6.3 Perceived Benefits and Challenges of Using AI in Design Projects

The research results demonstrate that the perceived benefits of using AI in design projects include enhanced creativity, improved efficiency, and the ability to automate tedious tasks. AI tools are valued for their ability to generate novel ideas and visuals, offering designers a source of inspiration and a means to explore creative possibilities that are unexpected or hard to understand.

However, the integration of AI into design workflows is not without challenges. Concerns about the supervision of AI-generated content, ethical considerations, and the authenticity of AI-assisted creations are prevalent. Designers are mindful of the potential for AI to produce content that may be deceptive or unethical, such as deepfakes, highlighting the need for critical engagement with AI tools and the development of guidelines for responsible use.

Earlier research shows that AI has the potential to generate unexpected results and variations, which are often referred to as hallucinations (del Campo & Leach, 2022). Based on the interview findings, unanticipated outcomes can have a positive impact on creativity, acting as placeholders and inspiring innovation by generating ideas beyond human thought. This unexpected element adds excitement and innovation to the creative process that designers find valuable, similar to asking a child to draw. They also appreciate the different perspectives that are outside of their comfort zone, which highlights the joy and excitement that come with these unforeseen results.

However, the unpredictability of AI-generated outcomes has raised concerns about their reliability and in some cases, has left a negative impression. Some participants in the studies insisted that human supervision is required to ensure the appropriateness and relevance of such outcomes.

6.4 Limitations and Directions for Future Research

While attempting to address methodological issues, this research still has limitations due to limited previous studies on the fast-evolving subject. This research utilized a modest sample of forty-nine (49) survey participants, two focus groups with three (3) participants in each one, and six (6) interviews. The focus of the research, as well as the sample, was limited to designers and artists, which reduced variation in conditions. This makes the sample size less problematic. The participant sample was limited to only one country, Finland. However, the implications of this research could extend to other industries and countries. It would be of great interest to conduct further research in other countries. Such an endeavour could provide valuable insights that can inform

and improve our understanding of the topic.

This research is exploratory, and gives rise to further questions which require answers. In addition to whether the results apply to other industry contexts, there are several directions for further research. Therefore, there is an immediate need for further research to explore how to apply AI assistance and tools to various design methodologies with greater confidence.

According to this research, taking a leading role rather than following is advantageous, as early adopters often secure positions in innovation. However, further research is necessary to determine whether investing in AI creativity will yield long-term benefits. This is especially relevant given the ethical discussions that arise around intellectual property issues, and participating in these discussions can lead to positive integration.

It is important to conduct more research to create successful strategies within businesses to facilitate the changing role of the designer. Further research should help businesses to understand and implement the evolving role of designers, which includes acting as a facilitator and judge in addition to marketing and product development. Additionally, it is necessary to conduct a long-term study on the impact of AI integration.

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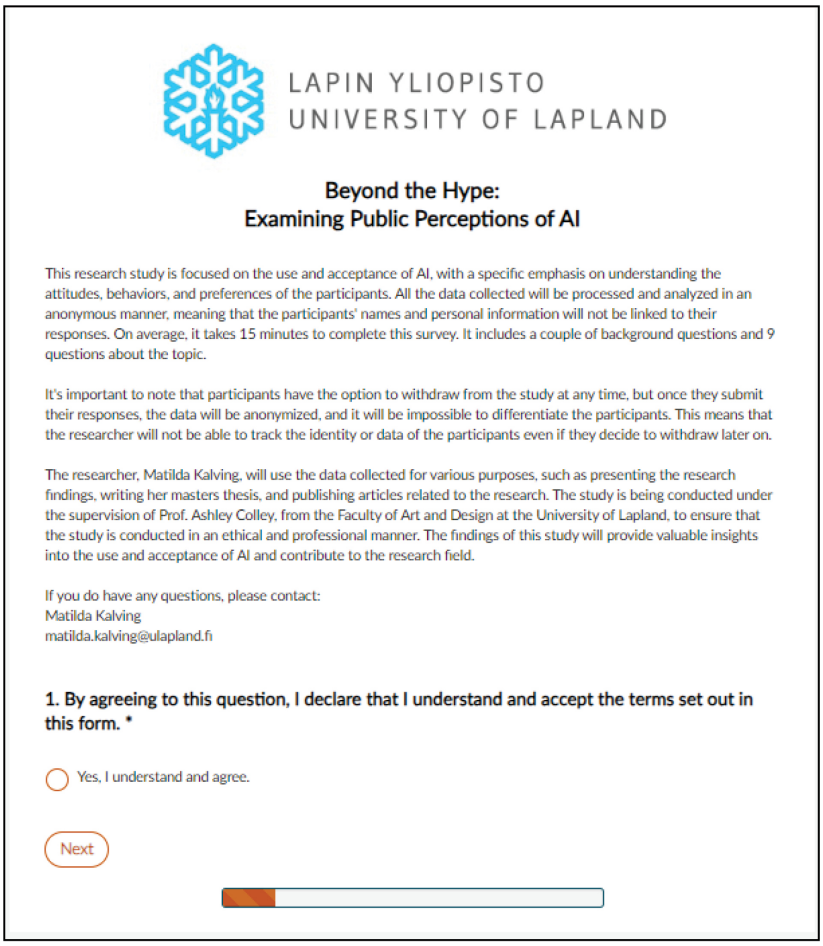
8 APPENDICES

