



Linnéuniversitetet

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Thesis

Artificial Intelligence for Graphical User Interface Design

Analysing stakeholder perspectives on AI integration in GUI development and essential characteristics for successful implementation



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Abstract

In today's world, Artificial Intelligence (AI) has seamlessly integrated into our daily lives without us even realising it. We witness AI-driven innovations all around us, subtly enhancing our routines and interactions. Ranging from Siri, Alexa, to Google Assistant, voice assistants have become prime examples of AI technology, assisting us with simple tasks and responding to our inquiries. As these once futuristic ideas have now become an indispensable part of our everyday reality, they also become relevant for the field of GUI.

This thesis explores the views of stakeholders, such as designers, alumni, students and teachers, on the inevitable implementation of artificial intelligence (AI) into the graphical user interface (GUI) development. It aims to provide understanding on stakeholders thoughts and needs with the focus on two research questions:

RQ1: What are the viewpoints of design stakeholders regarding using Artificial Intelligence tools into GUI development? And RQ2: What characteristics should be considered in including AI in GUI development?

To collect data, the thesis will use A/B testing and question sessions. In the A/B testing, participants will watch two videos, one showing how to digitise a sketch using an AI tool (Uizard) and the other showing how to do the same thing using a traditional GUI design tool (Figma). Afterwards, the participants will answer questions about their experience regarding the two different ways to digitise a sketch.

The study highlighted a generally positive outlook among the participating stakeholders. Students and alumni expressed more enthusiasm whereas experienced professionals and teachers were cautious yet open to AI integration. Concerns were voiced regarding potential drawbacks, including limited control and issues of over-reliance. The findings underscored AI's potential to streamline tasks but also emphasised the need for manual intervention and raised questions about maintaining control and creative freedom.

We hope this work serves as a valuable starting point for other researchers interested in exploring this topic.

Key words

Artificial intelligence (AI), Interaction Design (IxD), Graphical user interface (GUI), Human-AI Collaboration.



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List of acronyms

AI - Artificial intelligence

IxD - Interaction Design

NN/G - Nielsen Norman Group

UX - User experience

UI - User Interfaces

GUI - Graphical User Interface

HCD - Human-centred design

ML - Machine learning

NLP - Natural language processing

VAEs - Variational autoencoders

GANs - Generative adversarial networks



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1 Introduction

In this digital age, the design of Graphical User Interfaces (GUI) has proven itself to be crucial in the development of digital applications and websites. The way in which users interact with and perceive digital solutions is increasingly determined by the aesthetics, usability, and functionality of these user interfaces. As technology evolves, the tools available to designers evolve along with it, and Artificial Intelligence (AI) presents itself as an innovative provider of such tools ("AI-powered tools for UX research: Issues and limitations," 2023).

AI has expanded exponentially in recent years with its influence extending into many different domains (Wang et al., 2021). In the realm of GUI development, AI creates opportunities to redefine and refine the design process, offering solutions that range from automating repetitive tasks to enhancing user experience through personalization and predictive analytics which align with Chung & Choi (2022) study that emphasises and highlights the multifaceted role of AI software in assisting designers throughout the design process, encompassing ideation, prototyping, and testing. The integration of AI tools has the potential to streamline design workflows, optimise decision-making processes, and ultimately lead to the creation of more intuitive and user-centric interfaces (Verganti et al., 2020).

However, as the integration of AI tools into GUI development gathers momentum a lot of questions, concerns, and considerations arise that demand examination (Cabrera et al., 2023). The use of AI in IxD has sparked ongoing debate and requires further exploration to fully understand its potential for enhancing design processes (Preece et al., 2015). This thesis aims to explore the perspectives of design stakeholders on the integration of AI tools into GUI development and investigate the characteristics of AI tools that should be considered when using them for GUI design. By exploring designers in the field of UX/UI/IxD, alumni, students and teachers viewpoints, we hope to provide valuable insights that could provide valuable perspectives for future projects.

1.1 Problematization and motivation

As AI technologies and tools emerge, they present challenges and opportunities in the field of GUI. They bring a possibility to automate certain tasks traditionally performed by GUI designers which in turn challenges their role and future within the field. However, AI also offers an opportunity to enhance the GUI design process, which can be seen as beneficial to the efficiency of the design process.



As future stakeholders, we need to understand the challenges and opportunities of AI in GUI development to make better GUIs and help designers adapt to this new technology. We hope to provide as much information as we can to aid in creating a positive space for stakeholders as AI continues to be integrated and by doing so perhaps combat the negative feelings regarding AI and its ability to replace stakeholders, especially designers, tasks within GUI development.

1.2 Purpose and Limitations

The purpose of this thesis is to explore the views of stakeholders including designers, alumni, university students, and university teachers on the integration of AI into GUI processes in interaction design and informatics. Our focus is on stakeholders' thoughts and needs when using AI in GUI. It is important to note that this thesis is not intended to be a comprehensive overview of the views of all stakeholder groups or the technical challenges and opportunities associated with AI implementation. Instead, the focus will be on two specific areas: the perspectives of stakeholders on using AI tools in GUI development and the characteristics that should be considered when incorporating AI into GUI development.

1.3 Research Questions

1. What are the viewpoints of design stakeholders regarding using Artificial Intelligence tools in GUI development?
2. What characteristics should be considered when including AI in GUI development?

1.4 Structure of the report

The study begins with an introductory overview in chapter 1, which provides the necessary background information. Chapter 2 conducts a literature review to establish a foundation for this research.

The methodology employed in this study is detailed in Chapter 3, including an explanation of the data collection processes used. Chapter 4 presents the findings resulting from these data collection efforts. Visual aids such as graphs are incorporated to enhance understanding.

Chapters 5 provide a discussion of the study's results and methodology. Further, chapter 6 summarises the key findings of the research and discusses the implications for future work.

Lastly, provides a reference list that cites all sources referenced throughout this paper using APA citation style.



2 Theoretical framework

This section provides a theoretical framework for understanding the integration of artificial intelligence (AI) into graphical user interface (GUI) development.

2.1 Introduction to the Literature Review

The literature review aims to explore the use of artificial intelligence (AI) in graphical user interface (GUI) design, with a focus on human-AI collaboration. We searched for relevant articles in several databases, including ACM, Scopus, ResearchGate, and Google Scholar.

We used the following keywords: Artificial Intelligence (AI), interaction design (IxD), graphical user interface (GUI), human-centred design HCD, and human-AI collaboration.

Researchers independently reviewed different subsets of articles to optimise time and resources. However, this approach increases the possibility of overlooking relevant studies. To mitigate this risk, we established standardised criteria for article selection. Only peer-reviewed papers published after 2019 and containing at least two out of the five specified keywords were included in our review. Schoolbooks and one journal on thermal analysis were published after 2019 due to the lack of updates in their previous editions.

Next, we present and highlight the key findings from the literature.

2.2 Literature Review

The integration of artificial intelligence (AI) has revolutionised various technology areas, including graphical user interface (GUI) development. GUIs serve as the primary bridge between users and software applications, making them a crucial element in the user experience (UX) landscape.

As the digital landscape continues to evolve, GUIs play an increasingly critical role in shaping user interactions. Design stakeholders hold a pivotal role in guiding the development and evolution of GUIs to meet the ever-growing expectations of end consumers. It is essential to understand user perceptions of AI-driven interfaces. If users find the interface unappealing, they are less likely to engage with it, which could impede its success (Norman, 2013).

It is therefore crucial to identify key features that must be taken into account when incorporating AI into the development of GUI. This ensures not only the efficiency of these interfaces but also the satisfaction of the users who rely on them. What would happen if we were to replace the innovation processes that



have so far been carried out by humans with machines? Verganti et al. (2020) conducted a study and highlighted the transformative impact of software, digital networks, and Artificial Intelligence (AI) on the economy, particularly in the realm of innovation and design. AI, by automating decision-making and learning, plays a pivotal role in enhancing innovation performance. The removal of human-intensive design limitations in scale, scope, and learning is identified as a key factor contributing to AI's potential in achieving superior performance in customer centricity, creativity, and the rate of innovation.

The essential characteristics of AI inclusion address how AI can be seamlessly integrated to foster inclusivity and accessibility for all users. This could involve, for instance, providing users with the option to choose whether or not to engage with AI or designing AI features that are easy to comprehend and utilise (W3C Web Accessibility Initiative (WAI), 2023).

The intersection of AI and interaction design explores how these two domains can collaborate to create enhanced user experiences. This could encompass, for example, employing AI to automate tasks, provide users with personalised recommendations, or simplify the learning process for navigating a product or service ("AI-powered tools for UX research: Issues and limitations," 2023).

AI tools commonly used in GUI development encompass the various tools and techniques employed to develop AI-driven interfaces. These tools could be utilised, for instance, to collect user data, train AI models, or implement AI features within a product or service (Stige et al., 2023).

The integration of work-related AI into interaction design (IxD) investigates how AI can enhance the workflows of interaction designers. This could involve utilising AI to automate tasks, generate creative concepts, or provide feedback on design work, aligning with the findings of Wang et al. (2021) in their study on transitioning from human-human collaboration to human-AI collaboration. Wang et al. (2021) explored the opportunities and challenges associated with human-AI collaboration in the design process.

2.3 Interaction design (IxD) and AI

Interaction design (IxD) is a crucial field that focuses on crafting user-centric products and services, prioritising ease of use, efficiency, and enjoyment (Norman, 2013). It delves into understanding human interactions with digital systems and devising strategies to optimise these interactions for a seamless and pleasant user experience (Höök & Löwgren, 2021).

Artificial intelligence (AI), a branch of computer science, aims to develop intelligent agents capable of tasks traditionally considered human, like decision-making and intelligent behaviour (Arvola, 2021). AI tools, software



employing AI techniques, address various problems and perform diverse tasks (Höök & Löwgren, 2021).

IxD, human-centred design (HCD), and AI are synergistic fields that can collaborate to create interfaces that are more user-friendly, efficient, and engaging (Arvola, 2021; Höök & Löwgren, 2021; Norman, 2013).

2.3.1 Goals in IxD with AI Support

In line with Arvola (2021); Preece et al.(2015)), the goal of IxD is to design products/services that are easy to use, efficient, and accessible to all users, regardless of their abilities. This means that the usability should be easy to understand and use, and users should be able to complete their tasks smoothly and quickly. This user-centred methodology means that the design should be based on the specific needs and goals of the users, as emphasised by Goodwin & Coleman (2017). AI tools can help interaction designers achieve this goal by providing them with insights into user behaviour and preferences, as well as by automating tasks such as generating mockups [a digital or physical representation of a product or design that showcases its appearance and functionality]. They can be used to gather feedback, test usability, and visualise the final product before it is developed (Morville & Rosenfeld, 2006).

2.3.2 How AI tools can help interaction designers apply Nielsen Norman Group's (NN/G) Six Core Tenets:

AI tools can simplify the work of interaction designers by analysing user behaviour and automating tasks like prototype testing. Interaction designers can rely on Nielsen Norman Group's (NN/G) six core tenets of interaction design, which provide a solid foundation for their practice. NN/G is an established research and consulting firm known for its expertise in usability and user experience.

