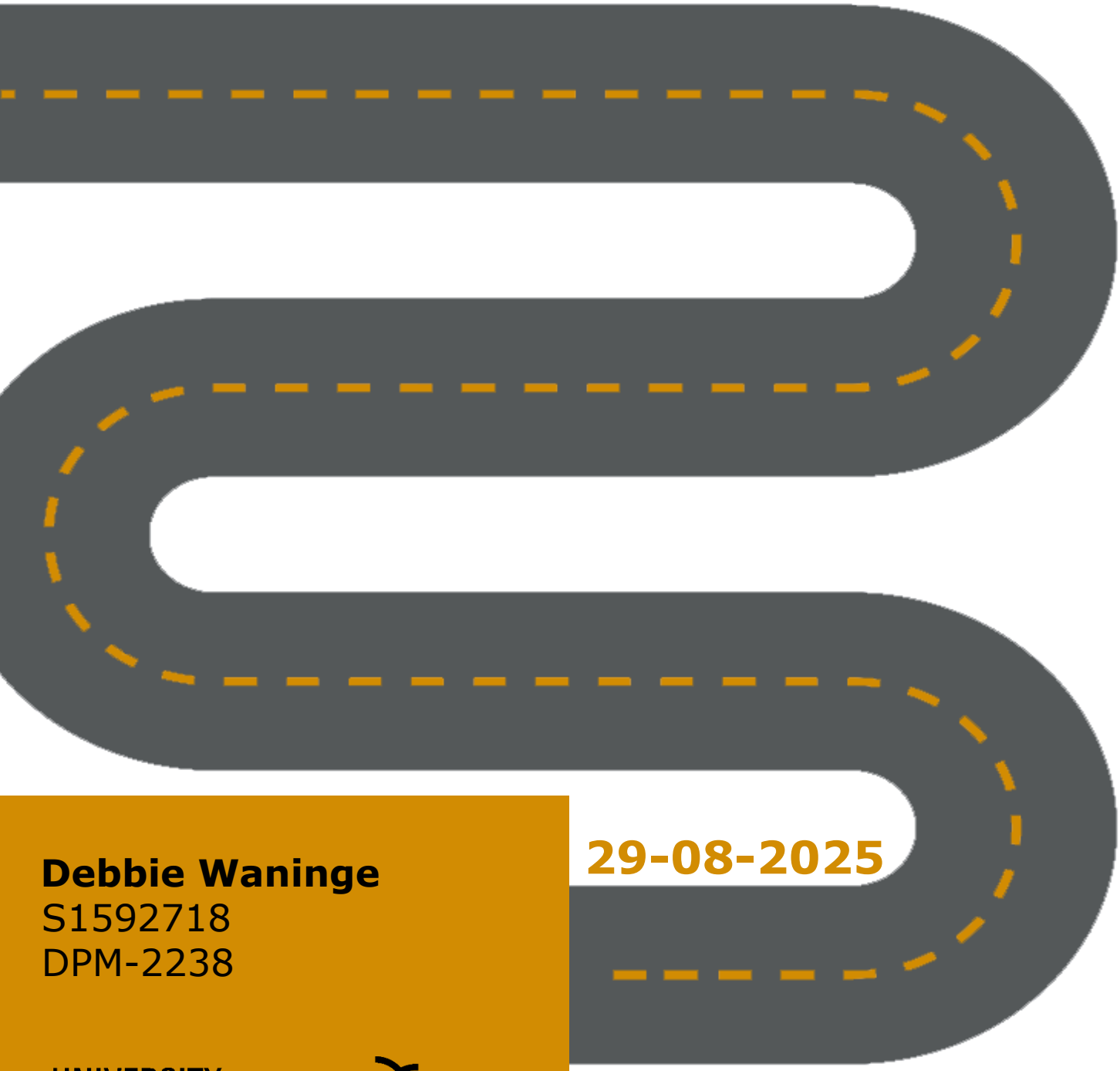
THE AI ADOPTION ROADMAP

SUPPORTING DESIGN AGENCIES IN THEIR AI JOURNEY: AN ACTION RESEARCH APPROACH TO CULTURAL AND ETHICAL ALIGNMENT



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29-08-2025

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Voor papa

This research was conducted on behalf of Saxion's research group Industrial Design as Master Assignment for the Master Industrial Design Engineering, Management of Product Development track at the University of Twente.

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Industrial Design Engineering

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FOREWORD

This thesis was written for my Master's degree in Industrial Design Engineering with a specialization in Management of Product Development at the University of Twente, Enschede. I truly enjoyed conducting this research. The flexibility and practical nature of action research suited me well. As an improv player, I am used to creating an overview within the chaos and complexity of a scene. With the research, I had the opportunity to put these skill in practice in a research context. Designing and providing a workshop gave me the chance to apply the skills I developed during my other Master's degree, Educatie in de Bètawetenschappen, bringing both of my academic paths together in a meaningful way.

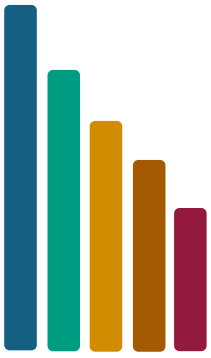
The successful completion of this project would not have been possible without the support of my colleagues at Saxion. I specifically want to thank Anne Pasman and Maran Lamberts for providing guidance, sharing insights and listening. I would also like to thank all the project partners involved for sharing their knowledge and investing so much time in this project.

Additionally, I thank my supervisor from the University of Twente Ian Gibson, for his guidance, his encouraging words and for all the questions that challenged me to think more deeply.

Finally, I want to thank my partner, friends and family for their support, especially over the last two years.

For those reading this thesis, I hope you enjoy it.

Debbie Waninge



SUMMARY

Since the launch of ChatGPT in November 2022, generative AI (GenAI) tools have been evolving rapidly and have drawn a lot of attention within society, including design agencies. Design agencies are intrigued by the potential of GenAI, but also wonder what these developments mean for their profession and how they can meaningfully integrate these tools in their workflow. These agencies want to know how to move forward with AI adoption, but struggle to do so while the technology is still developing and guidance is limited.

This research aims to explore how technology adoption works within design agencies, how differences in organizational culture influences this process, and how organizational culture can support these agencies in maturing in their AI implementation.

To investigate this, an action research methodology was applied. Action research is a practice-oriented methodology that combines practical interventions and research. This approach is suitable for relatively new subjects like GenAI in the design process, where literature is limited, and the challenges vary across different organizations. Through this approach, it became possible to generate insight about the complex situation around AI adoption and to support the participating design agencies in real time. The iterative nature of action research allowed for a flexible and responsive process to the context of each design agency.

The research involved close collaboration with four design agencies in Twente. Through interviews, focus groups, observations and interventions, the needs, challenges, and learning objectives for AI adoption were mapped. One important outcome was a framework including the factors that influence successful AI adoption for design agencies. It was found that one's understanding and the discoverability of suitable AI tools positively influence AI adoption. On the other side unrealistic expectations, little trust in output quality, negative impact of AI and costs seem to negatively influence the decision to adopt AI.

Besides these factors, also three personas were identified and how they contribute to the adoption of AI within a company. The Explorer, who adopts accessible AI tools for efficiency but tends to accept results with little critical thinking. The Executor, who follows others in using AI, is sceptical and cautious, and often stops with AI tools if they do not work immediately. The last one is the Innovator who fully engages with AI, seeing it as a creative partner that improves their skills and their quality.

The findings also highlight the cultural change required to enable successful AI implementation. Creating a safe learning environment with open communication about AI was found to be an important aspect of that.

As deliverable, a workshop was developed that allows design agencies to reflect on their current culture and define the conditions they need to create to adopt and continue using GenAI tools in a way that fits their identity, needs and practices.

Artificial Intelligence Statement

Throughout this research, various Artificial Intelligence (AI) tools were used to support the process. AI assisted in refining the interview questions and drafting exercises for the student sessions based on provided examples. AI is also used to support in transcribing interviews and to translate self-written Dutch texts to English. Several AI tools were tested as part of the research itself, to explore their potential role and limits for the design process and to understand its value for designers. During the writing of this report, AI was used to structure ideas and reformulate drafts into more concise and readable texts, and in finding the right words in English. All AI-generated content was critically reviewed, never directly copy-pasted, and always rewritten to reflect the intended message and personal voice of the author.

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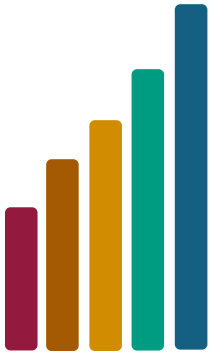
LIST OF ABBREVIATIONS

Abbreviation	Definition
AI	Artificial Intelligence
B2B	Business to Business
DOI	Diffusion of Innovations
GenAI	Generative AI
IT	Information Technology
NDA	Non-Disclosure Agreement
LLM	Large Language Models
SME	Small and Medium-sized Enterprise
TAM	Technology Acceptance Model
XAI	Explainable AI



01 INTRODUCTION

In November 2022, ChatGPT was launched. ChatGPT is an LLM that helps the user with tasks like text generation, code debugging, story writing and multilingual machine translation (Wu et al., 2023). In the same year, Dall-E was launched: an imaging software that generates images based on prompts. These GenAI tools have been evolving rapidly over the last years and gained a lot of attention within society. It is estimated that ChatGPT reached 100 million active monthly users within two months after launch, making it the fastest-growing consumer application in history (Hu, 2023; Mercado, 2025). Within society there has been positive responses towards ChatGPT's release. People believe that ChatGPT is an important preview of what can be done in the future and that it is capable of replacing a variety of boring and repetitive tasks (González-Arias & López-García, 2023). The same study shows that this enthusiasm goes together with the need for regulation and control of the developments. The concerns about this technology do not stop there. Other concerns arose, varying from plagiarism and academic dishonesty, to increasing unemployment, to a reduction in human interaction (Haque & Li, 2024).

These GenAI tools also gained attention among designers and design agencies. The research group Industrial Design at Saxion University of Applied Science in Enschede has connections with various design agencies among Twente. They found that these agencies are intrigued by the potential of AI, but at the same time struggle with the questions: How can AI be integrated into the design process? When does AI add value? And if we don't act now, are we at risk of falling behind? These design agencies have a need to understand what the developments in the field of AI mean for them and their job, and how they can incorporate GenAI tools in their workflow. At the same time, they struggle with the speed at which this technology evolves. Everyday new AI based tools arise and it is impossible for the design agencies to keep track of them all and try to understand their potential. These design agencies want to know how they can continue with their AI adoption process while the technology is still evolving. That is why the research group Industrial Design started the KIEM project 'AI in Ontwerp': exploratory research in which they inquire how AI tools can add value

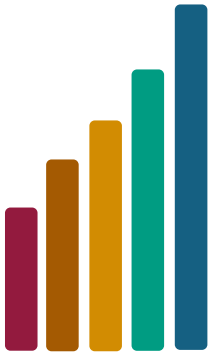
to the design process, and how to further develop GenAI tools to optimize its function as supporting the design process. In this project, the research group works together with four companies.

This thesis is the result of the Master assignment for Industrial Design Engineering at the University of Twente. The research is connected to the project 'AI in Ontwerp' but aims to investigate the potential of AI in relation to the design process and how companies can adopt and integrate the current and future AI functionalities in their work. It is important to understand how design agencies want to use AI in the future, and to understand the functions that AI should fulfil to fit the needs of the agencies. Before design agencies can integrate AI functionalities within their work, there should be a certain degree of readiness to make use of AI. This readiness is influenced by aspects like the company culture, policies, processes, available tooling, and training (Krijger et al., 2022). To move forward regarding AI implementation and to benefit from AI functionalities, agencies need to understand their development needs and their readiness for AI in relation to their strengths and weaknesses (Pringle et al., 2018).

This research focuses on the company culture aspect of AI readiness and tries to understand which aspects of these design agencies' cultures need to be adjusted to meet the AI related goals they envision. Besides that, this research aims to focus on the educational aspect of AI adoption and implementation. To integrate future AI functionalities, certain knowledge should be transferred to design agencies. Different didactic approaches will be investigated to find a suitable approach for a rapidly evolving technology like AI. After that, learning goals need to be formulated and appropriate work methods need to be selected.