This section includes all necessary forms, such as surveys, focus groups and interview questions, along with their corresponding consent and background forms.

8.1 Survey Form

Survey Screen Capture,Webropol 1/7: Page 1. Consent Form



LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Beyond the Hype:
Examining Public Perceptions of AI

This research study is focused on the use and acceptance of AI, with a specific emphasis on understanding the attitudes, behaviors, and preferences of the participants. All the data collected will be processed and analyzed in an anonymous manner, meaning that the participants' names and personal information will not be linked to their responses. On average, it takes 15 minutes to complete this survey. It includes a couple of background questions and 9 questions about the topic.

It's important to note that participants have the option to withdraw from the study at any time, but once they submit their responses, the data will be anonymized, and it will be impossible to differentiate the participants. This means that the researcher will not be able to track the identity or data of the participants even if they decide to withdraw later on.

The researcher, Matilda Kalving, will use the data collected for various purposes, such as presenting the research findings, writing her masters thesis, and publishing articles related to the research. The study is being conducted under the supervision of Prof. Ashley Colley, from the Faculty of Art and Design at the University of Lapland, to ensure that the study is conducted in an ethical and professional manner. The findings of this study will provide valuable insights into the use and acceptance of AI and contribute to the research field.

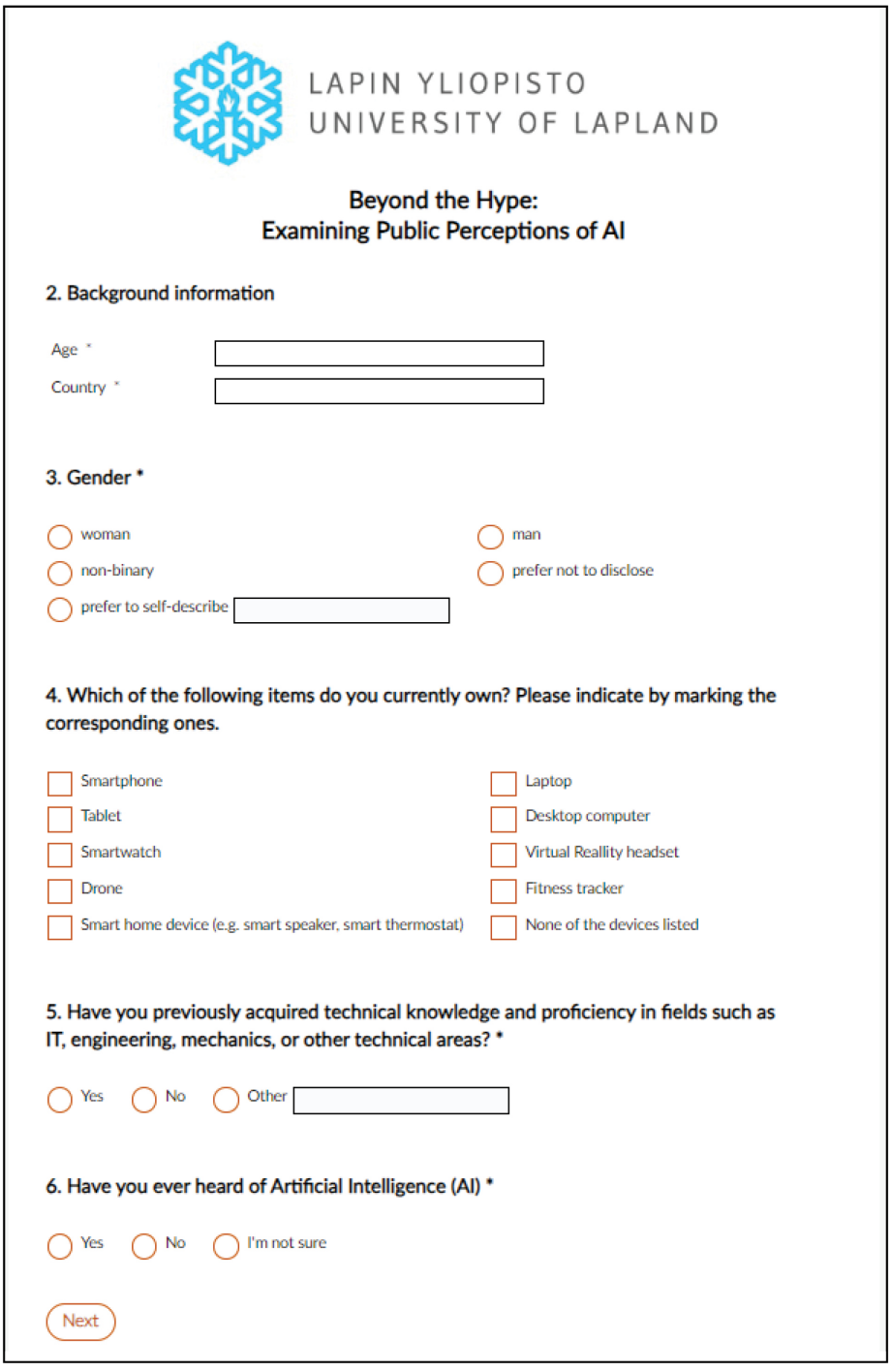
If you do have any questions, please contact:
Matilda Kalving
matilda.kalving@ulapland.fi