Their core tenets are:

Visibility: The design should be clear and obvious so that users know what they can do and how to do it. AI tools can be used to track user behaviour and identify areas where users are struggling. This information can then be used to improve the visibility of the design.

Feedback: The design should provide clear and timely feedback to users so that they know what is happening and whether their actions are successful. AI tools can be used to generate personalised feedback for users. This feedback can help users to understand what is happening and whether their actions are successful.

Affordance: The design should make it clear how users can interact with it through the use of visual cues and affordances. AI tools can be used to



generate design suggestions that are based on affordances. This means that the design will be more likely to make it clear to users how to interact with it.

Principle of least astonishment: The design should be familiar and predictable so that users don't have to learn new things every use. AI tools can be used to predict how users will interact with the design. This information can then be used to ensure that the design is familiar and predictable.

Consistency: The design should be consistent throughout so that users don't have to learn new things every time they switch between different parts of the design. AI tools can be used to analyse the design for consistency. This information can then be used to ensure that the design is consistent throughout.

Error prevention: The design should be error-tolerant so that users can recover from mistakes quickly. AI tools can be used to identify potential errors in the design. This information can then be used to make the design more error-tolerant.

With these core tenets, interaction designers can create designs that are easy to use, efficient, and enjoyable.

2.3.3 How AI enhance the Design process in IxD

AI tools can be used in the design process to assist interaction designers ("What is Human-AI interaction? — updated 2023," 2023) . These tools are particularly valuable during the development phase as they enable designers to rapidly generate ideas for mockups through brainstorming. The design process typically consists of three phases: concept, development, and detail (Arvola, 2021).

- **Concept phase:** The first phase in the design process is to gather information about the users, their needs, and goals. This is typically done through interviews, observations, or user surveys. AI is not that much of help with this phase because it requires human understanding of emotions.
- **Development phase:** The concepts from the concept phase are further developed and visualised using prototypes, which are then tested on users. The goal is to evaluate different design options and develop a design that is both usable and efficient. AI can be used to quickly generate brainstorming mockups in this phase, saving designers time.
- **Detail phase:** The final part of the design process, the final design is implemented and realised. This means that code, graphic design, and content must be clear, which may involve the inclusion of other professional groups in the phase. AI can help by automating some of these tasks, such as generating code and creating documentation.



2.3.4 AI's Impact on (IxD) and Graphical User Interface (GUI)

Interaction Design (IxD) is an interdisciplinary field that focuses on designing interaction experiences between people and products or services (Preece et al., 2015). GUI design is an important part of IxD because it is the visual representation of the interaction between a user and a product or service.

IxD designers work to create GUIs that are user-friendly, efficient, and aesthetically pleasing, using AI to enhance these qualities. They take into account the needs and goals of users, as well as the technical limitations of the device or service, with AI playing a pivotal role in optimising the user experience.

2.4 AI in GUI

Artificial intelligence (AI) is a branch of computer science concerned with creating intelligent agents which can perform tasks traditionally considered to require human intelligence, such as making decisions and acting intelligently. AI tools are software that use AI techniques to solve problems or perform tasks. The significance of AI tools spans across various domains and continues to grow (Stige et al., 2023). In the context of user interface design, AI plays a crucial role in revolutionising GUI (Graphical User Interface) development.

Graphical User Interface (GUI), a visual method that enables users to interact with electronic devices through graphical elements such as icons and sound signals, has played a pivotal role in the field of computer science. Cabrera et al. (2023) discuss the importance of behavioural descriptions in facilitating collaboration between humans and AI systems. Behavioural descriptions are formal representations of how a system should behave in various situations. According to the authors, these behavioural descriptions can enhance users' understanding and anticipation of AI system behaviour, ultimately leading to improved collaboration.

One example of how GUI, HCD, and AI can be used together is in the design of a new mobile banking app. The designers of the app could use HCD to understand the needs of their users and identify the features that are most important to them. They could then use AI to create a GUI that is inspiring and easy to use, and to automate tasks such as generating several mockups for the landing page of the app. The designers could also use AI to personalise the app to each user's individual needs and preferences.

GUIs, which represent one form of user interface, have significantly impacted the accessibility and usability of computers. They have transformed computers from complex machines that only experts could operate into user-friendly tools for productivity and creativity. GUIs debuted at the Xerox Alto Research



Center in the 1970s and gained commercial success with the release of the Apple Macintosh in 1984.

Key properties of GUIs include:

- **Direct manipulation:** Users can interact with GUIs by directly manipulating the graphical elements, such as clicking buttons, dragging and dropping objects, and typing in text fields.
- **WYSIWYG (What You See Is What You Get):** GUIs show users the final result of their actions, making them easier to learn and use.
- **Metaphors:** GUIs often use metaphors from the real world to help users understand how they work. For example, a GUI button can represent a physical button on a device.
- **Modularity:** GUIs can be broken down into smaller modules, making them easier to design and develop.

In GUI development, AI tools and technologies are becoming increasingly common. These include Machine learning (ML), Natural language processing (NLP) and AI tools that utilise Generative AI. The compelling properties and factors that are important in using AI into GUI development, and which are crucial to consider, are as follows. AI should be intuitive and user-friendly to maximise user acceptance. Another important factor to be developed within AI tools is that AI features should be intuitive and easy to use to maximise user acceptance. Another is that AI features should be designed to enhance the overall efficiency of the GUI so that users can perform their tasks faster and more efficiently. Adaptability is another important factor in creating a personalised user experience. Lastly, AI tools should be designed with accessibility in mind to include individuals with disabilities and ensure that the GUI is accessible to all.

2.4.1 Potential Benefits and Drawbacks

The potential benefits of using AI in GUI, as suggested by Sangüesa & Guersenzvaig (2019), are that AI has already shown its ability to become design intelligent and to understand and model the design process. According to Sangüesa & Guersenzvaig (2019), AI can be a design support for designers in their work, as designers can use AI tools during GUI development, which is seen as a design aid. Additionally, Sangüesa & Guersenzvaig (2019) argue that AI tools are developed to provide feedback on systems and evaluate design solutions.

The positive benefits that come with AI being design intelligent, a design support, and design-critical are that AI can make GUIs more intuitive and engaging for users, thereby enhancing the user experience. AI opens the door to new possibilities in GUI design, such as personalization and natural language interaction. And perhaps the most important benefit of AI is its ability



to automate tasks, helping users perform their tasks faster and more efficiently (Rožman et al., 2022).

Of course, there are also drawbacks, as pointed out by Sangüesa & Guersenzvaig (2019). There are challenges that must be overcome to develop and use AI in design effectively. Complexity is one such challenge, as the development and maintenance of AI tools can be technically complex. Reliability is also an important factor to consider when using AI tools, as data collection using AI must be accurate and not lead to errors and misleading results. Wärnestål (2020) also highlights these points, stating that it is we, as humans, who decide when AI is an appropriate tool and when it should not be used. Wärnestål argues that the responsibility lies with us humans to manage, and using AI in an inappropriate context can create catastrophic consequences for society.

New AI tools relevant to GUI include Generative AI, as previously described in this report. Generative AI emerged in the early 2020s and has since exploded in various fields. The main reason for its popularity is that the use of generative AI creates images or text that result in innovative design ideas and graphical elements, saving time in GUI development and increasing efficiency. Additionally, the use of Generative AI tools enhances the user experience by making GUIs more usable and appealing to users. One reason for this is that AI has the potential to personalise content and create more personalised GUIs, increasing user satisfaction. Being able to create prototypes, as Goodwin (2011) argues, is a crucial part of Interaction Design (IxD) to test the user experience, and Generative AI can efficiently create prototypes to achieve a better user experience.

2.4.2 Definition of AI tools and their importance

AI is software or hardware that has learned to act with human intelligence ("Generative models," 2023). For AI to solve problems and perform tasks, it is trained with different AI techniques depending on the purpose. Examples of AI techniques are machine learning (ML) and natural language processing (NLP). Important to mention in this report is Generative AI, which began to become popular in the early 2020s. Generative AI can use NLP and ML depending on purpose and application area. Generative AI is mainly used through ML, for example, through generative neural networks (GANs).

Machine Learning: Generative AI that creates images, music, or other non-text-based content can be built on generative neural networks (GANs), a machine learning algorithm. These networks are trained on large amounts of data and can generate new examples similar to what they have learned.



NLP (Natural Language Processing): When it comes to generating text-based content, such as text-generating AI or chatbots, generative AI uses NLP techniques.

2.4.3 Generative Artificial Intelligence

Using AI to see and understand visuals perfectly shows how artificial intelligence (AI) and visual information work together. It encompasses the art of crafting, reshaping and comprehending visuals using the power of AI. This could, for example, involve creating images since AI can generate pictures that look real. AI can be a powerful tool in the creative field, but it can also be used as a detective, where AI can look at a picture to find a specific pattern or information. This, for example, can be useful in removing inappropriate images on webpages. According to Uizard's home page (Uizard | App, Web, & UI Design Made Easy | Powered By AI, 2023) is Uizard “*the world's first AI-powered UX/UI design tool!*”. The program Uizard uses a technology called generative AI. This technology can be categorised into three different types of generative AI, which is:

- Generative Adversarial Networks (GAN)
- Variational Autoencoders (VAEs)
- Autoregressive Models

According to (Uizard | App, Web, & UI Design Made Easy | Powered By AI, 2023) the AI tool is a mix of all three technologies.

2.4.3.1 Three different types of generative AI

Generative Adversarial Networks: GANs involve two networks, a generator and a discriminator, that play a game. This means that the generator is trying to fool the discriminator by creating images that look real, and the discriminator's role is to determine if a picture is real or generated by a system.

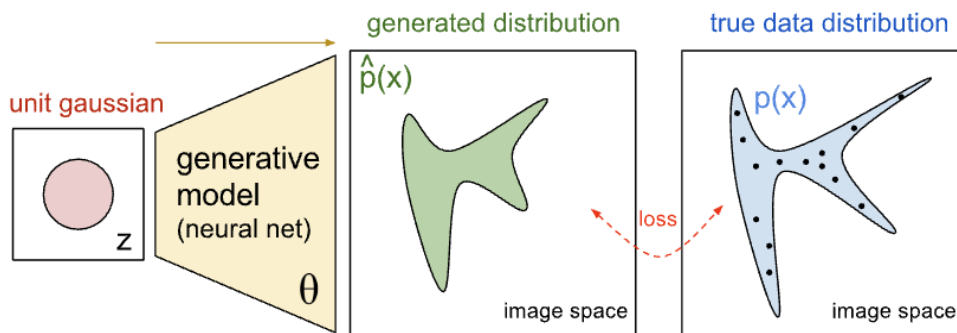


Figure 1. GAN model according to author "Generative models," (2023). Adapted from or taken from with permission or under licence OpenAi.com.