The aim of this research is to gain insight about AI adoption needs within design agencies, how different company cultures influence the implementation process, and how company culture can support design agencies to mature in their AI implementation. The central research question is:

How can design agencies effectively adopt AI technologies by addressing current needs, anticipating future developments, and aligning with their company culture?



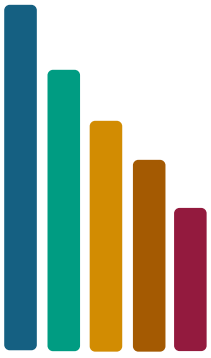
To answer the central question, this thesis is divided into four subquestions:

- What specific needs and challenges do design agencies face when adopting AI technologies, and how do these factors influence their decisions regarding AI-adoption?
- How can predictions about future AI functionalities be considered for adopting AI to ensure their relevance and practical value?
- How do company culture and individual personas within a design agency influence the adoption and use of AI technologies?
- What aspects of company culture need to evolve to support effective adoption of future AI functionalities, and how can these changes be facilitated?

This thesis contributes to research in the field of design and technology education by creating a framework about how rapidly evolving technologies, such as AI, can effectively be implemented at design agencies. By focusing on methods developed to teach designers how to adapt to and work with continuously changing technologies, the project provides insights into teaching approaches that stay relevant even as the technology itself advances, as well as the necessary knowledge. This also supports educators in designing educational material suited to technologies that change quickly.

Besides that, this research creates a better understanding of designers' needs in relationship to future AI functionalities. This could lead to recommendations for further AI developments and insights into the evolving role of industrial designers.

One of the deliverables is a model about company culture aspects that positively influence technology adoption. Another deliverable of this research will be an educational activity in some form, including an instructor’s guide, and evaluation criteria to measure the effectiveness of the educational activity.



02 THEORETICAL FRAMEWORK

This chapter forms the scientific foundation of the research. The relevant concepts, definitions, models, and theories related to the study are discussed here. The subquestions serve as a guide for the theoretical framework.

2.1. Adoption of New Technologies

What specific needs and challenges do design agencies face when adopting AI technologies, and how do these factors influence their decision regarding AI adoption?

GenAI tools are relatively new and therefore there is little to no literature available about the needs and challenges that design agencies face when adopting these types of AI technologies. Kalving and colleagues (2024) investigated how the utilization and acceptance of AI tools within the design process work for designers in Finland. They found that most of their participants have a desire to increase their usage of AI tools in the future, mainly to reduce time spent on annoying tasks. Organizations increasingly start to recognize GenAI's potential to automate labour-intensive tasks and increase efficiency (Banh, 2025). There are also designers who have no interest in AI tools due to their lack of intuitiveness, training, or bad experiences (Kalving et al., 2024). Other issues that negatively influence designers' decision to adopt AI are ethical issues surrounding things like copyright, security, AI bias and lack of trust in its output (Kalving et al., 2024; Banh, 2025).

Since the amount of literature in this specific area is limited, a more general understanding of adoption decisions helps to get insight into the influencing factors. Before an individual adopts a new technology, they first need to accept the technology (Taherdoost, 2018). Accepting a technology means that the user feels positive about using that technology. If the user decides to use the technology, that person is adopting it.

Different frameworks and models have been developed to explain the user's adoption of new technologies. All these models introduce factors that can affect the user's acceptance. Taherdoost (2018) compared 14 different adoption models and described how they relate to each other (Figure 1).

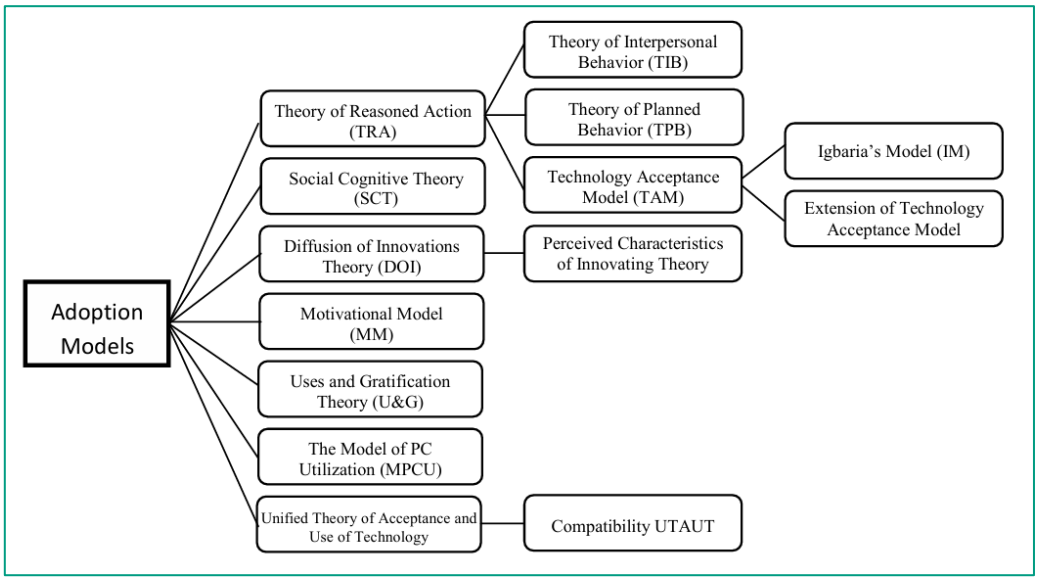


Figure 1. An overview of Adoption/ Acceptance models by H. Taherdoost (2018) in 'A review of technology acceptance and adoption models and theories'

Most of these adoption models describe adoption factors that are focused on explaining the behaviour of individuals, and therefore operate on an individual level. The DOI model by Rogers (2003) focuses on adoption decisions in which the organizational characteristics are most important (Taherdoost, 2018). It focuses on the features of a system, the organization and the environment based on beliefs about the technology (Sahin, 2006). This makes the DOI model useful for explaining adoption on an individual and organizational level. This model is less useful for explaining behaviour in a lot of detail or to make predictions (Taherdoost, 2018). Since this research focuses on the individual and organizational level of AI adoption, the DOI model is a good fit to get a better understanding of how design agencies are influenced in their adoption decision.

To understand by which factors influence the adoption of a new technology, it is valuable to understand the decision process prior to adoption. The decision to adopt a new technology is described in the innovation-decision process. In Rogers' work, the terms 'innovation' and 'new technology' are interchangeable (Sahin, 2006). The innovation-decision process describes the steps individuals take to inform themselves about an innovation and learn about their advantages and disadvantages (Rogers, 2003). This process follows the steps shown in Figure 2.

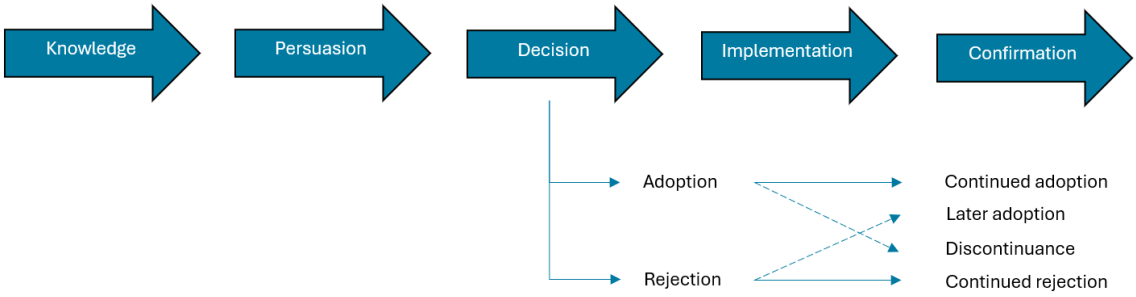


Figure 2. The Innovation-Decision process by Rogers (2003).

The innovation-decision process states that individuals first learn about the existence of a new technology and seek information about what the innovation is, how it works and why it works. After that they enter the persuasion stage, in which the individuals form opinions and beliefs about the innovation based on its functioning and other people's responses. In the decision stage, the individuals choose to adopt or to reject the innovation. When they decide to adopt the innovation, they start to actively use it. This is called the implementation stage. The innovation-decision process ends in the confirmation stage: the stage in which the individual looks for support of their decision. When they make the decision, individuals tend to stay away from messages about the innovation that conflicts with their decision and look for the ones that support their decision (Sahin, 2006). If they encounter conflicting messages or disappointing results, their decision could be reversed resulting in later adoption or discontinuance (Rogers, 2003).

According to Rogers (2003), there are five characteristics of new technologies that predict the rate of adoption: relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage describes how much better people think the new idea or technology is compared to the old one. The cost and social status are important aspects of this characteristic (Sahin, 2006).

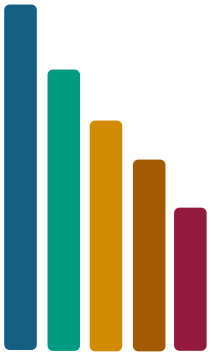
Compatibility describes the compatibility between the innovation and the user's needs and values. The higher the compatibility, the greater the chance that the innovation will be adopted.

Complexity is the degree to which an innovation is difficult to understand and use. Higher complexity results in a lower rate of adoption.

Trialability is positively correlated to the adoption of a new technology, and describes the degree to which the user can experiment with the technology.

Observability is about the visibility of the innovation's results to others. These five are the most predominant characteristics. In addition, the innovation-decision type, communication channels, social system, and change agents may increase the adoption of innovations (Sahin, 2006).

In summary, little research has been done about the needs and challenges design agencies face when they adopt AI technology. Designers have a desire to increase their usage of AI tools in the future to reduce the time they need to spend on annoying tasks (Kalving et al., 2024). What these annoying tasks are is not published. To increase this usage of AI tools, they need to be adopted more often. AI tools are adopted faster if they offer more relative advantages, compatibility, simplicity, trialability, and observability (Rogers, 2003). There are also designers who have no interest in AI tools due to their lack of intuitiveness, training or bad experiences (Kalving et al., 2024). Learning how to work with AI tools, facilitating trainings and sharing success stories could be ways to make up for these negative aspects. Other issues that negatively influence designers' decision to adopt AI are ethical issues like copyright, security, AI bias and lack of trust in its output (Kalving et al., 2024; Banh, 2025). Since there is only little information available, gaining a deeper understanding of the needs and challenges in the entire innovation-decision process can support design agencies into successfully adopting AI.



2.2. Future AI Functionalities

How can predictions about future AI functionalities be considered for adopting AI to ensure their relevance and practical value?

The whole thing about the future is that no one knows what it will bring, or when some things will come. But there might be some things to say about how new technologies develop over time and how other trends might influence GenAI functionalities.

Gartner (n.d.) found that new technologies often take the same path, they call it the hype cycle (Figure 3). The hype cycle consists of 5 stages:

1. **Technology Trigger** – early stories about an innovation start to circulate.
2. **Peak of Inflated Expectations** – excitement builds, leading to an unrealistic hype around the innovation's capabilities.
3. **Trough of Disillusionment** – the technology fails to meet expectations, and failed experiments or implementations causes disappointment.
4. **Slope of Enlightenment** – some use cases become successful, and the technology is further developed and refined.
5. **Plateau of Productivity** – the technology becomes widely adopted and starts to add practical value.