1. By agreeing to this question, I declare that I understand and accept the terms set out in this form. *

◯ Yes, I understand and agree.

Next

Survey Screen Capture,Webropol 2/7: Page 2. Background information version 1



LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Beyond the Hype:
Examining Public Perceptions of AI

2. Background information

Age *
Country *

3. Gender *

- woman
- man
- non-binary
- prefer not to disclose
- prefer to self-describe

4. Which of the following items do you currently own? Please indicate by marking the corresponding ones.

- Smartphone
- Laptop
- Tablet
- Desktop computer
- Smartwatch
- Virtual Reallity headset
- Drone
- Fitness tracker
- Smart home device (e.g. smart speaker, smart thermostat)
- None of the devices listed

5. Have you previously acquired technical knowledge and proficiency in fields such as IT, engineering, mechanics, or other technical areas? *

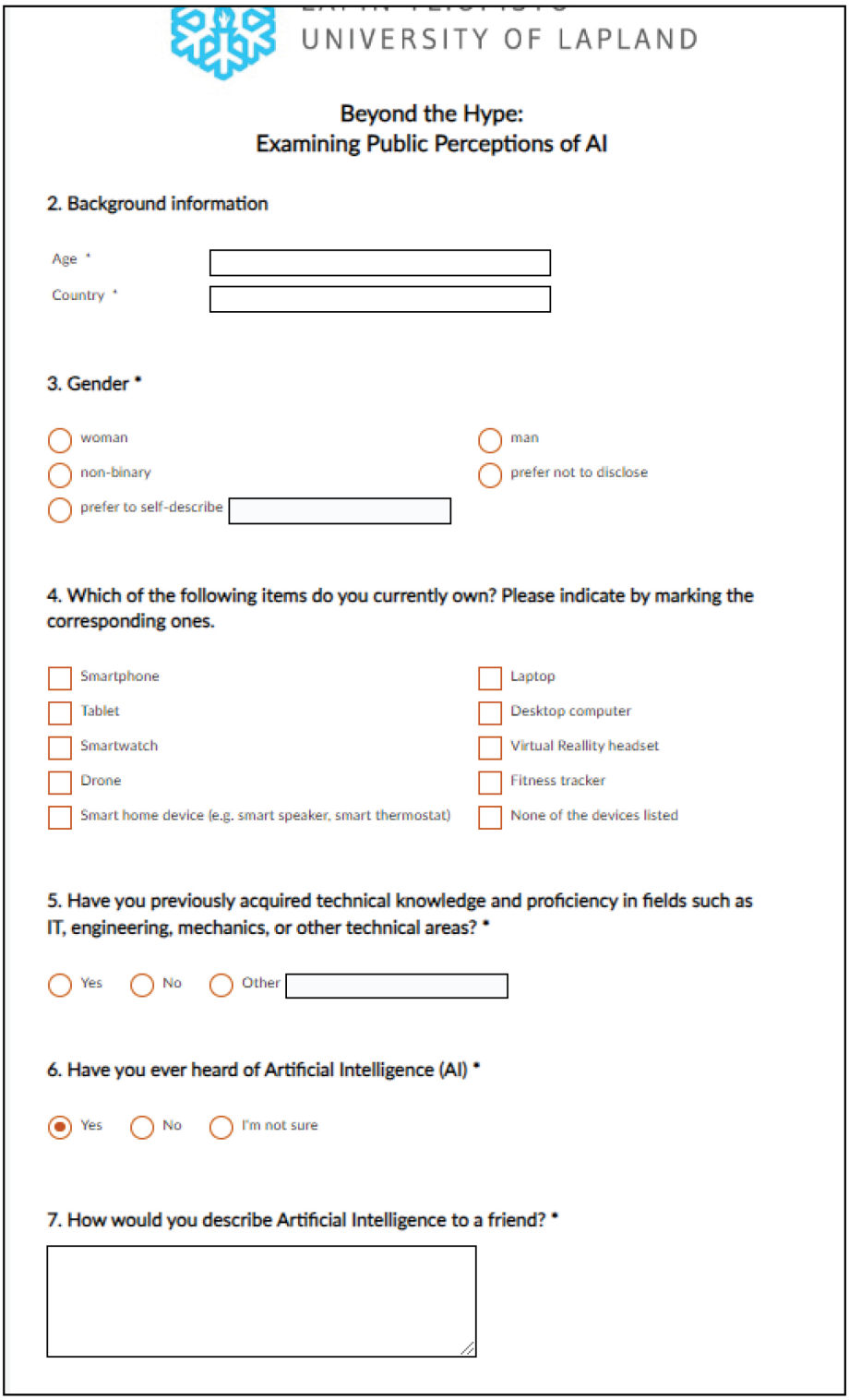
- Yes
- No
- Other

6. Have you ever heard of Artificial Intelligence (AI) *

- Yes
- No
- I'm not sure

Next

Survey Screen Capture,Webropol 2/7: Page 2. Background information version 2



UNIVERSITY OF LAPLAND

Beyond the Hype:
Examining Public Perceptions of AI

2. Background information

Age *

Country *

3. Gender *

- woman
- man
- non-binary
- prefer not to disclose
- prefer to self-describe

4. Which of the following items do you currently own? Please indicate by marking the corresponding ones.

- Smartphone
- Laptop
- Tablet
- Desktop computer
- Smartwatch
- Virtual Reallity headset
- Drone
- Fitness tracker
- Smart home device (e.g. smart speaker, smart thermostat)
- None of the devices listed

5. Have you previously acquired technical knowledge and proficiency in fields such as IT, engineering, mechanics, or other technical areas? *