Variational Autoencoders (VAEs): A Variational Autoencoder has two parts: the encoder and the decoder. The encoder takes an image and produces an output into the latent space. The decoder can take the latent space representation and transform it into a picture that closely resembles the initial picture. By slightly changing the image representation in the latent space, we can (through the decoder) generate realistic pictures which are close to, but not identical to, the initial picture.

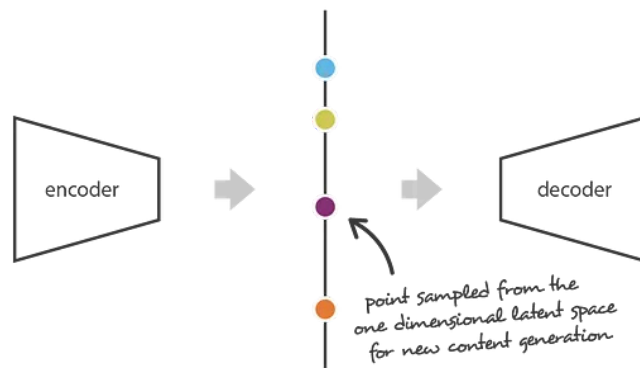


Figure 2. VAE Model. according to author Joseph Rocca. Adapted from or taken from with permission or under licence towardsdatascience.com.

Autoregressive Models: An example of this is Pixel Recurrent Neural Networks PixelRNN, which learns by examples and has been trained by being exposed to many pictures of the same subject. It scans every little pixel horizontally and vertically.

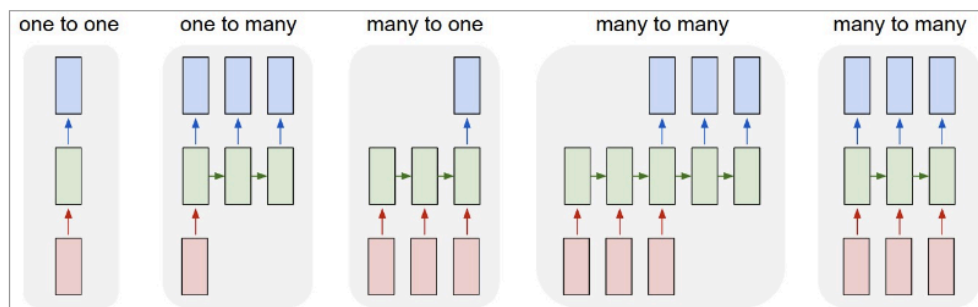




Figure 3. Autoregressive Models. according to author karpathy. Adapted from or taken from with permission or under licence karpathy.github.io.

None of these models work flawlessly. One of the problems with VAE is that when it tries to create a picture with new data, the results are a bit blurry, GAN is creating the sharpest picture today, but the training is unstable, which makes the training hard, Autoregressive Models have the most simple and stable training process and give the most realistic picture using familiar data. Still, when it comes to creating new pictures, they are very slow and inefficient. The scientists behind "Generative models," (2023) believe that all of these models require more research and are eager to follow the developments within these three models.

This table presents the top ten AI editing/creating tools for UX, along with their developers, release year, and intended use.

Table 1

This table presents the top ten AI editing/creating tools for UX according to bootcamp.uxdesign.cc., (2023).

Product name	Developers	Year Released	Usage
Mid-Journey	Midjourney	2022	Text-to-image AI
Khroma	Khroma.ai	2022	Image generation and editing AI
Pixso	Pixso Inc.	2018	UI/UX design and prototyping AI
VanceAI	VanceAI	2017	Image and video editing AI
Adobe Sensei	Adobe Inc.	2016	AI-powered features for Adobe products
Deep Art Effects	Deep Art Effects	2016	AI-powered art creation and editing
Foyr Neo	Fory	2022	AI-powered design automation
Looka Logo Maker	Looka	2021	Logo creation AI
Uizard	Uizard Inc.	2016	UI/UX prototyping and design AI



2.5 Work related to AI and IxD

One of the most significant articles in this field is by Chung & Choi (2022). In their study there are two participant groups, the designers and AI experts. The designers are interviewed about their needs for assistance in the design process and AI experts are interviewed in order to explore the potential of AI tools. Chung & Choi (2022) hopes that the study will help to develop guidelines for creating more useful AI tools for design processes.

The interviews with designers and AI experts led them to three findings:

1. AI software can help designers plan by collecting and analysing data relevant to the project and providing objective insights for decision-making.
2. AI tools should help designers generate and develop ideas by understanding their intentions from the start.
3. AI tools should be a holistic system that manages design contributions and achieves project goals.

Chung & Choi (2022) findings suggest that AI has the potential to revolutionise the design process and make it more efficient and effective. However, it is essential to note that the specific requirements of design support tools will vary depending on the design field, the type of design output and the type of company. In the future, it will be essential to conduct more research to develop AI design tools that are tailored to the specific needs of the designer.

While Chung & Choi (2022) study is the most significant, Wang et al. study is also relevant because it discusses how to transition from human-human collaboration to human-AI collaboration and the challenges of designing AI tools for this purpose. In their article, Wang et al. (2021) discuss the challenges and opportunities associated with human-AI collaboration. They argue that AI systems are becoming increasingly sophisticated and capable of collaborating with humans in various ways. However, there are still many challenges to overcome to create truly effective and efficient human-AI collaborations. One of the key challenges identified by Wang et al. (2021) is defining the roles and responsibilities of humans and AI in a collaborative setting. Who is the boss? Furthermore, he highlights more challenges such as: how we can teach AI to understand human emotions, what are the significant ethical aspects, how can we develop trustworthy AI tools and how can we ensure that AI is used in a way that benefits all?

Even though Wang et al. (2021) puts forth these challenges, they still sees the potential in human-AI collaborations and claims that humans and AI can achieve together what neither could achieve alone. We therefore need to solve this complex problem of working together and making better decisions, which can then lead to the better creation of products.



Furthermore, Veitch & Alsos (2021) contribute to this conversation by introducing the concept of Human-Centred Explainable Artificial Intelligence (XAI) for Autonomous Surface Vehicles (ASVs). Their work emphasises the importance of addressing end user interaction needs in real-world contexts, going beyond expert users. The concepts of usability, trust, and safety are highlighted in their Human-Centred XAI approach, suggesting parallels with Chung & Choi (2022) emphasis on the holistic management of design contributions.

2.6 Summary

Chapter 2 of this thesis provides an in-depth exploration of the integration of AI into graphical user interface (GUI) development from a human-centred design (HCD) perspective. HCD emphasises understanding user needs and experiences to create more usable and enjoyable products and services. In the context of GUI design, AI is seen as a tool to enhance user experiences, rather than replacing human designers. The chapter draws on a literature review and empirical study to understand the viewpoints of design stakeholders on AI integration into GUI development.

The literature review highlights the critical role of AI in GUI development, focusing on its potential and the importance of user feedback and inclusivity. It discusses the core tenets of interaction design, suggesting that AI tools can simplify designers' work and enhance user satisfaction by improving the visibility, feedback, affordance, predictability, consistency, and error prevention of GUIs.

The chapter also delves into the ways AI enhances the design process in interaction design, emphasising its value during the development phase, where it helps generate brainstorming ideas and mockups. The three main phases of the design process are concept, development, and detail.

Furthermore, the chapter examines the relationship between AI, interaction design, and graphical user interface, highlighting the transformative role of GUIs in making computers more accessible and user-friendly.

The integration of AI tools in GUI development is discussed, addressing key considerations such as intuitiveness, efficiency, and accessibility to all users. The potential benefits of AI in GUI development include making interfaces more intuitive and engaging, personalization, and task automation. However, challenges like complexity and reliability must be addressed. The chapter also introduces Generative AI and its potential to create innovative design ideas, prototypes, and personalised GUIs.



A section is dedicated to the definition of AI tools and their importance in GUI development, emphasising AI techniques like machine learning, natural language processing, and Generative AI.

The work related to AI and interaction design is discussed, with a notable study by Chung & Choi (2022) highlighting how AI software can assist designers in various aspects of the design process. It identifies the potential of AI to improve the design process's efficiency and effectiveness but also underscores the need for tailored AI design tools to meet specific designer requirements. Additionally, the study by Wang et al. (2021) explores the transition from human-human collaboration to human-AI collaboration and the challenges associated with designing AI tools for such collaboration.

In brief, Chapter 2 provides a comprehensive overview of the integration of AI into GUI development, emphasising user-centric design principles and the potential benefits and challenges of this integration. It also introduces the importance of AI in improving user interactions and the critical role AI tools can play in enhancing the design process.



3 Methodology

In this section, we will present a methodology framework that includes a literature review and A/B testing, followed by questions for the four participants groups that in total included 11 participants.

3.1 Methodology framework

We wanted to explore different views from participants: designers, alumni, students, and teachers, to get their thoughts on the use of AI in user interface design. We used a combination of A/B testing and questioning sessions to gather their feedback and ensure that our work was focused on user needs. We also took advantage of our locations (Sweden and Switzerland) to qualitatively extend that range of vision.

To answer our research questions (RQ1 and RQ2), we used a combination of literature review, A/B testing, and question sessions. The literature review helped us to understand existing research, identify areas where more work is needed, and lay the groundwork for our project (Bryman, 2012).

3.2 Literature review

The literature review were performed in multiple databases, including ACM, Scopus, ResearchGate, and Google Scholar, using the keywords “*Artificial Intelligence (AI)*”, “*Interaction Design (IxD)*”, “*Graphical User Interface (GUI)*”, and “*human-AI Collaboration*”. The keywords were combined with and without the search techniques AND and * to broaden the search results. Appendix 4 provides insight into the search process.

3.3 Empirical data collection

- **A/B testing:** Participants watched two videos, one demonstrating the process of digitising a sketch using an AI tool (Uizard) and the other showcasing the same task using a traditional GUI design tool (Figma).

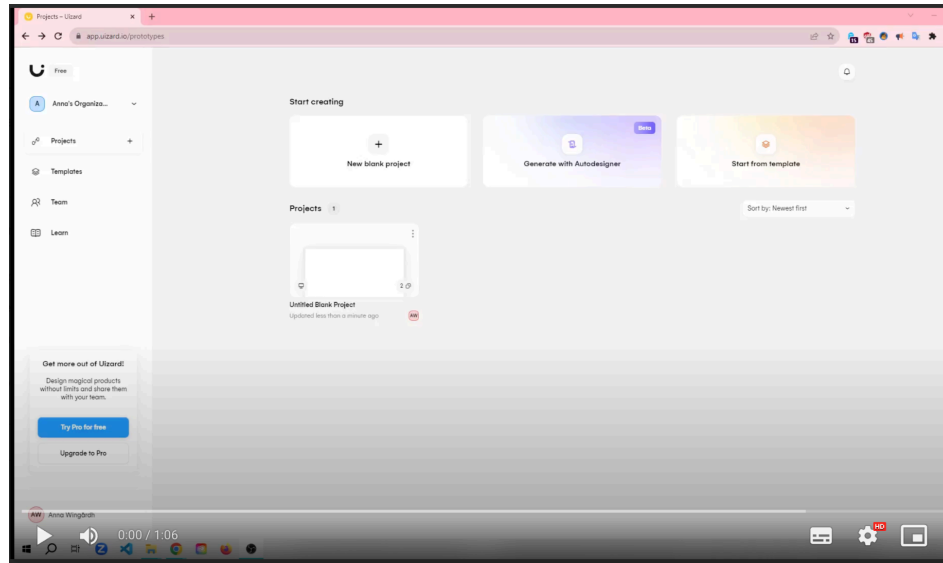


Figure 4. Printsreen of Uizard video. Digitizing a paper sketch with an AI tool. AI-powered design tools like Uizard can streamline the process of digitizing paper sketches and converting them into mockups. This video demonstrates how Uizard can be used to quickly and easily convert a hand-drawn sketch into a digital mockup.