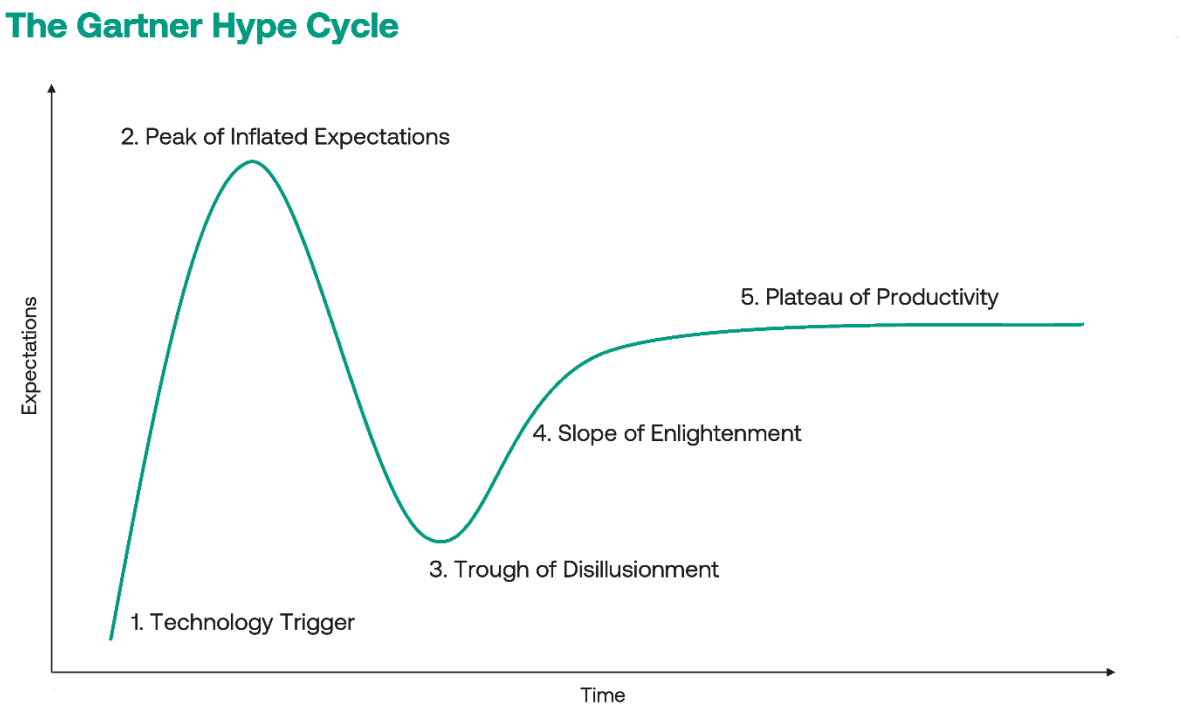


Figure 3. Hype Cycle by Gartner. Retrieved from: https://www.goodsignal.com/p/the-hype-cycle-of-alternative-proteins

According to predictions Gartner (2024) made in August 2024, GenAI is already past the peak at stage 2, expecting to reach the Plateau of Productivity in about 2 to 5 years. Gartner (2024) also made some statements about the increasing autonomy of AI systems and expects that they soon can operate with minimal human oversight, start to improve themselves and that they can be used for decision-making in complex situations. Gartner published a hype cycle for GenAI in 2024 (Appendix A) expecting domain-specific GenAI models making their way to the plateau in the upcoming 5 to 10 years. These models provide tailored solutions that address the needs of a certain domain in industry.

Another interesting development in the AI universe is Explainable AI (XAI). This is a field in research that investigates ways to make AI algorithms more understandable and transparent for humans. This allows people to better assess and trust the output of AI systems (Linssen, 2024).

Sam Altman, the CEO of OpenAI also posted a roadmap on X (formerly Twitter), sharing the steps they are taking with ChatGPT (Figure 4).

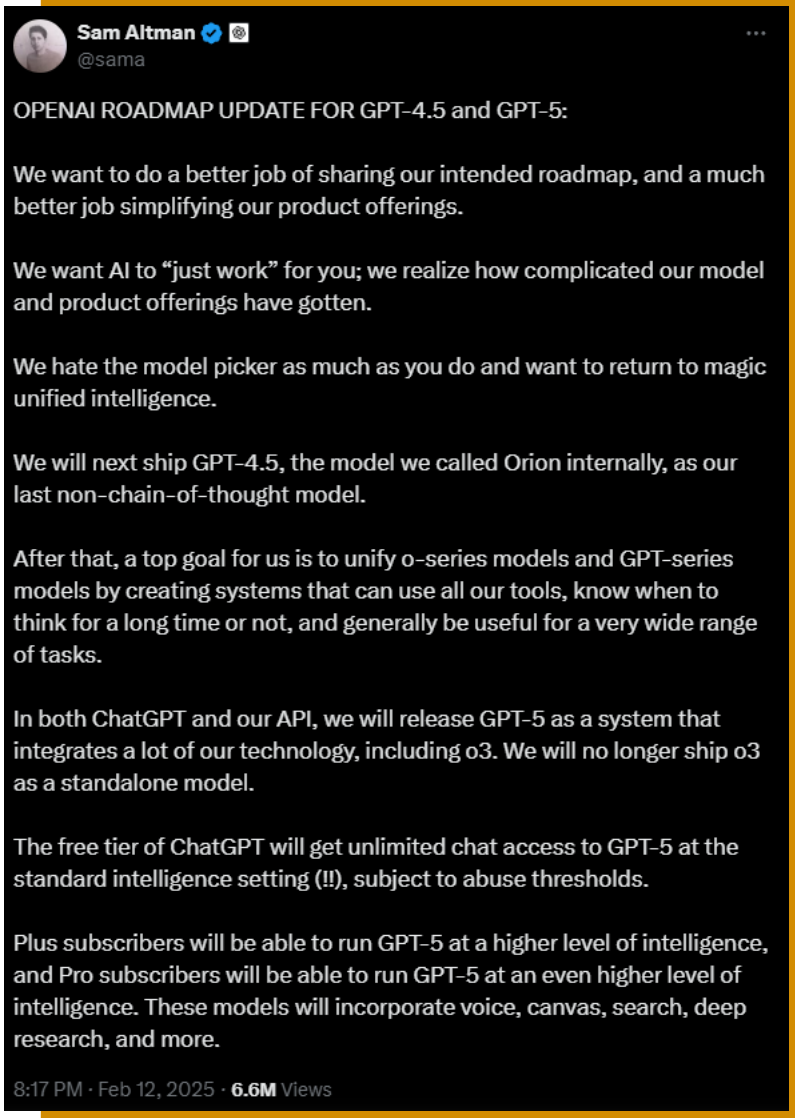


Figure 4. OpenAI roadmap by Sam Altman on his X account (Feb 12, 2025): Retrieved from: https://x.com/sama/status/1889755723078443244

Former OpenAI researcher Daniel Kokotajlo (2021) already predicted a lot of things about AI developments right up until this point. In the beginning of this year, Kokotajlo et al. (2025) made some new predictions about AI developments until 2027. Some of the most relevant developments are listed in Table 1.

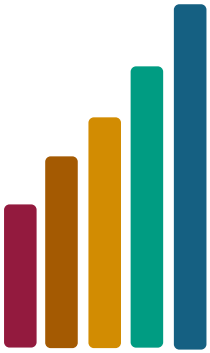
Table 1. Expected AI development up until 2027 by Kokotajlo et al. (2025).

Time	Expected AI developments
Mid 2025	The introduction of basic AI assistants that support simple computer tasks.
Beginning of 2026	A breakthrough in code-automatization speeds up the work of developers.
Beginning of 2027	AI surpasses human programmers and is used for AI research.
Late 2027	Superintelligent AI systems have the potential to accelerate science and technology at a revolutionary pace.

To conclude, although nothing is for certain, it can be said that predictions are that GenAI reaches its Plateau of Productivity within the upcoming five years. GenAI might fail to meet expectations right now, but in the upcoming months to years, more and more use cases will become available until it reaches its plateau.

It is expected that the developments of XAI help people to gain knowledge about how AI models work and reason, which allows them to make a more well-informed decision about AI adoption.

And there might be some problems designers now face regarding limitations and understanding of AI tools, but that might disappear in the upcoming years due to further developments of GenAI and XAI. In the meantime, LLMs keep improving with only higher output quality.



2.3. Company Culture and Personas

How do company culture and individual personas within a design agency influence the adoption and use of AI technologies?

2.3.1. Organizational Culture

In literature, company culture is often referred to as organizational culture. Organizational culture is a difficult concept to define. There has been some debate among researchers about the definition and assessment of organizational culture. Researchers came to a consensus about a few points (Bellot, 2011):

1. Organizational culture is socially constructed by groups and is based on shared experiences.
2. Each organization has their own relatively unique culture.
3. Culture is a property that an organization possesses and therefore can be influenced and changed by its members.

The key elements of organizational culture are beliefs, behaviours and attitudes of the group. The current state of an organization's culture is the results of the beliefs, behaviours and attitudes that contributed to the success of that organization (Muscalu, 2014). It is important for companies to have some sort of insight into their organizational culture. Companies who do not have insight into their own company culture are more likely to be caught off guard by changes, like the development of new technologies, and may struggle to manage them (Schein, 1990). Changing an organizational culture requires awareness about the current culture, and communication about the changing attitudes within their company (Muscalu, 2014).

Often organizational culture is assessed using mixed methods, which could be a combination of participant observations, interviews, focus groups, surveys and/or questionnaires (Bellot, 2011). The most cited assessment tools for organizational culture are the Organizational Culture Assessment Instrument by Cameron and Quinn (1999) and the Organizational Culture Inventory by Cooke and Lafferty (1986). Although these frameworks are validated by researchers (Amran & Setyanegara, 2021; Cooke & Szumal, 2013; Heritage et al., 2014; Rahman et al., 2021), there seemed to be little information available about the actual measurements. Probably due to its commercial purposes.

Research by Hofstede et al. (1990) proposes assessing organizational culture with values and practices as key elements of culture. According to their model, culture manifests through three types of practices, namely symbols, heroes, and rituals, and through underlying values (see Figure 5).

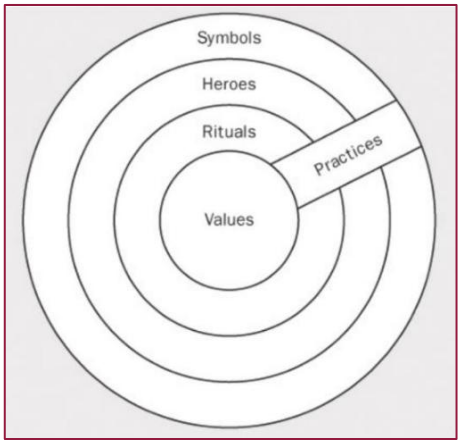


Figure 5. Manifestations of culture by Hofstede (1990). Retrieved from: https://www.researchgate.net/figure/Hofstedes-2010-onion-manifestations-of-culture_fig1_369094847

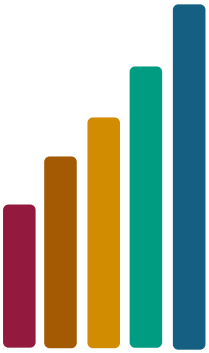
They described three dimensions for values: (1) need for security, (2) work centrality, and (3) need for authority. These company values are strongly related to nationality, education, age, seniority, and hierarchical level (Hofstede et al., 1990).

To describe and assess practices, Hofstede et al. (1990) used six dimensions:

1. Process-oriented vs. Result-oriented
2. Employee-oriented vs. Job-oriented
3. Parochial vs. Professional
4. Open system vs. Closed system
5. Loose control vs. Tight control
6. Normative vs. Pragmatic.

The dimensions 1, 3, 5, and 6 partly relate to the type of work the organization does and the market in which it operates. Dimensions 2 and 4 are more determined by the philosophy of the founders and people at the top. For each of these six dimensions, Hofstede et al. (1990) found two or three items that represent the essence of this dimension. The more an organization relates to the items, the more they are oriented towards the dimension on the right.

1. Process-oriented vs. Result-oriented
    - Comfortable in unfamiliar situations
    - Each day brings new challenges
    - People put in maximum effort
2. Employee-oriented vs. Job-oriented
    - Important decisions made by individuals
    - Organization is only interested in work people do
3. Parochial vs. Professional
    - People’s private life is their own business
    - Job competence is the only criterion in hiring people
    - Think ahead three years or more
4. Open system vs. Closed system
    - Only very special people fit in organization
    - Organization and people closed and secretive
    - New employees need more than a year to feel at home
5. Loose control vs. Tight control
    - Everybody cost-conscious
    - Meeting times kept punctually
    - Always speak seriously of organization and job
6. Normative vs. Pragmatic.
    - Pragmatic, not dogmatic, in matters of ethics
    - Major emphasis on meeting customer needs
    - Results are more important than procedures



2.3.2. Personas

Rogers (2003) defined adopter categories based on people's innovativeness. He distinguished five categories: innovators, early adopters, early majority, late majority, and laggards. Adopters of successful innovations generate the normal distribution curve shown in Figure 6. Rogers (2003) states that the innovation adoption decision takes more time the farther to the right at the curve it gets.