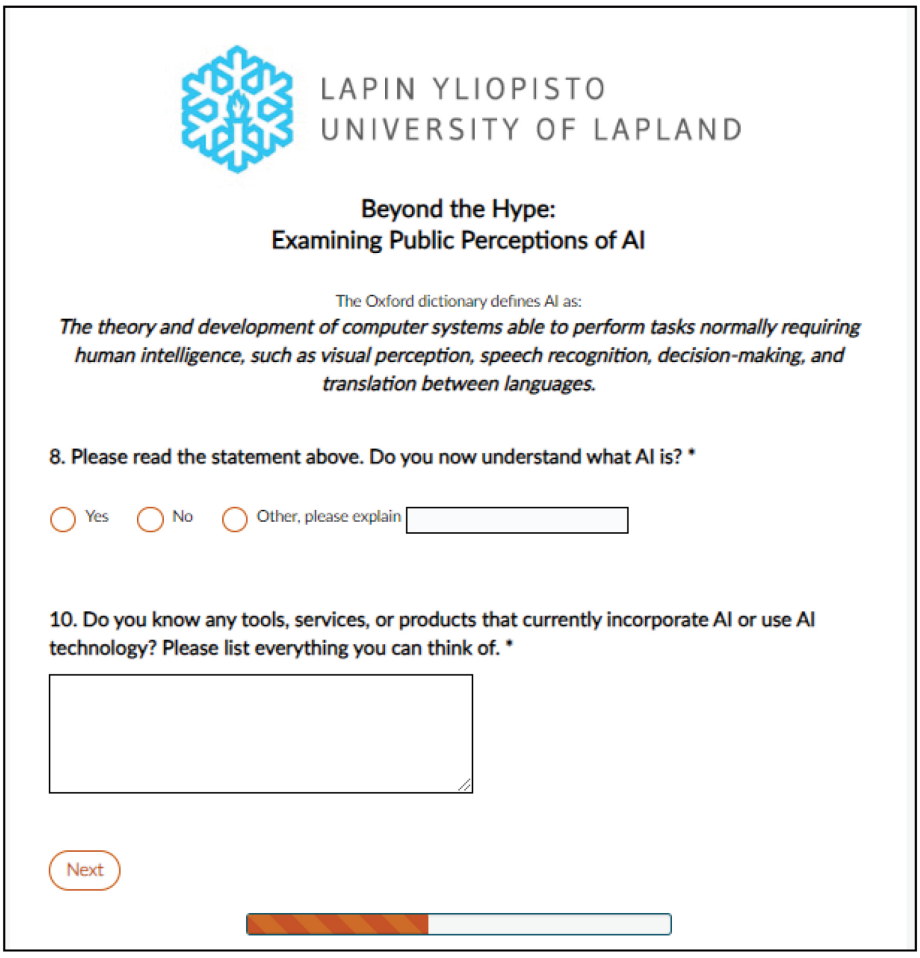
Yes No Other

6. Have you ever heard of Artificial Intelligence (AI) *

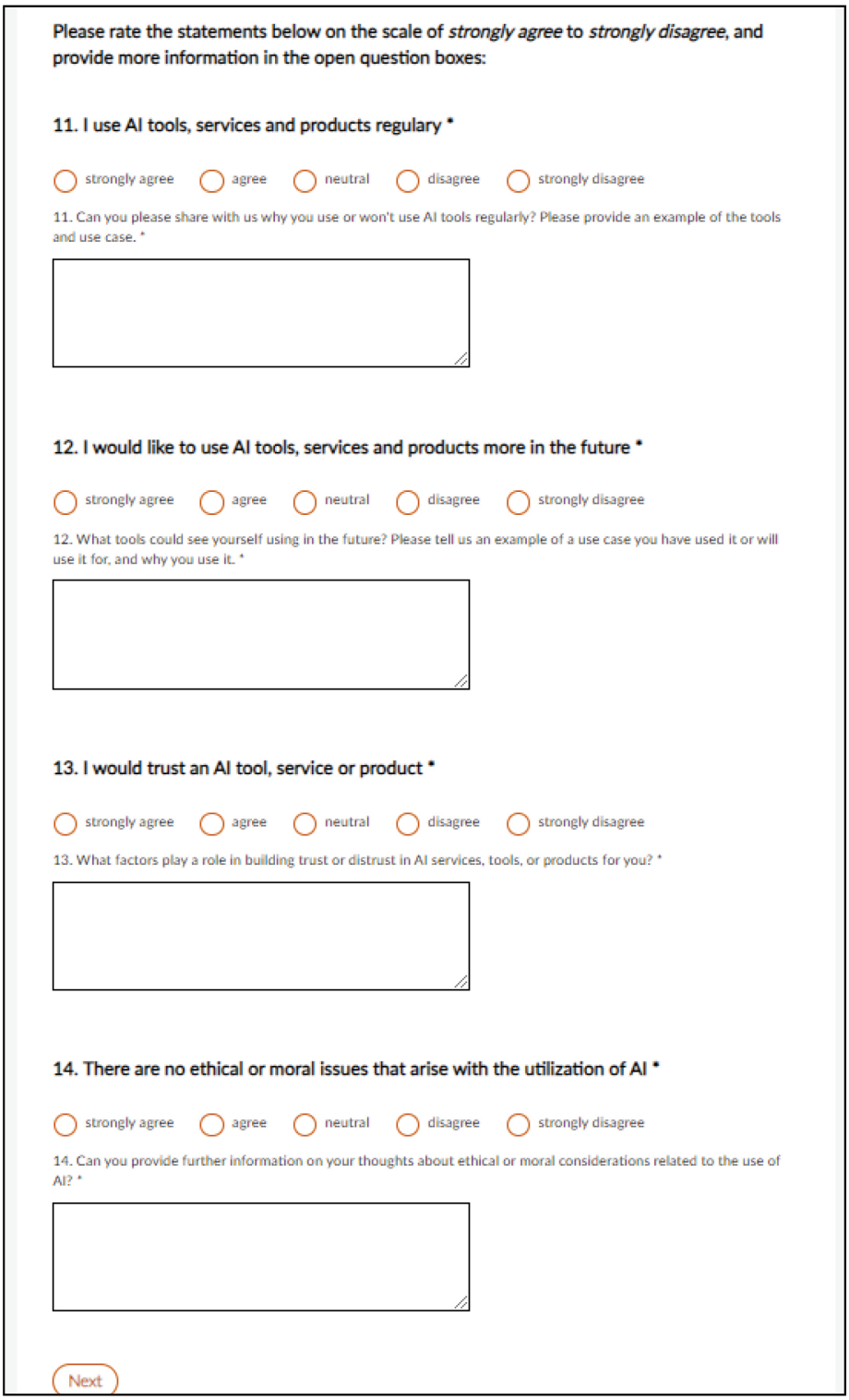
Yes No I'm not sure

7. How would you describe Artificial Intelligence to a friend? *

Survey Screen Capture,Webropol 4/7: Page 3. Definition of AI



Survey Screen Capture,Webropol 5/7: Page 4. Likert Scales



Please rate the statements below on the scale of *strongly agree* to *strongly disagree*, and provide more information in the open question boxes:

11. I use AI tools, services and products regulary *

◯ strongly agree ◯ agree ◯ neutral ◯ disagree ◯ strongly disagree

11. Can you please share with us why you use or won't use AI tools regularly? Please provide an example of the tools and use case. *

12. I would like to use AI tools, services and products more in the future *

◯ strongly agree ◯ agree ◯ neutral ◯ disagree ◯ strongly disagree

12. What tools could see yourself using in the future? Please tell us an example of a use case you have used it or will use it for, and why you use it. *

13. I would trust an AI tool, service or product *

◯ strongly agree ◯ agree ◯ neutral ◯ disagree ◯ strongly disagree

13. What factors play a role in building trust or distrust in AI services, tools, or products for you? *

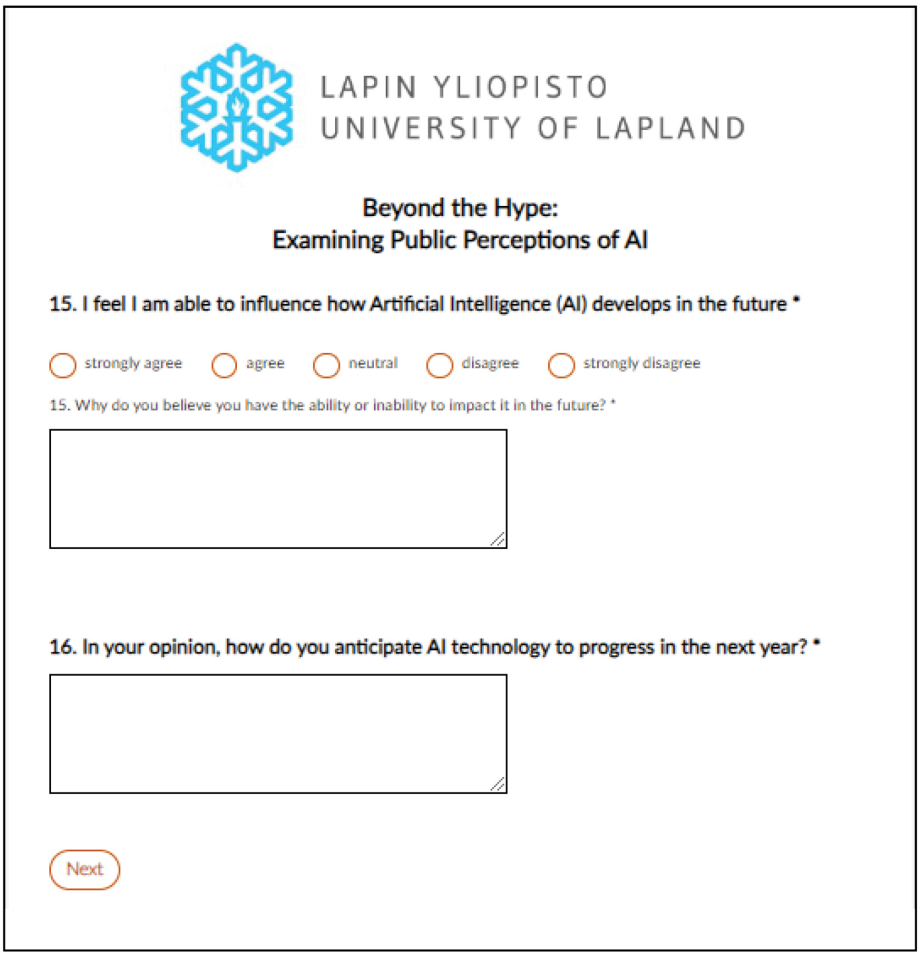
14. There are no ethical or moral issues that arise with the utilization of AI *