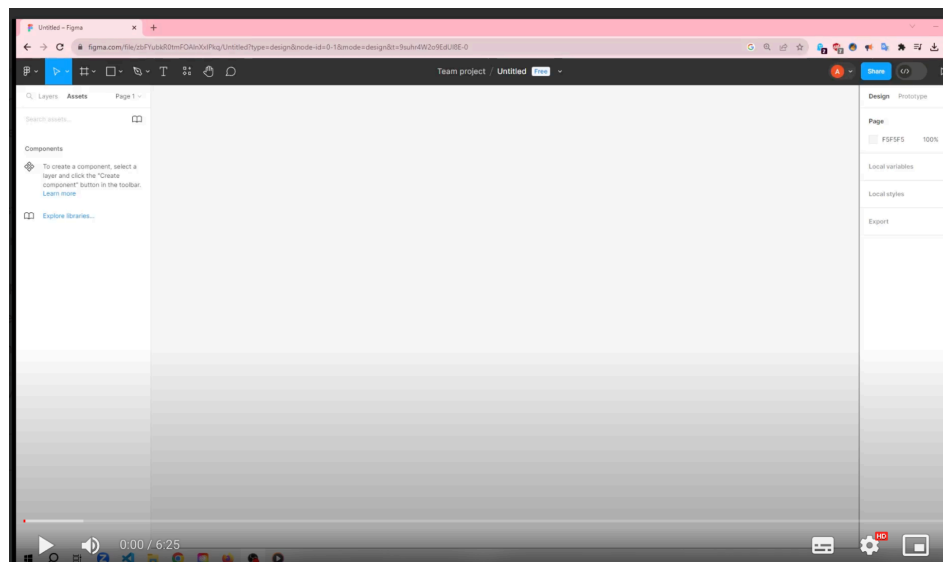


Figure 5. Printsreen of Figma video. Digitizing a paper sketch the traditional way. Figma is a popular user interface (UI) design tool that can also be used to digitize traditional paper sketches. This video demonstrates how to use Figma to convert a hand-drawn sketch into a digital mockup.



- **Question session:** Participants were asked to answer questions based on their feelings after watching the two demonstrating videos and their perspectives on integrating AI tools into GUI development. Due to time constraints, participants were either interviewed or requested to complete a questionnaire.

3.3.1 Participants

In this study there were 11 participants from Sweden and Switzerland. The participants in the empirical study were UX/UI/IxD designers, alumni, university students, and university teachers in IxD. We initially contacted designers and alumni through personal connections and social media. While students and teachers were recruited first through email and then also at the university.

The participant demographics were as follows:

1. Designers (*Sweden*)
2. Alumni (*Sweden*)
3. Students (*Sweden and Schweiz*)
4. Teachers (*Schweiz*)

3.3.2 A/B testning

The sessions were conducted by allowing the participants to watch the two videos on a computer, iPad, iPhone, or via a provided link, depending on their availability and preferences. Upon completing these videos, all four participant groups participated in a question session, addressing a common main question followed by group-specific contrasting questions.

3.3.3 Question session

Question sessions could be conducted in person or online, depending on the available time. The online question sessions were accessible through a provided link that participants could use to access and complete the session.

Each participant, regardless of their audience group, addressed the following main questions:

1. How many years of experience do you have in your field?
2. What did you like and dislike about seeing Uizard and Figma to digitise sketches?
3. How do you feel about AI?
4. What are your thoughts on the potential benefits and advantages of AI-powered GUI development?
5. Describe your role (Designer, Alumni, student, teacher)



(This question is asked first in the interview. In the questionnaire, it is asked last because it will take the participant to the correct section, depending on their answer).

Furthermore, participants responded to 2-4 contrast questions tailored to their specific audience group, providing a deeper understanding of their perspectives. Please refer to Appendix 3 for more detailed questions tailored to each group.

3.4 Data Analysis

A thematic analysis was conducted to examine the collected data during question sessions, focusing on participants' perspectives on the integration of Artificial Intelligence (AI) into GUI development. As the name suggests, this approach serves as a framework for systematically analysing qualitative data, offering a structured way to handle themes and information. It does not prescribe how to identify themes, acknowledging that this process often reflects the analyst's recognition of recurring ideas and topics in the data (Bryman, 2012).

3.5 Data validation

To ensure the reliability, which refers to the consistency of the data, meaning that the same results are obtained when the study is repeated (Bryman, 2012) and validity, which refers to the accuracy of the data, meaning that the data accurately reflects the phenomenon under study (Bryman, 2012), of our study, we employed:

Literature review: We conducted a comprehensive literature review to identify the key concepts and findings in the field of AI, GUI design, and human-centred design. This helped us to ensure that our research was consistent with existing research and that our findings were not simply based on our own assumptions or biases.

Empirical research: We collected empirical data from a small group of participants. This data was collected using A/B testing and question sessions. This helped us to gain a deeper understanding of the perspectives of design stakeholders on the integration of AI into GUI development.

Triangulation: We used triangulation, which is the process of collecting data from multiple sources, to ensure that our findings were not based on a single method or source. We used three different data collection methods: literature review, A/B testing, and question session. This helped us to increase the reliability and validity of our findings.



The results from all three data collection methods corroborated each other, reinforcing the validity of our study. Parallels could be drawn between the statements made by the participants and the insights gained from the literature review, further supporting the validity of our chosen methods. This convergence of findings demonstrates the effectiveness of our methodological approach.

3.6 Research ethics

We followed the ethical guidelines of the Swedish Research Council (Vetenskapsrådet, 2002). Before participating in the study, participant received an informed consent form (see Appendix 2) explaining the study's purpose, assuring anonymity, and their right to withdraw at any time. The participant was recorded during the interview, and these recordings remained anonymous and confidential.



4 Results

This section presents the findings of the study, covering the results of data collection methods, the A/B testing and the question session. The data was analysed using thematic analysis.

4.1 Testing

We employed two methods. First we conducted A/B testing where participants were assigned to watch two videos on digitising sketches (see Appendix 3). After watching their assigned video they were asked to answer four main questions. Then they were divided into separate groups to answer a 2-4 contrast questions. A total of 11 participants took part in the study, consisting of 4 designers, 2 alumni, 3 students, and 2 teachers. 10 out of the 11 participants answered the questionnaire and 1 participant was interviewed in person.

4.1.1 Thematic Analysis of Main questions

1. How many years of experience do you have in your field?

To organise the responses, the following table summarises the responses years of experience in the field of IxD in GUI.

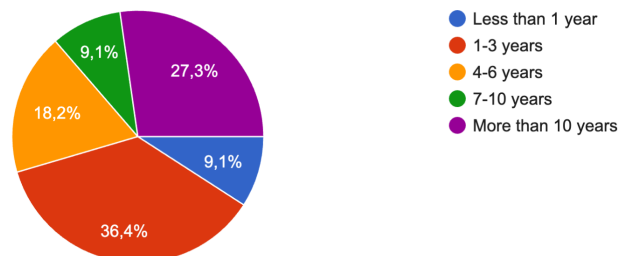


Figure 6. Diagram of participants years of experience. The diagram shows that 1 of the participants had less than 1 year of experience, 4 of the participants had 1-3 years of experience, 2 of the participants had 4-6 years of experience, 1 of the participants had 7-10 years of experience, and 3 had more than 10 years of experience.

2. What did you like and dislike about seeing Uizard and Figma digitising sketches?

To organise the responses, the following list summarises the participants' viewpoints, categorised by response type.



- **Designers viewpoints:** Thought that Uizard can be a time-saver in the early stages of the design process but it is restrictive in terms of design control and has less creative freedom compared to Figma.
- **Alumni viewpoints:** Appreciated Uizard's quick sketch conversion capabilities and its intuitive and easy-to-use interface. However, they expressed concerns about the limited design capabilities, which they found to be more comprehensive in Figma.
- **Student Viewpoints:** Appreciated the quick sketch conversion capabilities and the intuitive, easy-to-use interface of Uizard. However, they expressed concerns about the limited control over the tool's output and the occasional unpredictability of its results.
- **Teachers Viewpoints:** Teachers expressed positive sentiments towards both Figma and Uizard. They acknowledged Uizard's ease of use for digitising sketches, but also raised concerns about its potential to oversimplify the design process and limit students' understanding of fundamental design principles

To organise the responses, the following table shows a summary of all designer participants' opinions on Uizard vs Figma.

Table 2

Benefits and Concerns Analysed by Thematic Analysis of all designer participants.

Feature	Uizard	Figma
Ease of use	Easy to use, intuitive interface	More complex, requires more time to learn
Design control	Limited control over the output	More control over the design process
Speed	Produces quick results	Takes more time to create prototypes
Strengths	Quick prototyping, AI-powered conversion	Powerful features, high-quality designs
Weaknesses	Limited design capabilities, potential to oversimplify the design process	Can be time-consuming to learn and use
Overall	Good for quick prototyping, especially for beginners	Good for creating high-quality designs, especially for experienced designers

3. How do you feel about AI?

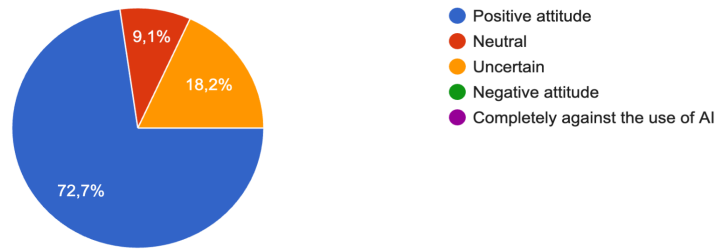


Figure 7. Diagram of participants' attitude to AI in GUI. The diagram shows that 8 of the participants had a positive attitude, 1 had a neutral attitude and 2 had uncertain attitude to AI in GUI.

4. What are your thoughts on the potential benefits and advantages of AI-powered GUI development?

To organise the responses, the following table summarises the responses opinion on potential benefits and concerns of AI-powered GUI.

Table 3

Thematic analysis of all design participants' opinions (“+” means that the participants saw this as a benefit, “-” means that the participants saw this as a concern).