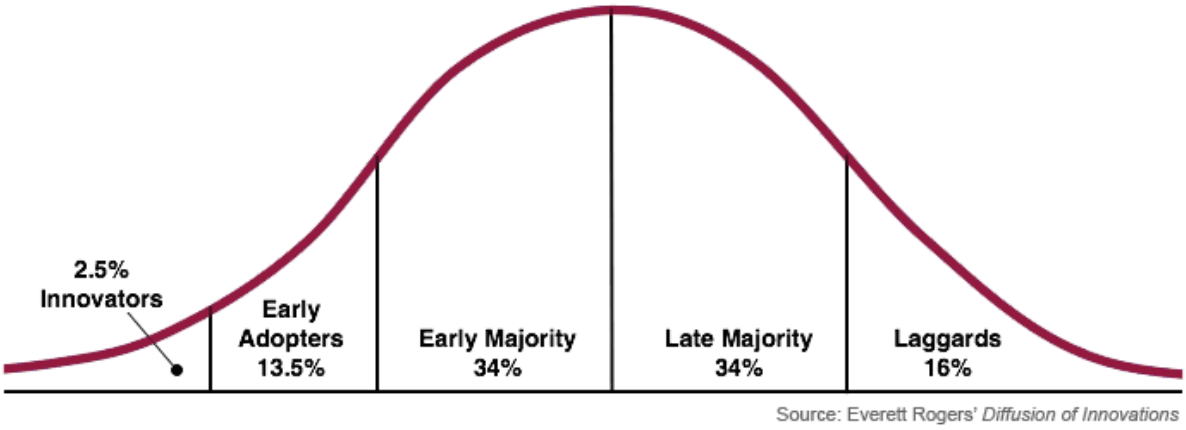


Figure 6. Adopter categories based on innovativeness (Rogers, 2003). Retrieved from: https://www.researchgate.net/figure/Technology-Adopter-Distribution-Bell-Curve-Rogers-1995_fig7_267198930

Innovators - According to Rogers (2003), innovators are the people who are willing to experience new ideas. At this stage, the technology is still in its infancy. Therefore, innovators should be okay to deal with a certain level of uncertainty about the technology. Since innovators are the first ones to interact with the technology, they will be the ones who bring it to the people outside of their group or system. Innovators need to have complex technical knowledge (Sahin, 2006).

Early Adopters - Rogers (2003) states that early adopters are most likely to be people with leadership roles, as other members of society come to them for advice or information about the innovation. The early adopters reach the early majority via interpersonal networks (Rogers, 2003). Early adopters tend to be the role models for all the following adopter categories, making their opinions about the innovation extra important (Sahin, 2006). At this stage, the first group of people adopted the technology, which will decrease the level or uncertainty about it.

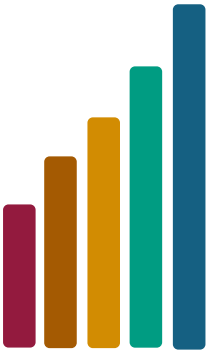
Early Majority - The early majority is about one third of the social system. This group does not have the leadership role the early adopters have (Rogers, 2003), but have good connections with these people. The early majority is still quite early with adopting a technology, making their adopting decision relevant for their peers (Sahin, 2006).

Late Majority - Same as for the early majority, the late majority consists of about one third of the social system. This group often waits with adopting an innovation, when all their peers have already done it (Rogers, 2003). This group is sceptical about the innovation and its outcomes, but they adopt the innovation because they feel that they must (Sahin, 2006). The late majority needs assurance from the early majority that it is safe to adopt (Rogers, 2003).

Laggards - The group that comes in last are the laggards. Due to their more traditional view, they are more skeptical about the innovation than the late majority. This group has limited resources and lacks awareness about new technologies (Rogers, 2003). For this group it is important that the innovation works well before they adopt it (Sahin, 2006). They mainly look at other people who successfully adopted the technology and after a long period decide whether to adopt it too.

In conclusion, AI adoption is shaped by both individual and organizational factors. For design agencies that want to adopt AI, it seems beneficial to have people from the early adopters and early majority categories in their team. People from these categories are often more open to trying new tools and can influence other people within the company more easily.

Organizational culture is also important. Companies who understand their own culture can create and carry out strategies that fit their beliefs and values, which make these strategies more successful (Schein, 1990). Based on the practice dimensions (Hofstede et al., 1990), ‘result-oriented’ and ‘loose control’ seem to be important aspects for adoption since these cultures allow for experimentation with AI. In contrast, pragmatic cultures may struggle as GenAI moves past the Peak of Expectations phase meaning results may not meet expectations.



2.4. Maturity Models

What aspects of company culture need to evolve to support effective adoption of future AI functionalities, and how can these changes be facilitated?

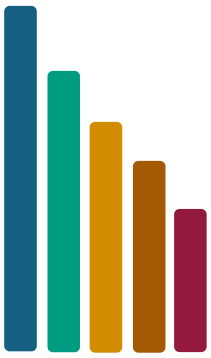
To understand in what aspects a company culture needs to evolve, it is important to assess the company culture and understand how a company matures in their AI usage. Maturity models are used to assess people's capability, processes or objects, where the company culture is part of the pillar 'people's capability' (Mettler, 2011).

A maturity model is a framework for measuring an organization's maturity, or in a certain area of that organization. Maturity models support organizations to reflect upon how well they are doing and provide guidelines to move towards their desired outcome (Krijger et al., 2022). There are different types of AI maturity models, for example models focusing on ethics (Krijger et al., 2022), models focusing on specific types of companies (Pringle et al., 2018) and models specifically focussing on generative AI (Bahn, 2025). Each model is different, but most models follow five levels towards AI maturity (Sadiq et al., 2021). From a company culture perspective, a distinction between the following five levels is made:

Level 1 describes the situation in which a company has not taken proactive steps regarding AI adoption. Some individuals within the company are aware of the technology, but it is not (high) on the agenda (Krijger et al., 2022). There are no inhouse AI experts or plans to recruit or train them (Pringle et al., 2018) At best, the company is in their assessment mode, meaning that they try some AI tools to assess their potential for simple tasks (Bahn, 2025).

At **Level 2** the individual users start to realize the potential of AI for their company (Bahn, 2025). This is where awareness starts: people become aware of the debate around AI and the ways in which it will impact their work (Stahl et al., 2021). The individual users start to understand for which tasks they can use AI and awareness within the company grows, and reaches management (Krijger et al., 2022). In the wider organization there is not much understanding of AI. At level two there are some people who gained knowledge about AI and its applications, but there are no AI experts (Pringle et al., 2018).

Level 3 in the maturity models often describes a situation in which a company is in the position to move forward and implement AI (Pringle et al., 2018). Companies align the new technologies with their organizational goals. This results in employees getting educated about the technology and creating a work group to take more standardised steps (Krijger et al., 2022). At this level, AI is getting more intertwined with the workflow.

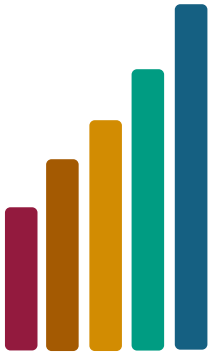


At **level 4,** the company gained a good amount of practical experience with AI and understands how to use it. They have commitment to and support for AI at different levels within the company (Pringle et al., 2018). AI is embedded in the company as part of their IT system and/or their workflow (Bahn, 2025). At this level, further integration of AI initiatives is still needed to receive organization-wide support (Krijger et al., 2022), because different teams often do not work together on AI strategy and use cases.

Level 5 is the last stage of the maturity model. At this level, all different departments and layers within a company are aware of AI and are actively involved in its application (Krijger et al., 2022). This also means that the company possesses a good level of AI expertise and has a range of use cases for the technology (Pringle et al., 2018). The usage of AI is supported at all layers and employees are mostly positive about AI.

For companies to progress in their AI journey, Pringle et al. (2018) state that companies should set up AI teams that work on exploring the technology. If necessary, this could be supported by seeking external experts to provide education and insight on AI. The highest level of an organization should support this AI journey, otherwise it will not succeed (Pringle et al., 2018). It is also important to communicate about AI, and keep on communicating (Krijger et al., 2022). In this way, more people become aware of AI and can join in on the process.

All things considered, for design agencies to support effective AI adoption they should create a culture in which employees can openly communicate about AI. Awareness about the current situation allows the design agency to assess their existing skills and knowledge. This gives an understanding of where investment is needed.



03 METHODOLOGY

This chapter describes the methodology that was used for this research and explains why this methodology is chosen. It also highlights the different data collection and analyses methods used for these results.

3.1. Action Research

This research employs an action research methodology. Action research is a practice-oriented methodology that combines action and research. The goal of this methodology is to develop knowledge and to improve real-world situations at the same time. Action research is suitable for complex issues, because it keeps the complexity of the situation intact (Matthijssen, 2024). With this approach, the researcher gains insight into a complex situation by trying new things and seeing what works (Van der Steen, 2016).

Action research follows a cycle of four steps: Planning, Action, Analysis, and Conclusion (Figure 7).

Planning – The initial phase entails conducting research into the subject matter. During this phase the researcher identifies an issue or concern that the community brought up. After that, the researcher plans the research process to get a better understanding of the issue or

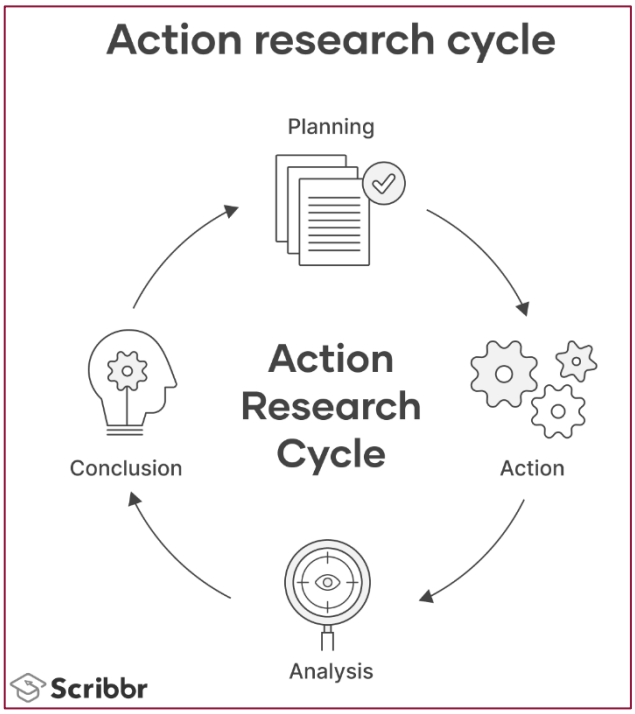


Figure 7. Action research cycle by Scribbr. Retrieved from: https://www.scribbr.com/methodology/action-

concern. To construct a plan, the researcher asks themself questions like: Who will be involved? What methods will be used? What resources and capacities are available? (SCDC, n.d.)

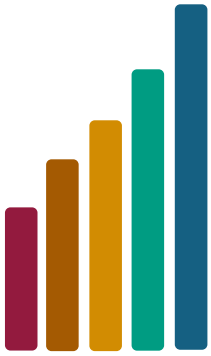
Action – The second phase is used to put the research plan into action. This can consist of various methods, like interviews, focus groups or brainstorm sessions with people closely involved with the issue or with experts in that specific field (Matthijssen, 2024). Once there is a deeper understanding of the issue, the researcher creates an intervention that (partly) solves the issue. This intervention will be put into practice with people from the community.

Analysis – During this phase, the researcher observes the intervention and its effect on the people involved. What happened? Did the intervention do what it had to do? Did anything unexpected happen? (SCDC, n.d.) These questions help to collect data, analyse the data, and interpret it.