◯ strongly agree ◯ agree ◯ neutral ◯ disagree ◯ strongly disagree

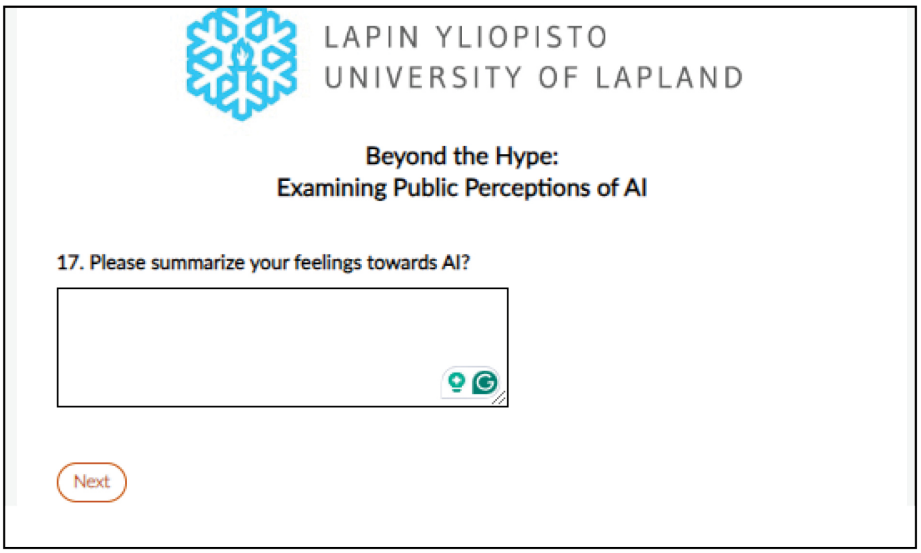
14. Can you provide further information on your thoughts about ethical or moral considerations related to the use of AI? *

Next

Survey Screen Capture,Webropol 4/7: Page 5. Future developement



Survey Screen Capture,Webropol 5/7: Page 6. Summarize



8.2 Focus Group Form & Questions

LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Consent Form

This research study is focused on the use and acceptance of AI, with a specific emphasis on understanding the attitudes, behaviors, and preferences of the participants. All the data collected will be processed and analyzed in an anonymous manner, meaning that the participants' names and personal information will not be linked to their responses. On average, it takes 45 minutes to complete this focus group study. It includes a couple of background questions and an open discussion.

It's important to note that participants have the option to withdraw from the study at any time, but once they submit their responses, the data will be anonymized, and it will be impossible to differentiate the participants. This means that the researcher will not be able to track the identity or data of the participants even if they decide to withdraw later on.

The researcher, Matilda Kalving, will use the data collected for various purposes, such as presenting the research findings, writing her masters thesis, and publishing articles related to the research. The study is being conducted under the supervision of Prof. Ashley Colley, from the Faculty of Art and Design at the University of Lapland, to ensure that the study is conducted in an ethical and professional manner. The findings of this study will provide valuable insights into the use and acceptance of AI and contribute to the research field.

If you do have any questions, please contact:
Matilda Kalving
matilda.kalving@ulapland.fi

By signing this form, I declare that I understand and accept the terms set out in this form.

Osallistuja _____ Aika ja paikka **Rovaniemi** ___.___.**2022**
Participant *Time and Place*

Tutkija _____ Aika ja paikka **Rovaniemi** ___.___.**2022**
Researcher *Time and Place*

Focus group

Acceptance of AI

Participant nr. _____

Date: ___

Background information

1. **Age** _____

2. **Gender**

- ☐ *female*
- ☐ *male*
- ☐ *non-binary*
- ☐ *prefer not to disclose*
- ☐ *prefer to self describe:* _____

3. **Field of study / work:** _____

4. **Which of the following items do you currently own?**
Please indicate by marking the corresponding ones.