Benefits of AI-powered GUI	Designer	Alumni	Student	Teacher
Automation of repetitive tasks	+	+	+	+
Prototyping and quick iterations	+	+	+	+
Increased efficiency and effectiveness	+	+	+	+
Concerns about AI-powered GUI	Designer	Alumni	Student	Teacher
Lack of transparency in decision-making processes	-			-
Unexpected	-	-	-	-



results

Over reliance on AI	-	-
Lack of human creativity touch	-	-

4.2.2 Thematic Analysis of Contrast questions

This subsection shows the participants viewpoints and opinions analysed by thematic analysis. In this case, the dataset is the participants' responses and opinions to the interview questions. The importance of this section is that it provides insights into the participants perceptions of the potential benefits and challenges of AI-powered GUI development.

4.2.2.1 Designers

1. Can you give an example of when you used an AI tool in GUI design? What were the most important characteristics of the tool that helped you to design a GUI?

To organise the responses, the following table shows the experience in creating interfaces per designer, the main AI characteristics identified and a personal opinion or feedback.

Table 4

Thematic analysis of the designer's first contrast question about the designer's experience with AI in GUI.

Participants	Experience	Characteristics of AI Tools	Personal feedback
Designer 1	Adobe Firefly for colour palette generation	Identify complementary colours from existing images.	Positive experience with Firefly and app design AI
Designer 2	AI tool for app design concepts	Generate diverse design concepts for creativity and innovation.	Positive experience by using AI tool for design concept
Designer 3	DALL-E for brainstorming posters and designs	Used for brainstorming posters and designs	DALL-E used for ideation, refinement, and iteration
Designer 4	No professional	Optimism about the	Not used yet



use, but optimistic about the future future improvements in AI tools

2. What has been your most challenging experience using AI tools in GUI design?
3. How have AI tools changed the way you work as a GUI designer?
4. How do you think AI in GUI design will change the way you design digital products in the future?

To organise the responses, the following table summarises the responses to contrast questions 2, 3, and 4 for designer participants.

Table 5

Thematic analysis of designers' responses to three contrast questions.

Question	Designer 1	Designer 2	Designer 3	Designer 4
Challenges of using AI tools in GUI design	Difficulty understanding tool usage decisions	Lack of transparency and unexpected results	Haven't used AI for GUI specifically	Not used yet
Impact of AI tools on GUI design work	AI tools empower GUI designers, enhancing efficiency and creativity	AI automates repetitive tasks and expands design possibilities	Not in any meaningful way so far	Never used
Future of AI in GUI design	AI's role in GUI design will expand	AI will automate design tasks, freeing designers for human-centred design	I believe it can be used to speed up workflows by improving new and existing tools	More focus on talking to users and less time on basic UI

Overall Insights Designer viewpoints

Designers believed that AI would speed up the process, with AI tools taking on a larger role in basic UX tasks, freeing up designers to spend more time talking to users and gaining a deeper understanding of their needs.

Designers appreciated the efficiency and ideation benefits of AI tools but also acknowledged the challenges of transparency, unexpected results, and usability. They pointed out that *"Design is an iterative process, and by building your designs by hand, you allow yourself room for an iterative process, moving from low- to medium- to high-fidelity. The AI tool skips the middle part of design."*



They emphasised the need for a balanced approach that leverages AI tools while preserving human creativity and critical thinking in the design process. In the future, designers hoped that AI tools would enable "*Smooth and fast development of UI and hopefully more focus on UX.*" Examples of AI tools that designers had been using included "*DALL-E to brainstorm posters and typographical designs*" and "*Adobe Firefly to generate a colour palette.*"

4.2.2.2 Alumni

1. Can you provide a specific example of a skill or knowledge you would have found valuable to learn about AI in GUI design during your studies?
2. What specific AI tools would have been most valuable for you to learn?
3. How do you think AI has changed/will change the field of GUI design since you graduated?

To organise the responses, the following table summarises the responses to three contrast questions of Aluminis.

Table 6

Thematic analysis of alumni responses to three contrast questions

Thema	Alumni 1	Alumni 2
Valuable AI skill or knowledge	Understanding different AI types and applications	Knowledge of AI tools
Specific AI tools	AI prototyping tools	AI-powered personalised design
AI impact on GUI design changed the field of GUI design since you graduated?	Increased adoption and usage of AI tools	AI integration in design tools and workflows

Overall Insights Aluminis viewpoints

The alumni responses provided valuable insights into the perceived needs and expectations of designers regarding AI integration in GUI development. They emphasised the importance of understanding AI tools, their capabilities, and their practical applications in creating personalised, user-centric design experiences. They were interested in learning more about the different types of AI tools that are available and how to use them effectively. As AI continues to evolve, it is crucial for design education to equip students with the knowledge and skills necessary to effectively utilise AI tools. They believed that AI would continue to play an increasingly important role in GUI design in the future. AI tools are becoming increasingly common and will be used in all stages of the design process.



4.2.2.3 Student

1. As a student new to GUI development, what are your thoughts on using AI tools like Uizard? Did they simplify the process, and what advantages or challenges did you notice?
2. How do you think AI in GUI design will change the way you design digital products in the future?

To organise the responses, the following table summarises the responses to two contrast questions of students.

Table 7

Thematic analysis of student responses to two contrast questions.

Thema	Student 1	Student 2	Student 3
Thoughts on using AI tools like Uizard	Simpler process, focus on creativity	Simplifies by saving time, but may require manual adjustments	Simplifies, adjustable, requires learning curve
Advantages of AI tools	Focus on innovation	Saves time	Speeds up process, provides basic structure
Challenges of AI tools?	Undesirable results, manual adjustments	Hard to figure out prompts	-
How AI will change GUI design in the future	Speed up process, focus on customer empathy	Automate repetitive tasks	Make work faster, provide basic structure

Overall Insights of Students' Viewpoints

The students appreciated that AI simplified and streamlined their workflow. They also recognized the limitations of current AI tools, noting that they can sometimes generate undesirable results requiring manual adjustments. They agreed that it was important for UX designers to maintain control and make decisions based on user research and human intuition.

4.2.2.4 Teachers

1. How do you feel about the potential of AI tools to transform GUI design education?
2. Can you share a specific concern you have about integrating AI tools into your courses?

To organise the responses, the following table summarises the responses to two contrast questions of teachers.



Table 8

Thematic Analysis of teachers Responses to two Contrast Questions

Thema	Teacher 1	Teacher 2
Feelings about AI	Optimistic	Cautious
Concerns about Integration	Over reliance on AI tools	Lack of independent design skills

Overall insights of Teachers' Viewpoints

The teachers believed that AI tools could speed up some tasks, but they were concerned about the potential for these tools to hinder students' development of fundamental design skills, diminish their creativity, and lead to over-reliance on technology. They advocated for a balanced approach that integrated AI tools while preserving traditional teaching methods, emphasising human creativity, and fostering critical thinking skills.

4.3 Summary

A positive sentiment prevailed among all four groups regarding AI tools in GUI development, with each group recognizing their potential benefits. However, the level of enthusiasm varied depending on the level of experience. Individuals with less experience were more enthusiastic about AI tools, while those with more experience were more cautious but still open to their integration.

Designers expressed concerns about AI tools potentially bypassing crucial aspects of the design process. They maintained that design is an iterative process, and creating designs by hand fosters greater flexibility and creativity. They emphasised the importance of transitioning from low- to medium- to high-fidelity designs through an iterative process, which AI tools might overlook.

Alumni were eager to learn more about AI tools and their applications in personalised design. They envisioned AI's potential to create more user-centric and engaging experiences.

Students perceived AI tools as streamlining the design process, allowing them to focus on user needs. They appreciated the ability to quickly generate wireframes and prototypes without expending excessive time in the initial design phases.

Teachers acknowledged AI's potential to streamline tasks and enhance teaching, but they expressed concerns about over-reliance on AI tools. They



feared that students might become overly dependent on AI, potentially hindering their ability to think critically and creatively about design problems. They emphasised the importance of adhering to human-centred design principles and ensuring that AI tools complement, not replace, human involvement in the design process.

4.3.1 Key findings

- The general perceptions are that AI tools have the potential to simplify and streamline the GUI development process by automating repetitive tasks.
- The participants expressed concerns regarding the lack of control and creative freedom, the oversimplification of the design process and the potential drawbacks of overreliance on such tools.
- Uizard is an impressive tool capable of generating digital solutions swiftly, but manual intervention may be required due to unpredictable outputs.
- Figma offers greater control but demands familiarity with its operation.



5 Discussion

This section presents the discussion of the results and methods of the study. The discussion of results will present the key findings of the study and their implications for practice. The discussion of methods will reflect on the strengths and weaknesses of the methods used in the study and suggest areas for future research.

5.1 Discussion of results

5.1.1 Control and creative freedom

It became evident that a large majority of the participants expressed a strong need to have the ability to influence the results when digitising a physical sketch. Students stated that the limitation of control of the output and the unpredictability of the results were a concern. Designers expressed similar apprehension regarding the lack of control and the lack of creative freedom when using such tools. Both the alumni and designer seemed to prefer the comprehensiveness of figma as a tool for digitising sketches and creating mock-ups, which confirms their similar craving for creative control. Alumnis also took notice of the limited design capabilities of the tool and teachers found the oversimplification of the design process worrisome. A conclusion can be drawn that these four groups place a similarly high value in the ability to assert control over the design process to an appropriate extent and that critical thinking is essential in human-centred GUI-development. These viewpoints are of significance and give insight into what is important to consider as designers and AI continue to work together in this field.

5.1.2 Previous experience and required knowledge

The teachers expressed the potential risk of tools such as Uizard oversimplifying the design process. They also raised valid concerns surrounding the potential drawbacks of overreliance on AI-tools, especially regarding the need to foster students' critical thinking and creativity. A student will benefit from AI tools undoubtedly, but only if they already have the required knowledge within the field. This will help them to not only utilise these tools appropriately, but to have an understanding as to what specific tasks will benefit most from the use of an AI tool. Since AI tools within this field are still relatively new and underused it is vital for anybody using them professionally to have a comprehensive ability to understand adjustments that need to be made to any generated design for it to be successful. Therefore it is vital not to integrate AI tools too early in students' studies. This will prevent overreliance and will make sure that the student has the required knowledge to be successful in the field of GUI-development.



A greater understanding of the possibilities and capabilities of AI tools specifically created for this field may lead to a change in attitude towards them by those with more experience in the field. An argument can be made based on the data collection that the level of experience a person has may cause them to be more cemented in their preferred methods of creating a GUI design and less open to new ones. This due to the fact that the participating teachers and designers expressed a slightly more reserved enthusiasm towards these tools when compared to students and alumni.

3 of the designers who participated in this study had previously utilised AI tools professionally (see figure 7) and seemed to express a positive attitude toward these tools. What becomes evident is that they had a very specific task in mind when resorting to these tools, for example generating a colour-palette using Adobe Firefly, creating design concepts and brainstorming. This confirms the importance of choosing the right tool for the right task and that when care is taken to do so, the experience is generally positive for the designer.