Conclusion – The researcher draws conclusions from its data, and the cycle starts again. The researcher investigates the gaps and plans accordingly. It is also possible that the researcher decides to change the initial direction based on the conclusions.

Action research is a great fit for this project due to its flexible approach. Since GenAI and the tools based on that technology are relatively new for design agencies, there is not a lot of literature available about their needs and challenges. It can be a complex situation, since companies differ in interest, culture, ideas and challenges. Action research allows for a more hands-on approach to gain insights about these aspects. The flexibility of action research allows a deeper dive into the issues design agencies are facing and quickly adjust the plan to get the most out of it.

Another reason why action research is a suitable methodology for this thesis is because it supports a deeper understanding of the needs, challenges in adopting AI, future developments, and the existing company culture. This aligns well with the research goal; not only understanding the issues design agencies face with AI adoption, but also actively supporting them in their journey towards effective and responsible use of AI. Action research means working closely with the real-world, in this case the design agencies (Van der Zouwen, 2022). This ensures their priorities come first and allows for change that is meaningful to the design agencies (George, 2024). The outcome will therefore be more relevant for them.



3.2. ADDIE Model

Action research often aims towards developing learning objectives and changing processes (Matthijssen, 2024). This research aims for an education activity as deliverable. Therefore, solely using the action research methodology, would not reach that goal. After the learning objectives become clear, a different approach is used called the ADDIE model for instructional design. This model is widely recognized and used to create learning material. It consists of five stages: Analysis, Design, Development, Implementation and Evaluation (Figure 8). Learning objectives are the outcome of action research and are the starting point of the Design phase. Therefore, the Analysis phase of the ADDIE model is skipped for this study.

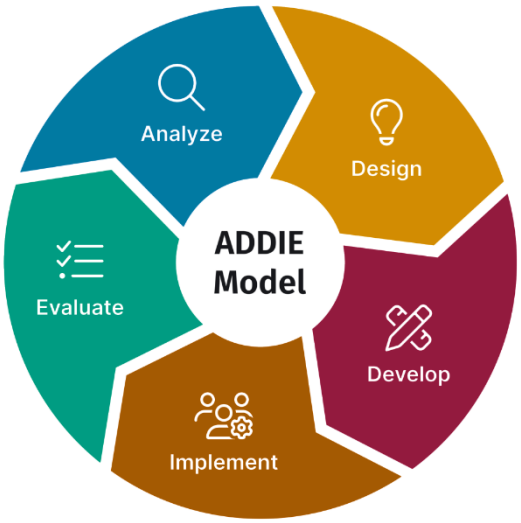


Figure 8. Steps of the ADDIE model for instructional design. Retrieved from: https://snaponhackedtempe.pages.dev/118097

Design – In the Design phase the general outline of the educational activity is constructed. This phase specifies the learning process by drafting the learning objectives and deciding upon the learning activities (Davis, 2013).

Development – In this phase the learning content, exercises and assessment will be created. This includes identifying which technologies should be used. Learning technologies can be any sort of tools, systems and techniques that enable learning. For example, podcasts, apps, video games or online collaboration spaces (Heick, 2021).

Implementation – The next phase includes testing the educational material with the target group. Also, the instruction for the instructors is included in this phase.

Evaluation – At last, it is important to evaluate whether the educational activity got the desired learning outcome. This happens during the evaluation phase.

3.3. Data Collection and Analysis

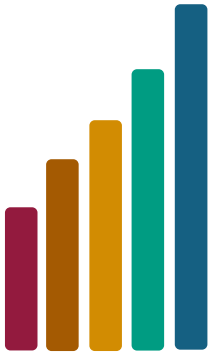
For this research, the action research methodology means working closely with design agencies. There were already four design agencies involved in the project 'AI in Ontwerp' from Saxion University of Applied Science. These companies will be monitored during their AI journey. They apply some AI based tools, which are selected based on the wishes from the companies and how suitable the tools are. By collaborating with these companies, the goal is to learn how they adopt and implement AI into their daily design tasks. This helps to understand the problems they face and questions they have along the way. At the same time, this research aims to support them in different ways during the process.

Therefore, this research uses a mixed methods approach for data collection, focusing on qualitative data collection. Qualitative data collection is often used if researchers want to develop knowledge about ideas and experiences of certain groups. There is not a lot of literature available about design agencies, their needs, and challenges regarding AI. This means that there is still a lot of uncertainty about the real issues around AI adoption and implementation for these companies. With qualitative data collection it is easier to adjust methods based on newly developed knowledge (Scribbr, n.d.).

Figure 9 shows a timeline of the different data collection methods, which mainly involves semi-structured interviews and focus groups. The qualitative data is analysed using thematic analyses. This is used to understand general themes in the data and how they connected with each other (Scribbr, n.d.). These thematic analyses follow six steps (Braun & Clarke, 2006):

1. **Familiarization –** getting an overview of the data by going through the audio, creating a transcript, reading through the text and taking notes.
2. **Coding –** highlighting sections in the text that correspond to certain codes. Each code describes an idea or feeling expressed in that part of the text.
3. **Generating themes –** combining the codes that show similarities into themes.
4. **Reviewing themes –** making sure that the themes are useful and accurately representing the data. This can be done by splitting up, combining or discarding themes.
5. **Defining and naming themes –** formulating each theme in a clear and easily understandable way.
6. **Writing up –** sharing the finding.

This qualitative analysis leads to a more complete and deeper understanding of all the issues related to AI adoption, which eventually helps the design agencies move forward with their AI journey.



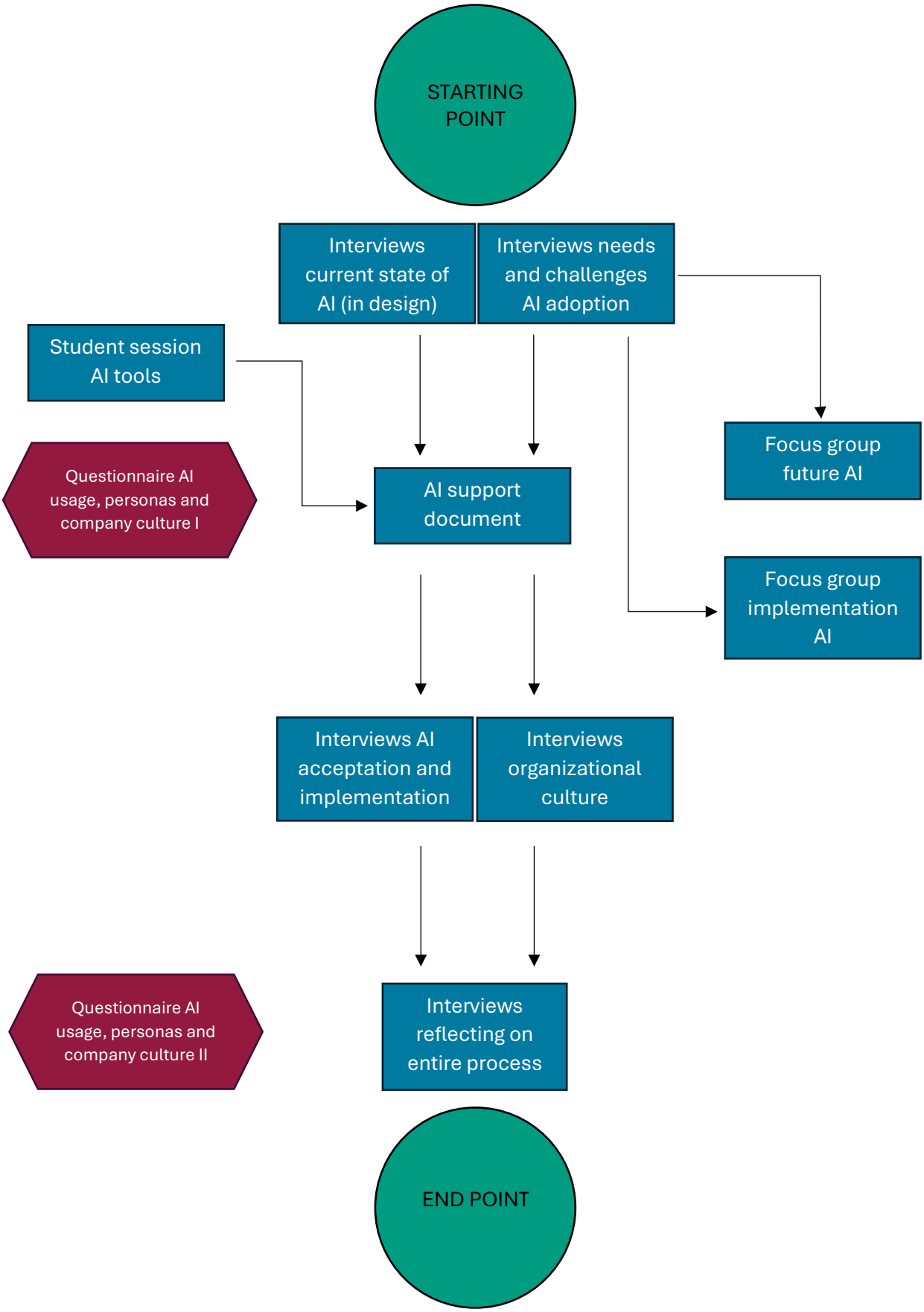


Figure 9. Data collection process

The remaining part of this section explains per data collection method what its purpose was and how it was executed. The interviews about ‘needs and challenges AI adoption’ and ‘current state of AI (in design)’ were both executed at the same time using the same interview protocol (Appendix B.1. – B.3.). The same goes for the interviews ‘acceptation and implementation’ and ‘organizational culture’ (Appendix B.4.)

3.3.1. Interviews needs and challenges AI adoption

To gain a good understanding of the needs and challenges of design agencies around AI adoption, three groups of people were interviewed: AI experts, designers at design agencies and industrial design educators. This happened in a semi-structured interview spanning about an hour. The interviews took place from October 2024 up until December 2024.

Eight AI experts were individually interviewed to explore how AI is currently used and how that can be applied to the field of industrial design: what opportunities and challenges do they observe and how can designers be supported.

Besides that, five design agencies were visited to talk with thirteen designers and project leaders in total. The interviews were conducted for each design agency separately, with one to four people present per interview. The goal of these interviews was to understand design agencies' motivation to use or avoid AI in their design processes. Therefore, their current design processes were identified and together with the design agencies their perceived benefits and risks of AI were explored. These interviews ended with discussing their expectations and wishes for the future.

Three educators in Industrial Design were interviewed to understand the opportunities and challenges of AI in design education. The interviews focused on which design tasks benefit most from AI support and what skills students need to develop to use AI effectively in the future design career.

3.3.2. Interviews current state of AI (in design)

In the same interview as mentioned above, attention was given to the current state of AI (in design). The focus shifted to the tools that are currently available and how these tools could be used in practice to support designers.

The eight experts were asked questions to gain insight into the AI based tools relevant for the design process: which tools are already in use, which stages of the design process are most suitable to integrate AI, and how AI can currently support designers. The experts also reflected upon future developments and what designers might gain from these developments.

Design agencies were interviewed to investigate how they currently use tools in the design practice. The interview focused on which tools they apply, and how these are integrated into different phases of the design process.

The educators gave insight into how AI tools are currently used in design education. The interviews addressed which tools students use and how both teachers and students apply AI in their design work or by learning about the design process.

3.3.3. Student session AI tools

The interviews gave an overview of relevant AI based tools for the design process. These tools were tested to get some insight into their potential, and explore potential use cases. The tools that seemed most relevant for the design process at that time were used for the student sessions that took place from December 2024 up until January 2025.

During the student session, first and second year students from the study Industrieel Product Ontwerpen at Saxion were asked to try out a different AI tool for each part of the design process (Table 2). They worked in pairs, got a number assigned and made the responding assignments. In total, all the groups listed in Table 2 had two or three pairs of students working on the assignments. *Appendix C.1. Student session assignments* gives an example of one of the worksheets. After this session the students had three weeks to try to use the corresponding tool in their project and presented the results in another session in January.