- ☐ Smartphone
- ☐ Laptop
- ☐ Tablet
- ☐ Desktop computer
- ☐ Smartwatch
- ☐ Virtual Reality headset
- ☐ Drone
- ☐ Fitness tracker
- ☐ Smart home device (e.g. smart speaker, smart thermostat)
- ☐ None of the devices listed

5. **Have you previously acquired technical knowledge and proficiency in fields such as IT, engineering, mechanics, or other technical areas?**

_____

6. **How would you describe Artificial Intelligence to a friend?**

_____

_____

7. **Do you know any tools, services, or products that currently incorporate AI or use AI technology? Please list everything you can think of.** (You can continue on the other side)

_____

_____

Focus Group timeline

Explain the study 5 min
Consent form 10 min

Prompt: ChatGPT & General discussion of AI
Let's think back a few months, AI has been a thing we see on scifi movies and what the IT guys babble on about. But now it's everywhere.
Let them talk and prompt in questions in between:

1. What where the first AI tools you tried and what have you used regularly since?
2. Can you please share with us why you use or won't use AI tools regularly? Please provide an example of the tools and use case.
3. What tools could see yourself using in the future? Please tell us an example of a use case you have used it or will use it for, and why you use it.

Prompt: Self driving buss
You are waiting for a buss and all of the sudden a self driving bus arrives:
Let them talk and prompt in questions in between:

4. Would you jump in?
5. What factors play a role in building trust or distrust?

Prompt: Medical
You've been feeling down and go to the doctor, the wan't to put your data in to AI diagnosis machine.
Let them talk and prompt in questions in between:

6. Would you let him do it? And if not, what would make you say no to it?
7. What factors play a role in building trust or distrust??
8. Can you provide further information on your thoughts about ethical or moral considerations related to the use of AI?

Other Questions to put in:

9. Do you believe you have the ability or inability to impact AI development in the future?
10. What would you like the developers of AI take in to consideration
11. In your opinion, how do you anticipate AI technology to progress in the next year?
12. Please summarize points that you would like the developers of AI take in to considerations

8.3 Interview Form & Questions

LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND

Consent Form

This research study is focused on the use and acceptance of AI, with a specific emphasis on understanding the attitudes, behaviors, and preferences of the participants. All the data collected will be processed and analyzed in an anonymous manner, meaning that the participants' names and personal information will not be linked to their responses. On average, it takes around 30 minutes to complete this interview. It includes a couple of background questions and an open discussion.

It's important to note that participants have the option to withdraw from the study at any time, but once they submit their responses, the data will be anonymized, and it will be impossible to differentiate the participants. This means that the researcher will not be able to track the identity or data of the participants even if they decide to withdraw later on.

The researcher, Matilda Kalving, will use the data collected for various purposes, such as presenting the research findings, writing her masters thesis, and publishing articles related to the research. The study is being conducted under the supervision of Prof. Ashley Colley and Prof. Jonna Häkkilä, from the Faculty of Art and Design at the University of Lapland, to ensure that the study is conducted in an ethical and professional manner. The findings of this study will provide valuable insights into the use and acceptance of AI and contribute to the research field.

If you do have any questions, please contact:
Matilda Kalving
matilda.kalving@ulapland.fi

By signing this form, I declare that I understand and accept the terms set out in this form.

Osallistuja _____ Aika ja paikka **Rovaniemi** ___.___.**2024**
Participant *Time and Place*

Tutkija _____ Aika ja paikka **Rovaniemi** ___.___.**2024**
Researcher *Time and Place*

Interview group

Participant nr. _____
(Filled by researcher)

Date: ___

Background information

1. **Age** _____

2. **Gender**

- ☐ *female*
- ☐ *male*
- ☐ *non-binary*
- ☐ *prefer not to disclose*
- ☐ *prefer to self describe:* _____

3. **Field of study / work:** _____

4. **What AI tools do you regularly use?**

_____

_____

5. **How would you describe Artificial Intelligence to a friend?**

_____

_____

INTERVIEW PLAN:
Exploring designers' experiences involves understanding how they use tools, including Visual AI, uncovering challenges and opportunities, examining the perceived acceptability of AI in design, and gathering recommendations for improvement.
To think about while interviewing: What is the definition of visual AI output by the interview participants?

Questions

1. Can you briefly describe your role as a designer and your experience in using design tools, including any experience with Visual AI tools?
2. How frequently do you incorporate AI tools into your design process?
3. Can you share a specific project where you found Visual AI tools particularly useful? What aspects did you find most beneficial?
4. Are there specific factors that contribute to your positive or negative perception of using AI in design?
5. How do you perceive the acceptability of AI tools in the design community?
6. Have you received any formal training on Visual AI tools? If yes, how has it impacted your workflow?
7. What resources or methods do you find most effective in learning and staying updated on Visual AI technologies?
8. Based on your experience, what improvements or features would you like to see in Visual AI tools to enhance their usability for designers?
9. In your opinion, what do you see as the future trends in the integration of Visual AI tools into the design field?