5.1.3 Streamlining the development process

Students and teachers expressed similar opinions regarding Uizard, stating that the interface appears to be easy to use, intuitive and time-saving which shows that these qualities are of significant importance when a designer is utilising an AI tool. A claim can be made that using an AI tool for the wrong task can do more harm than good. It can have a detrimental effect on the efficiency of the process and quality of the product, so it is vital to have a comprehensive understanding of what tools are available and how and when they should be used in order to effectively streamline the development process.

The study by Chung & Choi (2022) emphasises and highlights the multifaceted role of AI software in assisting designers throughout the design process, encompassing ideation, prototyping, and testing. This aligns with the stakeholders' opinions that they believe that AI has the potential to revolutionise the design process and make it more efficient and effective. The study by Wang et al. (2021) explores the transition from human-human collaboration to human-AI collaboration, addressing the challenges associated with designing AI tools for such collaboration. This resonates with the stakeholders' opinions that AI should be easy to use and trustworthy, as they pointed out that AI tools can sometimes be unpredictable and give undesirable results. This highlights the importance of fostering effective human-AI collaboration in GUI development to ensure positive outcomes and a more streamlined development process.

Student and alumni viewpoints align with Stige et al. (2023) in that they all emphasise the potential of AI tools to improve the efficiency and effectiveness of GUI development. The alumni's interest in personalised design suggests that



they believe AI tools can be used to create more customised and user-friendly interfaces. Similarly, the students' appreciation for AI tools' ability to generate wireframes and prototypes quickly suggests that they believe these tools can help them to save time and focus on the more creative aspects of design. Moreover, the literature's discussion of Nielsen Norman Group's Six Core Tenets aligns with Stige et al. (2023) emphasis on the role of AI tools in enhancing user experience. AI tools can improve visibility, feedback, affordance, predictability, consistency, and error prevention in GUIs, making them more human-friendly and collaboration-friendly.

Using AI tools to automate certain tasks could be hugely beneficial and leave more time for the designer to implement their human competence that AI cannot mimic. More time can thus be spent on the user in the form of formative and summative analysis and testing. This is a uniquely human capability which is vital for successful GUI development and something that was expressed by multiple participants. The results also suggest that there is a viewpoint that humans possess a unique ability to be creative in a contextual way that perhaps AI is not fully capable of.

The best way forward seems to be to not rely on AI tools to perform the entire job for you, but rather to use specific AI tools for specific tasks in a way that benefits the development process as a whole. One of the viewpoints expressed was the potential benefit of using such tools to simplify prototyping and idea generation for example, further suggesting that the participants are already open to using these tools for specific tasks, but perhaps lack enough knowledge about existing tools and what they can do to do so.

5.1.4 Ethical concerns

AI as a concept is a controversial topic and a person's perception of AI in general may have an effect on their willingness and openness to implement it in their work-process. This is something that could be studied further in the future to gather more insight regarding stakeholders viewpoints.

The teachers emphasised this importance of adhering to human-centred design principles and ensuring that AI tools complement, not replace, human involvement in the design process. The teachers perspective aligns with Verganti et al. (2020) emphasis on the need for organisations to evolve their approaches to innovation, acknowledging the distinct capabilities and potentials introduced by AI in shaping the future landscape of design and creativity. The teachers' concerns suggest that they are aware of the transformative potential of AI in GUI development, but they also believe that it is important to use AI tools responsibly and in a way that does not diminish the role of human designers. Verganti et al. (2020) would likely agree with the teachers' concerns. They would likely argue that AI should be used to augment



human creativity, not replace it. They would also argue that AI should be used to develop more human-centred designs, not less.

There is always the need to analyse any potential harm that such tools can do. One of the biggest ones, as stated above, is the very real threat of designers' obsolescence. We have countless times throughout history seen humans being replaced by cost-saving machines in the name of efficiency. We are of the opinion that instead of viewing AI as something that could take over and leave designers obsolete, it could be viewed as a companion to the designer. By combining the competencies of humans and machines we can reach a state of symbiosis where the good will outweigh the bad significantly. This field of design has something special: it incorporates the concept of human-centred design. The usefulness and success of a GUI is completely reliant on the user of the product and that is not something that can easily be understood by AI. Therefore it can be argued that humans are a necessity in this field and cannot simply be replaced. What needs to be done, however, is for the field to grow with this new advancement instead of refusing it.

How we embrace this new advancement is vital and should be done with care and consideration as to prevent the worries expressed by the participants during the data collection. The teachers especially expressed this concern that we should not simply replace significant parts of their curriculum with AI tools, instead we need to make sure that the unique competency that humans possess is fostered properly so this budding new relationship between them and AI proves to be a fruitful one. Unfortunately we were not able to gather significant data regarding the stakeholders' viewpoints regarding the specific threat of obsolescence. This is something that could be of significant importance with regards to this topic and is something that could be beneficial to study in the future.

5.3 Discussion of methods

We believe that the methodological approach used in this study was appropriate and fit within the timeframe. With more time, we would have liked to allow users to digitise the paper sketches themselves in Uizard and Figma. We would also have liked to include a larger proportion of experienced UX/IXD/UI designers in the respondent pool. This would have allowed us to gain a better understanding of the users' needs and preferences. Finally, we would have liked to collect more data through interviews to better understand the stakeholders' perspectives and emotions. This would have given us a deeper understanding of the problem area.

5.3.1 Literature review



The literature review provided us with invaluable insight into the topic at hand, specifically the use of AI in GUI with a focus on human-AI collaboration, and guided us through the early stages of setting out to answer our research questions. We successfully established a set of criteria for the article collection which allowed us to find related literature to consume and analyse. This in turn gave us a solid foundation on which to not only plan and conduct our data collection but also provided us with an essential understanding as to how the results of said data collection could be analysed and discussed with regards to the use of AI in GUI.

A struggle we experienced while conducting the literature review was finding the appropriate criteria and key words for our specific goals. Knowing that this would lay the groundwork for the whole thesis we took great care to make sure that the articles found were relevant to the research question at hand and useful to us as researchers. We believe that despite this initial struggle we were ultimately successful.

After having conducted the data collection through A/B testing and question sessions we could also conclude that the results from all three methods supported each other substantially. Parallels could be drawn between the statements made by the participants and the insight we gained from the literature review which in turn showed that the chosen methods validated each other in significant ways, thus increasing the validity of the study as a whole. Conducting a literature review therefore proved to be a successful choice.

5.3.2 A/B testing

To make sure that our thesis did not stray from our topic of study, interaction design, we decided to incorporate an established form of testing called A/B testing. Using this method allowed us to create a scenario where we could gain insights from various stakeholders without relying on their previous experience with AI tools. In the early stages we planned to let the participants themselves use the AI tools and therefore get first hand experience which we could later collect their thoughts on. We realised, however, that this would greatly limit our available selection of participants and would perhaps exclude a significant portion of the stakeholders whose viewpoints we aimed to discover. We felt it was equally as important to unveil the viewpoints of those with experience as those without. We therefore decided to show the participants two videos, one where the task of digitising a wireframe was performed on the AI tool Uizard and another in which the same task was performed on Figma. The intent was for them to be able to compare both the time required and the process in general. We also decided on the following four groups: students, teachers, alumni and professional designers. By placing our focus on these groups we managed to cover a significant portion of stakeholders affected by the use of AI tools in GUI.



With more time we feel that we could have expanded this selection to include eventual other groups, such as shareholders, hobbyists and others. Due to our aim to perform as high quality a data collection as possible we decided to limit the selection as to not spread ourselves and the study too thin. We hope that further studies similar to this one can be conducted in the future with a more expansive selection. In a similar vein we also feel that more participants would have been beneficial. Due to this method being chosen quite late in the process of this study we were forced to make the decision to accept a minimum of two participants from each group. We acknowledge that this is not enough to cover the viewpoints of an entire group and can therefore not generalise the viewpoints of the participants with regards to other people belonging to these groups. We accept that this method provided us with insight into their viewpoints but far from provided us with a complete and comprehensive understanding of the general viewpoints of these groups. Given the chance to do things differently we would definitely have chosen this method earlier, therefore enabling us to not only reach a wider selection of participants but also simply more of them.

It is also important to be aware of the limitations of performing such a test with only one AI tool. For a more in-depth understanding of the stakeholders viewpoints a more comprehensive A/B test could have been performed using a variety of tools. This was unfortunately also due to the time constraints we experienced during the data collection section of this study and we are of the opinion that with more time we would have implemented this significant change.

Further changes could have been implemented if this A/B testing was redone with more time, perhaps in the form of exposing the participants to the use of an AI tool in the wrong scenario in comparison to using an AI tool in a more appropriate scenario. This would allow for further insight regarding the participants viewpoints as they would be exposed to two very different scenarios using the same tools but for different tasks. In our scenario, we presented a milder comparison, however, exploring their response to a more extreme contrast could potentially have been valuable in our goal to gain as much insight into stakeholders viewpoints as possible.

5.3.3 Question session

The question session was the method we chose at the start of this study. Our goal was to simply conduct interviews, either in person or via a questionnaire, which would enable us to gather insight into their viewpoints. It became clear, however, that this would not provide us with a comprehensive enough understanding of their viewpoints. This is when the previously mentioned method, A/B testing came into play. We altered the questions slightly and added a few questions more relevant to the videos they were asked to compare. We also decided that in order for us to get the most out of the selected groups



we would have to have a set of common questions for all of them to answer as well as a set of unique questions for each group. By doing so we were able to get as many relevant viewpoints from the participants as possible. Similarly to the A/B testing, this method would also greatly benefit from a wider selection and more participants.

We chose to use a questionnaire because it was faster and more efficient. We are aware that interviews could have given us more in-depth answers, but they would have been more time-consuming. We also worried that respondents might not be as honest in interviews. According to Bryman (2012), questionnaires and interviews are both common methods for social research. The main difference is that in a questionnaire, the respondent reads the questions and answers them themselves. In an interview, the interviewer asks the questions and records the respondent's answers. We followed Bryman's advice when designing our questionnaire. We made sure the questions were clear and easy to understand. We also pre-tested the questionnaire to make sure it was easy to use.

5.4 Summary

The results from the data collection gave us great insight into the viewpoints of the participating stakeholders regarding integrating AI into GUI development as well as what characteristics should be considered in regards to this integration. The results emphasise the importance placed by the stakeholders on maintaining control and creative freedom when digitising sketches. Concerns were voiced about limitations and unpredictability when utilising AI tools which led some of the participants to prefer the comprehensiveness of a more manual tool such as Figma in comparison to an AI tool such as Uizard. There was a general consensus that the human capability of critical thinking is necessary when developing successful GUIs.

The significance of a stakeholders experience and knowledge was also expressed with teachers raising concerns about oversimplification and overreliance on AI and emphasising the necessity for students to possess foundational knowledge before implementing these tools in their design process. It could also be stated that the level of experience could influence an individual's enthusiasm toward the integration of AI tools. This indicates a correlation between experience and an individual's receptiveness to new design methods.