Table 2. Division of the different AI tool applications that were tested during the student session.

Group	AI-tool	Design process activities
1	ChatGPT	Personas – Market research – User scenarios - Brainstorming
2	CoPilot	Personas – Market research – User scenarios - Brainstorming
3	Perplexity	Personas – Market research – User scenarios - Brainstorming
4	Midjourney	Inspiration – Mood boards – Story boards – Iterating
5	OpenArt AI	Inspiration – Mood boards – Story boards – Iterating
6	Dall-E3	Inspiration – Mood boards – Story boards – Iterating
7	Midjourney	Materialization – Brainstorming – Sketch to render – Product presentation
8	Vizcom	Materialization – Brainstorming – Sketch to render – Product presentation
9	ChatGPT	Requirements – Morphological scheme – Business plan - Interview protocols
10	CoPilot	Requirements – Morphological scheme – Business plan - Interview protocols
11	Perplexity	Requirements – Morphological scheme – Business plan - Interview protocols

The students handed in their assignments and presentations afterwards. All assignments and presentations were checked to get a better understanding of how the students perceived the AI tools. All tools were connected to design process activity and a list full of pros and cons per AI tools was created as shown in *Appendix C.2. Student session output*.

The goal of these sessions was to make an initial selection of which tools are suitable and unsuitable for the design process and to learn more about their use cases. Due to the quality of the output, it was not possible to gain in-depth knowledge about the AI tools. Therefore, the results were mainly used to get an overall feeling for a few AI tools. The output of this session was partly used to write the AI support document for the design agencies, after validating some of the findings by more experimenting.

3.3.4. AI support document

Following the initial interviews and the student sessions, it was time for design agencies to experiment with AI tools. The earlier interviews had identified several challenges to AI adoption, especially the lack of knowledge around prompting, relevant tools and practical use cases. To address this, an AI support document was developed for each of the four participating design agencies. The purpose of this document was to lower the threshold for implementing AI into their current workflow and to provide practical guidance tailored to their needs and context. The AI support document is the first intervention that hopefully helps design agencies adopting and implementing AI.

Each design agency submitted a list of current projects. Using this input, together with the needs identified during the interviews, insights from market research, and outcomes of the student sessions, four AI support documents were created. While each document was tailored to the agency their specific situation, they all followed the same structure and included the following components (see *Appendix D. AI support document* for an example):

1. **Overview of relevant AI tools –** including some descriptions and expectations about the capabilities of these tools.
2. **Use case –** showing how one or more tools could be applied within their workflow.
3. **In-depth information -** one or two tools were selected and more information about features and functionalities were given.
4. **Tips and tricks –** both general (e.g. prompting techniques) and tool-specific advice to support the design agencies with experimenting.

Table 3 provides an overview, showing per agency the types of AI output they were interested in, the design phase in which they planned to apply AI, and the tools that seemed most suitable for the experimentation phase based on their context. In the entire report, the design agencies are represented by a letter of the alphabet, so they stay anonymous.

Table 3. Experimenting with AI tools, overview per company.

Company	AI output	Design phase	Relevant AI tools
A	Image	Conceptualize Detailing	Vizcom Copilot
B	Video and text	Product Prototyping	Sora PixVerse.ai
C	Text	Research Project management	Fireflies WhisperAI Connected Papers
D	Text and image	Research Idea generation	Midjourney ChatGPT (custom GPT)

In later interviews, participants were asked to reflect on the usefulness of the AI support document as intervention to implement AI. These interviews explore whether the document effectively addresses their needs, and what additional support or information might be needed for successful AI adoption.

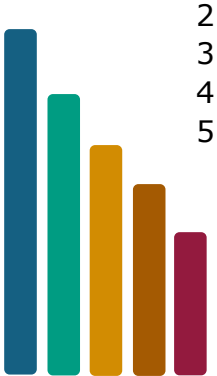
3.3.5. Focus group Implementation AI

The focus group Implementation AI was conducted in March 2025. It consisted of six participants, including ethics and technology researchers, an AI implementation researcher, AI experts and designers. This focus group had two goals: (1) identifying factors that negatively influence the adoption and implementation of AI, and (2) exploring how these factors could be addressed to support more successful AI implementation.

The chosen method for this focus group is negative brainstorming, since it is valuable for both goals. This technique is effective in group settings, and it helps participants break out of familiar thinking patterns (Matthijssen, 2024). People often tend to generate solutions based on their existing knowledge or past experiences. Negative brainstorming changes the perspective which can lead to unexpected insights and therefore a more comprehensive understanding of the challenges regarding AI adoption and implementation.

Negative brainstorming consists of five steps:

1. Identify the problem
2. Reverse the problem
3. Collect ideas
4. Reverse these ideas
5. Identify solutions



This method supports a broader exploration of challenges and needs related to AI adoption and implementation, and builds on the insights gathered during the earlier interviews on the same topic. The protocol used for the focus group is included in *Appendix E.1. Focus group Implementation AI.* The results of this session were shared with participants for validation. The findings from this focus group, combined with those from the interviews 'needs and challenges AI adoption', serve as input for further analysis and for the development of the follow-up interview protocol on 'AI acceptance and implementation'. Thematizing the output of the focus group is done via Miro. Links to Miro boards can be found in *Appendix F. Miro boards.*

3.3.6. Focus group Future AI

The second focus group was held in April 2025, shortly after the previous one. There were seven participants in this focus group, including designers, teachers from Industrieel Product Ontwerpen and AI experts with backgrounds in both implementation and research. The session had two main objectives: (1) exploring expectations regarding future AI functionalities for both general development and specifically for the design process, and (2) developing a roadmap that can help design agencies to prepare for upcoming AI developments.

Each objective requires a different method. For the first goal, the think-pair-share method is used. This method is often applied in educational settings to activate individual knowledge and promote peer exchange (Geurts, 2019). The participants received multiple questions. For each question, the participants got time to think individually about the answer (think), then discuss their ideas in pairs to develop a shared answer (pair) and finally share their conclusion with the group (share). This method ensures that every participant contributes without being influenced by others (Matthijssen, 2024). At the same time, the think-pair-share method supports collaboration between the participants. Both valuable aspects for a good setup to achieve the second goal.

The mapping method was used for the second goal. This method is applied in focus groups to visually make clear how aspects relate to each other, for example by creating concept maps or empathy maps (Matthijssen, 2024). In this case, the method was adapted to create an actual road map. A visual representation of a road was used, with the current situation at one end and the desired future situation at the other. The participants were provided with various visual attributes (see Table 4), each symbolizing a different element. Together, they mapped out the necessary steps to move from the present state to the envisioned state (Figure 10).

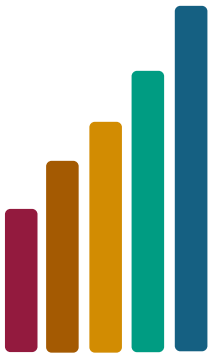


Table 4. List of all attributes available for creating a roadmap during the Future AI focus group.

Attribute	Name	Meaning
	Car	Required steps
	Gas station	Supportive means to make the required steps
	Roadblock	Constrains
	Railroad	Innovation or new AI development
	Train	New use cases due to innovation or new AI development
	Police car	Rules and regulations
	Car trouble	Unexpected problems
	Ambulance	Solution for the unexpected problems

The protocol can be found in *Appendix E.2. Focus group Future AI*. As with the previous focus group, the results were shared with the participants for validation to ensure accurate interpretation. The findings from this focus group, combined with those from the interviews 'needs and challenges AI adoption' and 'current state of AI', contribute to a deeper understanding of how expectations about future AI functionalities can inform and guide the adoption process within design agencies. Thematizing the output of the focus group is done via Miro. Links to Miro boards can be found in *Appendix F. Miro boards.*

Figure 10. Creating a roadmap during the focus group Future AI.

3.3.7. Interviews AI acceptation and implementation

The goal of this interview was to understand how the acceptance and implementation of AI tools progressed once the first barrier, namely a lack of knowledge about tools, strategies, and use cases, was addressed. From the earlier interviews it became clear that design agencies were interested in learning about relevant AI tools and how to properly write prompts. They wanted practical examples of how these tools could be applied to the design process.

To support this, each of the four participating design agencies received an AI support document aimed at lowering the threshold for integrating AI into their existing workflow. These documents were used by the agencies for a period of three to four weeks prior to this interview.

In total, 12 designers across four design agencies participated in the interview with one group interview per company. These four semi-structured interviews were conducted between March and May 2025. Each interview took place in approximately one hour. The interview protocol is the same for all companies and is included in *Appendix B.4. AI implementation and organizational culture.*

The interview had two main purposes. The first one was to gain insight into how AI was implemented in practice: what went well, what was difficult, and what barriers remained. The second one was to reflect upon the usefulness of the AI support document as an intervention. Participants were asked whether the information provided was sufficient to get started and whether it met their initial needs to gain a better understanding of AI.

All interviews were recorded and analysed. The responses were compared to those from the earlier interviews to assess any changes in participants' perceptions of AI. This helped to gain a deeper insight into how shifts in attitude or understanding may have influenced the ongoing adoption and implementation of AI tools in the design process.

3.3.8. Interviews organizational culture

During the same set of interviews as described above, additional questions were asked to explore the organizational culture within the four participating design agencies (Appendix B.4.). The goal of this interview was to better understand the organizational culture of each of the four design agencies and how that influences their AI adoption and implementation so far.

Organizational culture plays an important role in creating and carrying out strategies. Companies need to understand their own organizational culture to shape what strategies they can achieve (Schein, 1990). Therefore, this interview also served as a reflective intervention. During these interviews the design agencies were made aware of their organizational culture and had to reflect on how their culture might affect their readiness for change. In addition, discussing organizational culture helped validate earlier observations made throughout the research, both through direct interactions and the analysis of agencies' external communication. This combined approach helps to get a more complete understanding of how organizational culture can support or hinder the adoption of AI tools. As Muscalu (2014) states, changing organizational culture requires awareness about the current culture, and communication about the changing attitudes within their company.

The assessment of organizational culture was inspired by the framework of Hofstede et al. (1990), which states values and practices as key elements of culture. According to their model, culture manifests through three types of practices, namely, symbols, heroes, and rituals, and through underlying values (see Figure 11). These elements formed the base for formulating the interview questions.

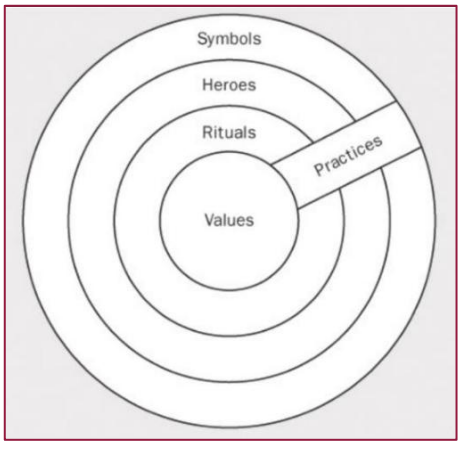


Figure 11. Manifestations of culture by Hofstede (1990). Retrieved from: https://www.researchgate.net/figure/Hofstedes-2010-onion-manifestations-of-culture_fig1_369094847

To assess practices, Hofstede et al. (1990) used six dimensions:

1. Process-oriented vs. Result-oriented
2. Employee-oriented vs. Job-oriented
3. Parochial vs. Professional
4. Open system vs. Closed system
5. Loose control vs. Tight control
6. Normative vs. Pragmatic.

The three dimensions for values: (1) need for security, (2) work centrality, and (3) need for authority are strongly related to nationality, education, age,

seniority, and hierarchical level (Hofstede et al., 1990). For this research, the focus lies on the practice dimensions, since shared perception of daily practices is considered the core of an organization's culture (Hofstede et al., 1990).

While the original study used 135 survey items, a simplified version of the framework was applied here due to time constraints. Interview questions were formulated in such a way that they provide insights into each of the dimensions above while remaining within the one-hour timeframe.