The importance of understanding AI tool's capabilities and limitations is vital to successful integration of AI tools according to the results. It can be suggested that in order for AI tools to streamline the development process, the right AI tool has to be used for the right task since implementing them incorrectly could have consequences regarding the efficiency of the development process and the quality of the results. Streamlining could allow



the designers to focus on tasks that require uniquely human qualities like critical thinking and knowledge of human-centred design that AI tools might lack. This could foster a symbiotic relationship which could be of significant benefit, not only when it comes to the development process itself, but also with regards to the ethical concern of future obsolescence for the designer.

The chosen methods of performing a literature review, conducting A/B testing and subsequent question sessions proved to be successful. Participants' statements and experiences aligned with insights from the literature review, confirming this success and enhancing the study's overall validity. There were, however, significant ways that the chosen methods could have been conducted differently to increase the quality of the study and therefore allowing us to provide more comprehensive answers to our research questions. The main critique was that due to time constraints we had to accept having a significantly smaller pool of participants than we wanted and limiting our question sessions to being a questionnaire instead of conducting interviews. This time constraint also prohibited us from expanding our A/B testing. We missed the opportunity to do a more comprehensive test, perhaps by comparing different AI tools and using the tools in both appropriate and inappropriate scenarios. This could have provided us with great insight into many different facets of implementing AI tools into GUI development. However, since we wanted to prioritise quality results with high validity and reliability we decided to not stretch our study too thin, a decision that ultimately yielded high quality data.



6 Conclusion and future work

While our research has focused on exploring the viewpoints of design stakeholders on the integration of AI tools into GUI development and investigating the characteristics of AI tools that should be considered when using them for GUI design, it's crucial to address the two main research questions that guided this investigation.

RQ1: What are the viewpoints of design stakeholders regarding using Artificial Intelligence tools into GUI development?

Based on the perspectives of design stakeholders, AI tools present a spectrum of opportunities for enhancing GUI development, including the automation of repetitive tasks, streamlining of processes, and personalization of user experiences. However, stakeholders also voiced concerns regarding the potential impact of AI on design creativity, as some designers believe that AI tools may skip the crucial middle stage of the design process. Teachers are worried that students will become overly reliant on AI and stop using their own critical thinking skills. While students and alumni expressed less apprehension, they acknowledged the need for awareness as AI tools can sometimes produce unrealistic results. Overall, students and alumni demonstrated a keen interest in learning more about AI and exploring its potential to simplify and streamline their future design work.

RQ2: What characteristics should be considered in including AI in GUI development?

When integrating AI tools into GUI development, several key characteristics should be considered to ensure their effective and responsible implementation. These characteristics include:

- **Ease of use:** AI tools should be simple to use and fit smoothly into the way designers already work. Designers should be able to use them without too much trouble or training.
- **Designer control:** AI tools should allow designers to keep control of the design process. Designers should be able to change what AI tools suggest, fix designs that AI tools make, and be in charge of the final product.
- **Complementary role:** AI tools should serve as complementary tools that augment human skills and knowledge, not replacements for human expertise.
- **Ethical use:** AI tools should be made and used in a way that is fair and responsible. They should protect user privacy, not be biased, and follow all the rules about how to use them fairly. Designers should



think about the ethical implications of AI tools and make sure they are used in a way that is ethical.

If these characteristics are considered carefully, AI tools can enhance GUI development while humans maintain control over the design process.

Our research revealed interesting insights into the perception of AI among design professionals. Notably, individuals with more experience in the field expressed slightly more concerns about AI, while newcomers tended to view AI more positively, considering it a revolutionary force. Importantly, the study highlights that the evolution of AI will significantly impact the future workforce, necessitating designers to refine their skills and develop a deeper understanding of how to effectively collaborate with AI systems.

6.1 Future work

This study has the potential to pave the way for exploring how AI integrates into GUI development. It's crucial to focus on resolving stakeholder concerns regarding retaining control and creative freedom and preventing over-reliance. Additionally, further insight into AI tool limitations and unpredictability is vital with regards to finding solutions that improve usability and reliability.

The correlation observed between experience and enthusiasm toward AI integration suggests the need to examine how different experience levels influence the adoption of new design methods. Future research could focus on strategies to bridge this gap, facilitating smoother integration and acceptance among individuals with varying experience levels.

Understanding the capabilities and limitations of AI tools becomes essential for successful integration. Future studies should emphasise identifying the right AI tools for specific tasks to optimise the development process. This involves a careful assessment of tools to ensure their compatibility with human-centric design needs, allowing designers to concentrate on tasks that require uniquely human skills.

While the methods used proved successful, adjustments could be made to improve the quality of the study. A larger participant pool and employing interviews alongside questionnaires could provide more comprehensive insights. Expanding A/B testing, possibly comparing different AI tools in varied scenarios, could increase our understanding of AI tool implementation. Though time constraints limited these aspects in this study, prioritising depth over breadth ensured high-quality, reliable data.



Further exploration could deepen our understanding and aid us in the unavoidable integration of AI tools in GUI development, effectively addressing concerns and maximising AI's capabilities.



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Consent form to participate in the A/B -testing and Interviewing/questionnaire for AI in GUI.

This activity aims to explore the viewpoints of design stakeholders on the integration of AI tools into GUI development and investigate the characteristics of AI tools that should be considered when using them for GUI design.

Two methodologies will be used:

A/B testing

The first part includes watching two different videos. The first video shows using an AI tool (Uizard) to digitise a sketch, and the second shows a traditional GUI design tool (Figma) doing the same thing but the traditional way.

Interviewing/questionnaire

The second part includes an interview or answering a questionnaire, depending on the time available. You will be recorded during the interview, and these recordings will remain anonymous and confidential, only to be used to accurately disclose the results of the testing.

By signing this consent form, you consent to your participation and the use of the data for the sole purpose of this study. You can withdraw your consent anytime by contacting one of the contact persons below. In that case, your personal data will not be saved or processed any longer without any other lawful basis.

The personal data that will be collected in the report is as follows: .

- Participant years of experience in GUI design.
- Participants' responses to the questions will be anonymous.

NOTE! The recording will only be used for discussing the result of the report and will not be used for any other purpose.

The personal data will be deleted 1 year after the study is completed.

You always have the right to request information about what has been registered about you and to comment on the processing of the data that has been collected by contacting one of the contact persons at aw223pw@student.lnu.se or lh223dj@studnet.lnu.se.



Complaints that cannot be solved in dialogue with Linnaeus University can be sent to the Swedish Authority for Privacy Protection.

.....
Signature

.....
City and date

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Name in block letters

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Researcher's name: Anna Wingårdh

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Data collection protocol: A/B -testing and Interviewing/questionnaire for AI in GUI.

Purpose:

This activity aims to explore the perspectives of design stakeholders on the integration of AI tools into GUI development and investigate the characteristics of AI tools that should be considered when using them for GUI design.

Participation:

Participants will be informed of the purpose of the activity and their right to withdraw at any time. All interview data will be kept confidential and used only for research purposes.

Audience:

1. Designers (*UX/UI/IxD in Sweden*)
2. Alumni (*Lnu, Chalmers*)
3. Students (*Lnu, University in Zurich*).
4. Teachers (*Lnu, University in Zurich*).

Materials:

- Ipad/ computer
- Interview protocol
- A device to voice record (i.e. your cell phone)

Procedure in Audiences 1,2,3,4:

1. The participant will be informed of the purpose of the activity, the value of their participation and the possibility to stop at any time.
2. The participant will be asked to complete the following tasks:

A/B testing:

Participants will watch two videos, one showing how to digitise a sketch using an AI tool (Uizard) and the other showing how to do the same thing using a traditional GUI design tool (Figma). After watching these two videos, they will do an interview or a questionnaire.

Interviewing/questionnaire: The researcher will interview the participants about their experience seeing AI tools and their views on integrating AI tools into GUI development. Depending on the time available, will the Participant be interviewed or asked to answer a questionnaire.

Main questions

1. How many years of experience do you have in your field?
2. What did you like and dislike about seeing Uizard and Figma digitising sketches?
3. How do you feel about AI?



4. What are your thoughts on the potential benefits and advantages of AI-powered GUI development?
5. Describe your role (Designer, Alumni, student, teacher) (This question is asked first in the interview. In the questionnaire, it is asked last because it will take the participant to the correct section, depending on their answer).

Contrast questions

Question for Audiences 1 (Designers)

1. Can you give an example of when you used an AI tool in GUI design? What were the most important characteristics of the tool that helped you to design a GUI?
2. What has been your most challenging experience using AI tools in GUI design?
3. How have AI tools changed the way you work as a GUI designer?
4. How do you think AI in GUI design will change the way you design digital products in the future?

Question for Audiences 2 (Alumni)

1. Can you provide a specific example of a skill or knowledge you would have found valuable to learn about AI in GUI design during your studies?
2. What specific AI tools would have been most valuable for you to learn?
3. How do you think AI has changed/will change the field of GUI design since you graduated?

Question for Audiences 3 (Students)

1. As a student new to GUI development, what are your thoughts on using AI tools like Uizard? Did they simplify the process, and what advantages or challenges did you notice?
2. How do you think AI in GUI design will change the way you design digital products in the future?



Question for Audiences 4 (Teachers)

1. How do you feel about the potential of AI tools to transform GUI design education?
2. Can you share a specific concern you have about integrating AI tools into your courses?

Data Analysis:

The researcher will analyse the interview transcripts and A/B testing data using a thematic analysis approach (Clarke & Braun, 2014). This approach will involve identifying common themes and patterns in the data relevant to the two research questions. The researcher will then interpret these themes and patterns to develop insights that answer the research questions.

Results:

The results of the study will be published in the thesis.

A/B testing & question session (Uizard vs Figma)

The figures in this appendix depict the materials and questions employed for data collection.

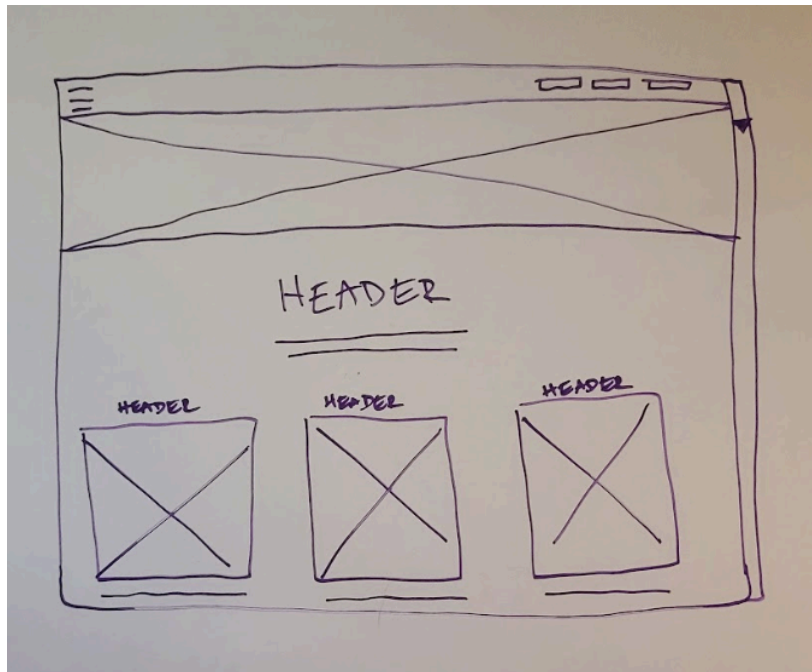


Figure 1. Hand-drawn paper sketch used for the A/B testing. The figure above depicts the hand-drawn paper sketch that served as the basis for the A/B testing conducted in our study. This sketch illustrates a basic user interface design, consisting of essential elements such as buttons, labels, and input fields.