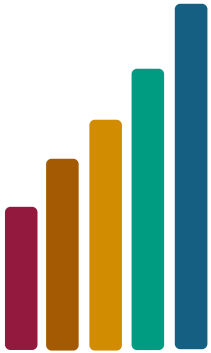
As with the interview above, all these sessions were recorded and analysed. The responses were compared with earlier observations to validate interpretations and deepen understanding of the agencies' organizational culture. This contributed to identifying how organizational culture supports or limits AI implementation and informed about what cultural changes might be needed to improve AI adoption in design agencies.

3.3.9. Interviews reflection on entire process

Between April and June 2025, approximately 8 to 10 weeks after the design agencies received the AI support document, a final round of interviews was conducted. As in the previous interview, 12 people (designers and project leaders) from 4 design agencies participated in the interviews, with one group interview per design agency.

The purpose of these interviews was to reflect on the entire process, from the beginning of this project in October 2024 until the time of the interview itself. During these interviews, each design agency was presented a summary of the needs and challenges regarding AI adoption they shared in the initial interviews. This formed the basis for a reflection on how their perspectives and practices had evolved over the last months. It was focused on exploring whether the interventions, like interviews, support documents, and focus groups, had influenced how the agencies perceived AI and how that changed their adoption and implementation plans. Another aspect that was important was finding out what the participants found most valuable throughout the process, and what support they felt had been missing.

All interviews were recorded and analysed. The findings were compared to those from earlier interviews to identify shifts attitudes related to AI. This comparison contributes to the development of an AI journey map for each agency. This offers an overview of insight and recommendations for improving AI adoption and implementation in the design practice.



3.3.10. Questionnaire AI usage, personas and company culture

Employees from all four participating design agencies were invited to fill in a questionnaire on Qualtrics. No personal information was collected; they only had to fill in the name of the company they work for. Anonymity for the participants reduces the pressure to give socially desirable answers (Tracy, 2024). The questionnaire consisted of four categories containing multiple statements each. Each statement needed to be answered on a 1 to 10 rating scale, with 1 being 'strongly disagree' and 10 being 'strongly agree'. To minimize order-effect bias, both the categories and the statements within each category were randomized per respondent (Perreault, 1975).

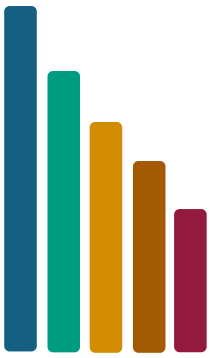
Participants completed the questionnaire twice, with an interval of approximately 9 to 11 weeks. The first round took place at the time the AI support document was introduced to the design agencies, with 26 respondents. The second round followed one week after the final interview, with 29 respondents. Both questionnaires share the same content. The full questionnaire can be found in *Appendix G.1. Questionnaire content.*

The questionnaire was structured in four categories:

Experience AI – This section consists of 7 items derived from insights gathered during the first round of interviews. The items reflect how agencies and experts currently use AI and how they would like to use it in the future. This is based on three potential functions for AI: (1) efficiency gain, (2) assistance and (3) quality improvement. The purpose of the statements is to measure changes in familiarity with, and usage of AI based tools. It is expected that scores would increase after more frequent interaction between designers and AI tools. As new literature became available (Bahn, 2025), the items were found to align with the first three levels of the GenAI maturity model: AI as a tool (level 1), an assistant (level 2), and a sparring partner (level 3).

Personas - The second section contained 9 items based on types of AI-related personas that emerged during the initial interviews. Each persona was represented by three statements. The aim of this section is to explore how the distribution of personas within an organization relates to its culture and to investigate if certain persona types facilitate or hinder AI adoption.

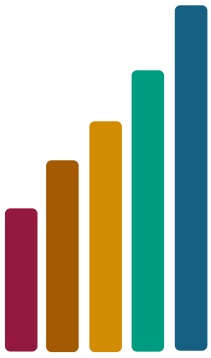
Usage AI – This category included 6 statements representing factors that negatively influence the adoption of AI, as reported in earlier interviews. These items were used to assess if these negative factors of AI adoption shift as design agencies gained experience with AI tools.



Organizational culture – While interviews and observations already provided nuanced insights into each culture, the questionnaire addresses the cultural readiness of AI. This segment contained 5 items which are aligned with the AI maturity levels described in the theoretical framework. The goal of this section is to create a better understanding on where the design agencies are standing in terms of AI maturity and if this changes while experimenting with AI tools.

Appendix G.2. Relation statement – measurement presents an overview of how each statement is linked to its associated concept or measurement. At the end of the questionnaires, the participants were asked to answer three open-ended questions about how they would like to work with AI.

Within this software, it was not possible to investigate per individual how they answered the rating questions. This made it impossible to say something about the personas within the companies. This also made it difficult to draw conclusions about the different opinions within a company, because extreme answers from both sides would cancel out each other. Therefore, the results from the questionnaires were only used to compare the two situations per company and connect this to the findings from the interviews. The results of the interviews are shown in *Appendix G.3. Results questionnaires.*



04 RESULTS

This chapter describes the results from the interviews, focus groups and interventions.

4.1. Design Agencies

This paragraph introduces the four companies that were involved in this research. Some basic facts about the company are presented together with information about their organizational culture and their experience with AI in the design process. The names of these companies will not be mentioned, instead they are mentioned as “Company [letter of the alphabet]”.

4.1.1. Company A

Company A is a small design agency in Enschede with approximately 15 employees. The agency focuses on B2B product design with a strong emphasis on styling and visual appeal. They do not manufacture the products themselves, but they do support their clients in making products ready for production. A significant amount of the products they make involve television-related products, like stands, remotes, and antennas.

Organizational culture - Creativity is an important value within the company, both in terms of the outcomes they deliver and how employees view their job. Designing an aesthetically pleasing product is therefore one of the aspects that would make a project successful. Customers also play a key role in shaping what is considered a successful project. Company A defines success as client satisfaction and values long-term partnerships with them.

The employees describe the culture at Company A as open-minded, enthusiastic and impulsive. The organizational structure is flat, with little formal hierarchy.

Designers take initiative and are encouraged to act independently and assertively. Social activities, like celebrating birthdays, work anniversaries or project completions are only celebrated when employees informally organize these moments. While the leadership team is supportive, new ideas and initiatives generally originate from the designers, rather than management.

The company culture relies heavily on personal responsibility, teamwork, and intrinsic motivation. Those who thrive at Company A are typically self-driven, enthusiastic, and willing to take ownership. The biggest mistakes an employee can make are bad communication, and not being able to meet expectations or deadlines as a result.

Based on the six practice dimensions by Hofstede et al. (1990), Company A is assessed as:

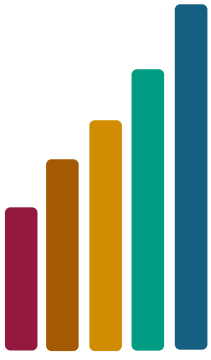
1. Process-oriented vs. **Result-oriented**
2. Employee-oriented vs. **Job-oriented**
3. Parochial vs. **Professional**
4. **Open system** vs. Closed system
5. Loose control vs. **Tight control**
6. Normative vs. **Pragmatic**

AI adoption - There is little formal structure for experimentation or adoption of AI tools, but there is a clear willingness to do so. They had interns testing some AI tools with them to investigate its relevance for ideation and style inspiration. The company was enthusiastic about it, but did not implement the tools. This contradicts with the company's wish to be among the early adopters and their excitement about innovation. This is partly driven by the fear that they will miss the boat otherwise. This

Company A likes AI as a brainstorm tool because it gives more output and explanation. For them, AI usage does feel like cheating when they use it to enhance their creative process because creativity is a strong value at that company. They are also not sure if the designer would still add value after further developments.

They want to gain more knowledge about AI developments, learn how to write a good prompt, and learn when AI does not add value anymore. Training about AI implementation seems like a good setting to meet these needs.

Based on the interviews and questionnaire, Company A seems to be at maturity level 2. There is already some knowledge about AI spread around the company, but they lack a shared vision and a good understanding of AI to be ready for level 3.



4.1.2. Company B

Company B is a micro design agency consisting of seven employees, including both product designers and programmers. The company combines art and technology by creating interactive experiences. They offer standardized products available for rent, and tailor-made experiences. With their own workshops, Company B builds products in-house from idea to final product. Storytelling through design plays an important role in their work.

Organizational culture - The culture at Company B can be described as creative, technical and chaotic in a good way. The team has a fast pace and works impulsively. The employees value the rapid iteration and love to experiment along the design process. The employees characterize the structure at Company B as informal and flat: everyone is equal, and everyone's voice is heard. Final decisions are often left to the founder as the team has the tendency to engage in long discussions due to strong opinions, passion and critical thinking. Brainstorming is their default meeting modus because of the often-occurring debates.

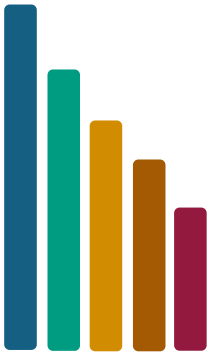
Employees thrive at this company if they are flexible and if they have affinity with the project and the slightly chaotic way of working. Employees must be open to try out new things, since some projects require different skills or approaches.

Perfectionism is deeply ingrained into this company. Projects are considered done because the deadline is there, never because the team feels they have reached the ideal result. Satisfaction is rarely a thing among the employees as there is always room for improvement. This makes that successes are rarely formally celebrated. There is a wish among the employees to create more moments or reflection and inspiration.

What excites the people at Company B is the opportunity to try out new things, be involved in random projects and have fun while doing it.

Based on the six practice dimensions by Hofstede et al. (1990), Company B is assessed as:

1. Process-oriented vs. **Result-oriented**
2. Employee-oriented vs. **Job-oriented**
3. **Parochial** vs. Professional
4. **Open system** vs. Closed system
5. **Loose control** vs. Tight control
6. Normative vs. **Pragmatic**



AI Adoption - At the beginning of the research project, Company B did not feel a strong need to adopt AI. They only used ChatGPT a few times to generate some texts, but were not thrilled by the results. They want AI tools to speed up their process or to improve the quality of their work. Because they have not found any AI tools that could do that, they have not adopted anything yet.

Company B perceived the reliability of AI tools low and found it hard to get the desired results. Both reasons why they do not put in much energy to look for other AI tools and experiment with them.

There seems to be little concern at this company about adopting AI or not. They are aware that customers approach them because they offer a unique service and make unique products. They do not fear AI will take over anytime soon.

Based on this information and the questionnaire results, Company B is placed at maturity level 1. They are aware of the technology, touched upon it briefly but no further actions are planned.

4.1.3. Company C

Company C is a small research-driven organization in the field of Industrial Design, consisting of approximately 15 people. The company has two directions of focus: (1) exploring new production processes, materials and applications, and (2) human-centered design. They occasionally contribute to final products, but mainly it stops at prototyping or concept development. Production is handled by project partners. The organization has their own workshop which is mainly used to experiment with production techniques.

Organizational culture - Creating and sharing knowledge are two important aspects of Company C's identity. Projects are often self initiated, based on topics the team and project partners find meaningful. Most of the work is done individually or in small groups, with everyone contributing to multiple projects in parallel.

The organizational culture is described as flat and informal with curiosity as an important driver. The employees describe the team as young, friendly, approachable and diverse. Within the team there is a strong sense of autonomy and mutual respect.

People who thrive at Company C are independent, curious and proactive. They need to be able to work with the vagueness of some projects, and switch between tasks often. Most of the time, work tasks are executed individually, which makes asking for help and showing initiative important.

Employees are engaged during meetings, but have the tendency to postpone decision-making, as they prefer discussion over closure. Quick switches between informal and formal behaviour are common.

There are multiple ways to define success within the organization. In general, the employees believe that satisfaction of the project partners, a project resulting in a publication or follow-up project, and achieving the intended result are all important indicators for success. Some individuals also value learning something new. The company finds meaningful work with societal impact important, especially in areas where project partners lack the time or resources to experiment or innovate. For the nearby future, the team expresses a wish for more structure, direct communication, and better continuity through longer-term projects.

The biggest pitfalls within the company are poor communication, dishonesty, perfectionism taken too far or being resistant to change.