A screenshot of two video demonstrations of the A/B testing in the questionnaire.

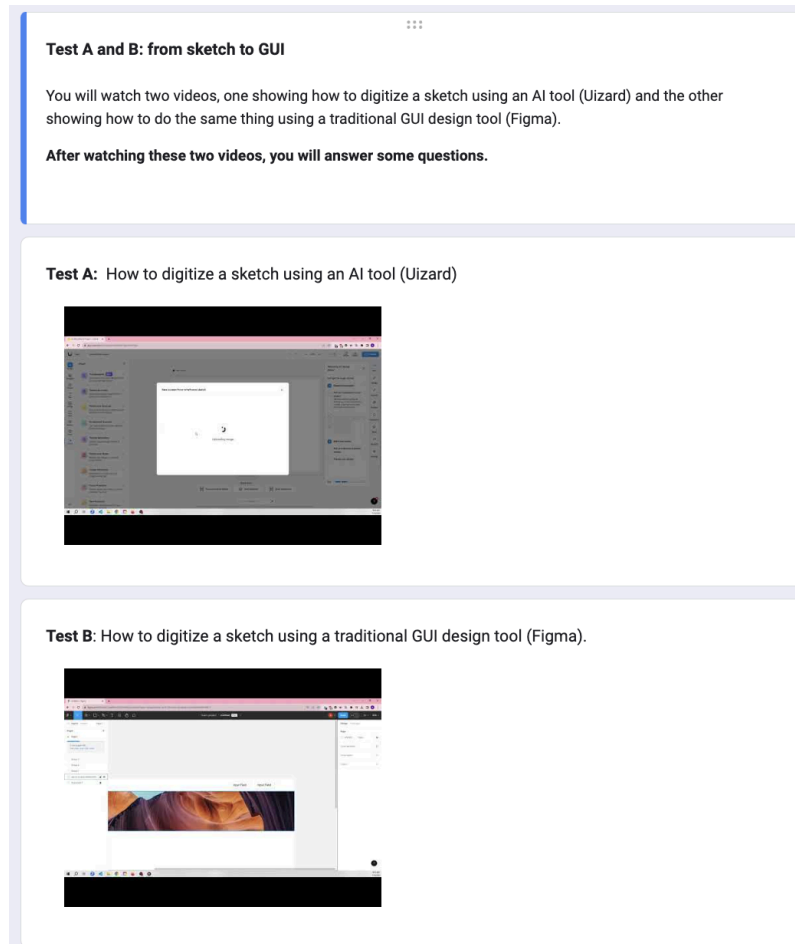


Figure 2. A screenshot of two video demonstrations of the A/B testing in the questionnaire. This figure depicts a screenshot of the questionnaire used in the A/B testing study. The screenshot shows two video demonstrations, one showcasing the digitization process using the AI tool Uizard and the other demonstrating the process using Figma. The videos illustrate the capabilities of these two AI tools in converting paper sketches into digital mockups.



Avsnitt 2 av 6

Interviewing/questionnaire ⌵ ⋮

After watching the two videos we would like you to answer some questions and get your opinion.

How many years of experience do you have in your field?

- Less than 1 year
- 1-3 years
- 4-6 years
- 7-10 years
- More than 10 years

What did you like and dislike about seeing Uizard and Figma to digitizing sketches?

Lång svarstext

How do you feel about AI?

- Positive attitude
- Neutral
- Uncertain
- Negative attitude
- Completely against the use of AI
- Annat ...

What are your thoughts on the potential benefits and advantages of AI-powered GUI development?

Lång svarstext

Describe your role (Designer, Alumnus, student, teacher) *

- Designer
- Alumnus
- Student
- Teacher

Efter avsnitt 2 Fortsätt till nästa avsnitt ▼

Figure 3. Screenshots of the main question from the questionnaire. This figure presents screenshots of the main question from the questionnaire used in the study. The screenshots illustrate how the question was presented to participants and the response options they were given..



Avsnitt 3 av 6

Question Designers ✕ ⋮

Beskrivning (valfritt)

Can you give an example of when you used an AI tool in GUI design? What were the most important characteristics of the tool that helped you to design the GUI? *

Lång svarstext

What has been your most challenging experience using AI tools in GUI design? *

Lång svarstext

How have AI tools changed the way you work as a GUI designer? *

Lång svarstext

How do you think AI in GUI design will change the way you design digital products in the future? *

Lång svarstext

Efter avsnitt 3 Skicka formuläret ▼

Figure 4. Printscreens on the contrast question for the designer from the questionnaire. This figure presents screenshots of the contrast question for designer from the questionnaire used in the study. The screenshots illustrate how the question was presented to alumni participants and the response options they were given.



Avsnitt 4 av 6

Question Alumnus ⌵ ⋮

Beskrivning (valfritt)

Can you provide a specific example of a skill or knowledge you would have found valuable to learn about AI in GUI design during your studies? *

Lång svarstext

⋮

What specific AI tools would have been most valuable for you to learn? *

Lång svarstext

How do you think AI has changed/will change the field of GUI design since you graduated?

Lång svarstext

Efter avsnitt 4 Skicka formuläret ▼

Figure 5. Printscreens on the contrast question for the alumni from the questionnaire. This figure presents screenshots of the contrast question for alumni from the questionnaire used in the study. The screenshots illustrate how the question was presented to alumni participants and the response options they were given.



Avsnitt 5 av 6

Question Students ⌵ ⋮

Beskrivning (valfritt)

As a student new to GUI development, what are your thoughts on using AI tools like Uizard? Did they simplify the process, and what advantages or challenges did you notice?

Lång svarstext

How do you think AI in GUI design will change the way you design digital products in the future?

Lång svarstext

Efter avsnitt 5 Skicka formuläret ▾

Figure 6. Printscreens on the contrast question for the student from the questionnaire. This figure presents screenshots of the contrast question for student from the questionnaire used in the study. The screenshots illustrate how the question was presented to alumni participants and the response options they were given.



Avsnitt 6 av 6

Question Teachers × ⋮

Beskrivning (valfritt)

How do you feel about the potential of AI tools to transform GUI design education? *

- Optimistic – I believe that AI tools can revolutionize education and make it more effective and relevant.
- Expectant – I see the potential in AI, but I'm curious as to how it will be implemented.
- Neutral - I haven't formed a strong opinion on this yet.
- Caution – I am concerned about how AI tools can negatively impact education if not used correctly.
- Skeptical – I doubt that AI can make any significant difference in GUI design education.
- Annat ...

Can you share a specific concern you have about integrating AI tools into your courses? *

Lång svarstext

Figure 7. Printscreens on the contrast question for the teacher from the questionnaire. This figure presents screenshots of the contrast question for teacher from the questionnaire used in the study. The screenshots illustrate how the question was presented to alumni participants and the response options they were given.



Literature Search



Redovisning av informationssökning

Namn: Anna Wingårdh, Linda Henriksson
Datum och kurs: Aug 2023

Steg 1: Sökfråga, tema och sökord

Frågeställning/sökfråga

Skriv här: "Human- AI collabartion in Ixd"

Tema 1: Human-AI Collaboration	Tema 2: Service Design	Tema 3: Human-Centered Design
Artificial Intelligence AI interface AI-assisted design AI-assisted decision making. Human AI collaboration	Gui user interface interaction design	User experience Interactive design Human-centred Design

Valda teman och förslag på sökord ur frågeställningen:



Steg 2: Redovisning av slutgiltiga sökningar och valda artiklar

Databas /söktjänst & datum	Sökning (sökord, söktekniker och operatörer)	Avgränsningar (tex. år, artikeltyp, filter mm.)	Antal sökträffar	Referens till utvald artikel
ACM	[[All: "artificial intelligence"] OR [All: ai] OR "Edit Search C Save Search [All: "ai interface"] OR [[All: "ai assisted design"] AND [All: "human ai collaboration"]]] AND [[All: design] OR [All: "user experience"] OR [All: "interactive design"] OR [All: "interaction design"] OR [[All: "human centered design"]OR [All: "design process"]]	År 2019-2023, Research Article	33,104	Artikel:Cabrera, Á. A., et al, (2023). Improving Human-AI Collaboration With Descriptions of AI Behavior. Proc. ACM Hum.-Comput. Interact., 7(CSCW1), Article 136 https://dl-acm-org.proxy.lnu.se/doi/10.1145/3579612
Scopus	(artificial intelligence OR ai OR Ai) AND (interface OR design OR "AI assisted design" OR "ai assisted decision making") AND (service design OR design OR "user experience" OR "us" OR "interactive design" OR "human centered design") AND (human ai collaboration)	År 2019-2023, Research Article	3,557	Artikel: Lu, Y., Zhang, C., Zhang, I., & Li, T. J. (2022). Bridging the gap between UX practitioners' work practices and AI-enabled design support tools. In Proceedings of the InContext: Futuring User-Experience Design Tools Workshop at CHI Conference on Human Factors in Computing Systems (pp. 1-10). Scopus.



Researchgate	Human-centeed and AI	År 2019-2023,	3,466	Verganti, R., et al (2020). Design in the age of AI. Working Paper 20-091 in part by Harvard Business School. Retrieved from https://www.hbs.edu/ris/Publication%20Files/20-091_3889aa72-1853-42f8-8b17-5760c86f863e.pdf .
Google scholar	human, Ai-tools, gui, interaction design	År 2019-2023,	1 720	Wang, D., et al. Designing AI to Work WITH or FOR People?. https://doi.org/10.1145/3411763.3450394



Arbetsfördelning

Arbetet med rapporten har genomförts jämnt mellan de inblandade författarna, Anna och Linda. Författarna delade vissa moment mellan sig, men har samtidigt hållit en bra kommunikation med varandra genom att diskutera via distans när behovet fanns.

Arbetsuppgifter

Anna:

Abstrakt gjordes tillsammans

Kapitel 1: Introduktion

1.1 Problematisering och motivation

1.2 Syfte och begränsningar

1.3 Forskningsfrågor

Kapitel 5: Diskussion

Kapitel 6: Slutsats och framtida arbeten gjordes tillsammans

Linda:

Abstrakt gjordes tillsammans

Tack till

Lista över förkortningar

1.4 Rapportens struktur

Kapitel 2: Teoretisk referensram

Kapitel 3: Metodologi

Kapitel 4: Resultat

Kapitel 6: Slutsats och framtida arbeten gjordes tillsammans

Planering av datainsamling och framtagning av intervjufrågor gjordes tillsammans.

- Anna var ansvarig för att utforma och utförda A/B-testningen.
- Linda var ansvarig för att utforma enkäten.