Based on the six dimensions from Hofstede et al. (1990), Company C is assessed as follows:

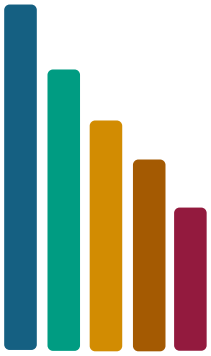
1. Process-oriented vs. **Result-oriented**
2. **Employee-oriented** vs. Job-oriented
3. **Parochial** vs. Professional
4. **Open system** vs. Closed system
5. **Loose control** vs. Tight control
6. **Normative** vs. Pragmatic

AI Adoption - Within Company C there is not a lot of experience with AI tools. They are interested in the subject but currently feel no urgency to adopt AI into their workflow, as their projects are highly specialized and exploratory in nature.

Their focus is more about gaining knowledge about the available AI tools to eventually see if it can help them increase efficiency and improve the quality of their work. They have been assessing some of the more popular tools like ChatGPT, Midjourney and Dall-E.

Company C finds AI tools not completely reliable and has some concerns about privacy. This is more in the back of their heads, because there are no plans yet to adopt AI.

Therefore, Company C is placed at maturity level 1. There is curiosity among some individuals about AI and some tools are assessed by these individuals. But there are no actual plans yet to adopt the tools.



4.1.4. Company D

Company D is a small industrial design agency with approximately 15 employees. It focuses on both product design and engineering and delivers production-ready concepts for clients at various industries. A significant amount of their projects relates to bicycles or bicycle-related products, such as baskets, rear lights, children's bikes, wheelchair bikes, locks, and batteries. The company has their own in-house workshop for prototyping and experimentation.

Organizational culture - Innovation, quality, and pragmatism are important aspects for Company D. Employees describe the culture as pragmatic, efficient, and collaborative. A trial-and-error approach is seen as a natural part of the design process.

The organizational structure is flat and open. Employees share ideas, question assumptions, and contribute to problem-solving. Discussions often happen informally by walking over to a colleague's desk. Weekly Monday morning meetings are short and efficient, focusing on sharing updates. Afterward, there is space for follow-up discussions. Prototypes and sketches are often shared during these meetings to keep everyone involved.

Company D celebrates its work. Every completed project is celebrated with cake, awards are celebrated, and company anniversaries involve team getaways. Monthly summer barbecues and Friday drinks are organized by a group of people to increase bonding at the company.

People who thrive at Company D are autonomous and so called 'vakidioten'. Employees are expected to take ownership, stay critical, and adapt to changing needs of their clients. In the end, they want to deliver high quality products. Mistakes are accepted, as long as one communicates openly and shows that they put their best effort into the task.

Success is defined both individually and collectively. A project is considered successful when the client is satisfied, but also when the designer feels personally motivated and proud of the outcome. Company D currently focuses on formalizing its definition of success by including new indicators such as satisfaction, process efficiency, and budget alignment.

Employees get most energy out of solving complex problems. They enjoy crafting elegant solutions to puzzles that others might find too difficult and take pride in hearing clients addressing their innovativeness. Their most important driver: designing meaningful, high-quality products.

Company D is assessed as follows according to Hofstede et al. (1990):

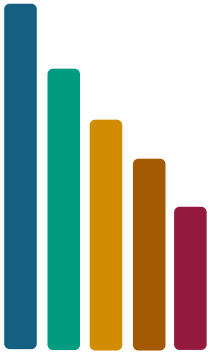
1. Process-oriented vs. **Result-oriented**
2. Employee-oriented vs. **Job-oriented**
3. Parochial vs. **Professional**
4. Open system vs. **Closed system**
5. Loose control vs. **Tight control**
6. Normative vs. **Pragmatic**

AI adoption - While Company D seems eager to adopt new AI tools and ideas, they will only do that when those tools meet their standards. Progress is important to this company, but not at the expense of quality. They do want to stay up to date about the innovation, because once it reaches their standards, they want to implement it. Otherwise, the fear of falling behind comes back.

They have been experimenting a bit with AI tools already and have experienced that these tools support designers to be more creative and to discover more concept direction and variations more easily.

No AI tools have been adopted yet. They want to use AI tools to increase efficiency and to improve quality. Right now, these tools are not better or faster than their current skills and methods. There are also some concerns about privacy and how it does not align with their NDAs.

Given the above information, this company resides in maturity level 1. There are some individuals aware of the technology, and they try out a few things. They assess the potential of the tools, but did not find reasons yet to go a step further.



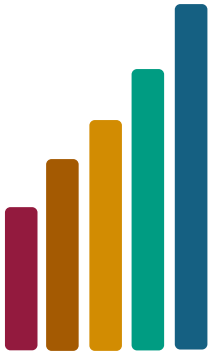
4.2. Current State of AI in Design

The interview 'current state of AI' gave insight into what AI experts deem possible for AI in the design process and what the design agencies are currently doing with AI. It showed that both AI experts and design agencies are aware of the existence of different LLMs, like ChatGPT and Copilot. Most of them also mentioned image generators like Midjourney and Dall-E. The last one that was mentioned by both was Vizcom: an AI-powered tool that turns sketches into realistic renderings.

The same interview showed that AI experts have more ideas about how to use AI in design than design agencies. In general, they say that AI allows people to be more efficient because it can take over the boring and repetitive tasks. AI experts also see potential in using AI tools for inspiration to support designers in their creative process. AI tools allow designers to make quick designs and variations. Most of the AI experts also suggest using AI to improve the quality of text, images or code. By using AI as a critical analyst of their own work, designers can lift their output to a higher level. There were some other ideas mentioned by experts, like creating personas with AI and interacting with them, using AI to assist in brainstorming and problem definition, using AI for searching literature and creating an AI avatar. Once designers are getting more familiar with AI, the experts see potential in training their own models and using AI as an extension for their skills.

Researchers have been assessing the added value of AI tools in the design process and found that these tools are effective in various stages of the design process (Zhong et al., 2024). GenAI tools combined with critical thinking are believed to enhance the efficiency and creativity of designers (Hsiao & Tang, 2024), by boosting their thinking speed, refining designs and speeding up the decision-making process (Akverdi & Baykal, 2024). LLM chatbots, like ChatGPT, seem to be helpful for brainstorming, idea generation, organizing product information and user interview questions (Akverdi & Baykal, 2024; Hsiao & Tang, 2024, Zhong et al., 2024). Hsiao and Tang (2024) also found that LLM chatbots seem effective in discussing market trends, data retrieval, and planning product goals. The same studies show that AI image generation tools, like Midjourney and Dall-E seemed to be more suitable for product renderings, interface design and persona creation.

According to the interviewed AI experts and the outcome of multiple research projects, there are a lot of opportunities for AI in the design process to improve the quality, creativity and efficiency. Although this sounds promising and designers seem to respond positively to GenAI tools (Akverdi & Baykal, 2024; Hsiao & Tang, 2024, Zhong et al., 2024), in practice things look different. During the initial interview round it became clear that most designer agencies have almost no experience with AI tools. Some mentioned that they have occasionally used them for a brainstorm, to get some style inspiration, for ideation, and to generate text and code. So, what is going on?



While there are a lot of positive responses and a lot of people who see the potential of AI tools for the design process, designers face challenges with these GenAI tools.

Creativity - Researchers already showed that the usage of GenAI tools in the design process can enhance creativity. Even though designers shared some positive experiences of AI tools supporting their creativity, they also shared concerns that arose. Since they experienced that AI tools help them generate ideas, they fear that if this technology advances, it itself can generate ideas and they are not needed anymore. So, the concerns lie mostly in AI taking away the things they love about their job: solving problems by using their creativity. In that sense, AI is seen as a threat to their creativity and identity as a designer.

AI experts took a different stance and said that GenAI tools move towards an average, which does not support outside the box thinking. Akverdi and Baykal (2024) also showed concerns that AI tools their predetermined patterns might hinder creativity.

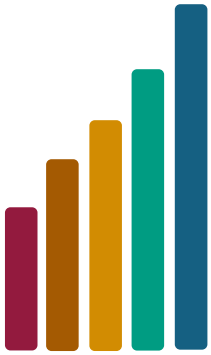
Unreliable output - All design agencies mentioned that they find the output from LLMs not reliable enough. Since AI tools lack any sense of XAI, it is hard to verify the output or understand why it generated a certain output. Research showed that designers should always manually review the output of an LLM, verify it and, if necessary, correct it (Hsiao & Tang, 2024; Zhong et al., 2024). Trusting the output of an LLM feels like losing a sense of control for the designers because they have no idea which assumptions AI-models make to generate output. There seemed to be a need for explainable AI within design agencies. To maximize the benefits of these tools, designers need to make sure that the output aligns with their understanding of the subject to be able to guide the LLM accordingly (Hsiao & Tang, 2024).

Time consuming - The AI experts stated that it requires a lot of work to learn how to use AI tools. There are a lot of new tools coming out, it is hard to keep track of them and try them out. Keeping up with AI developments can be a fulltime job nowadays. Designers said that it is often not time efficient to work with AI tools, they feel like they can do the design tasks faster. Akverdi and Baykal (2024) found that designers struggle with the same thing. They state that designers struggle with efficiently integrating AI due to lack of skills. Prompting asks for an emphasis on verbal communication skills, while designers are used to visual communication. Entire reports have been written about prompt engineering techniques (Schulhoff et al., 2023). Most important is that a bad input results in a bad output. The output from the student session and personal experiences with prompting confirm this. Since designers do not possess the required skills, it takes more time to get the desired result. Designers consider time as an important factor to not invest in using AI. The design agencies do projects for customers, which means that most of their time must go into those projects. That is how they get their pay. This leaves little room to experiment with AI tools or take time to acquire the right skills. Designers have the need for a more sustainable way to experiment with tools; if they know an AI tool works well for a certain use case, they are more motivated to experiment with it. It feels less like a waste of time, and therefore money.

Hard to get the desired result - As mentioned above, designers struggle to get the desired output out of a GenAI tool, making the output seen as unpredictable. Designers find it hard to understand how specific inputs lead to certain results, which makes it hard to steer the output in the desired direction. This leads to inconsistent output quality and a trial-and-error process. This is partly explained by designers' lack of prompting skills. Another explanation is the quality of the tools. Designers spend a lot of time on adjusting their prompts to get the desired output, making the tasks more complex (Hsiao & Tang, 2024). Tools like Midjourney and Dall-E generate images quite easily, but it falls short in adjusting details (Zhong et al., 2024). It is hard to steer the tools the way designers want. Some of the image generation tools, like Arko AI or Mokker, also lack the capability to get high quality output (Zhong et al., 2024). The student sessions also verify this. One of the most recurring disadvantages of AI tools mentioned by the students was that it is hard to steer the output on detail level, and that output seemed incomplete. More information about their findings can be found in *Appendix C.2. Student session output.*

The GenAI tools are promising, but their capabilities do not yet align with the needs of designers. The development of GenAI tools is going at a rapid speed. It is expected that as the tools continue to develop, their usefulness for product design further improves (Zhong et al., 2024). Looking at the developments from the start in 2022 up until July 2025, this seems like a realistic expectation. In 2022, AI image generators still had a lot of trouble with generating realistic output, generating hands that often had more than five fingers (Mollick, 2025). In 2023 the realism increased, by 2024 lighting and positioning became more accurate and by 2025 highly photorealistic images were generated (Mollick, 2025). In March 2025, image generators became part of LLMs, making it easier to steer images and to add text to images (Mollick, 2025). This development makes it possible to make infographics using AI.

So, there seems to be a discrepancy between the capabilities of GenAI tools and what designers can and want to do with this. Let’s dive deeper into the reasons for designers and design agencies to (not) adopt AI.



4.3. AI Adoption

Several factors that influence the designers their decision to adopt AI for design tasks have been found. These factors are shown in Figure 12, with aspects that negatively impact the decision to adopt AI (red arrows), and the ones that positively impact that decision (green arrows). Designers seem to struggle with understanding AI, having realistic expectations and discovering GenAI tools that fits to their standards and aligns with their user conditions.

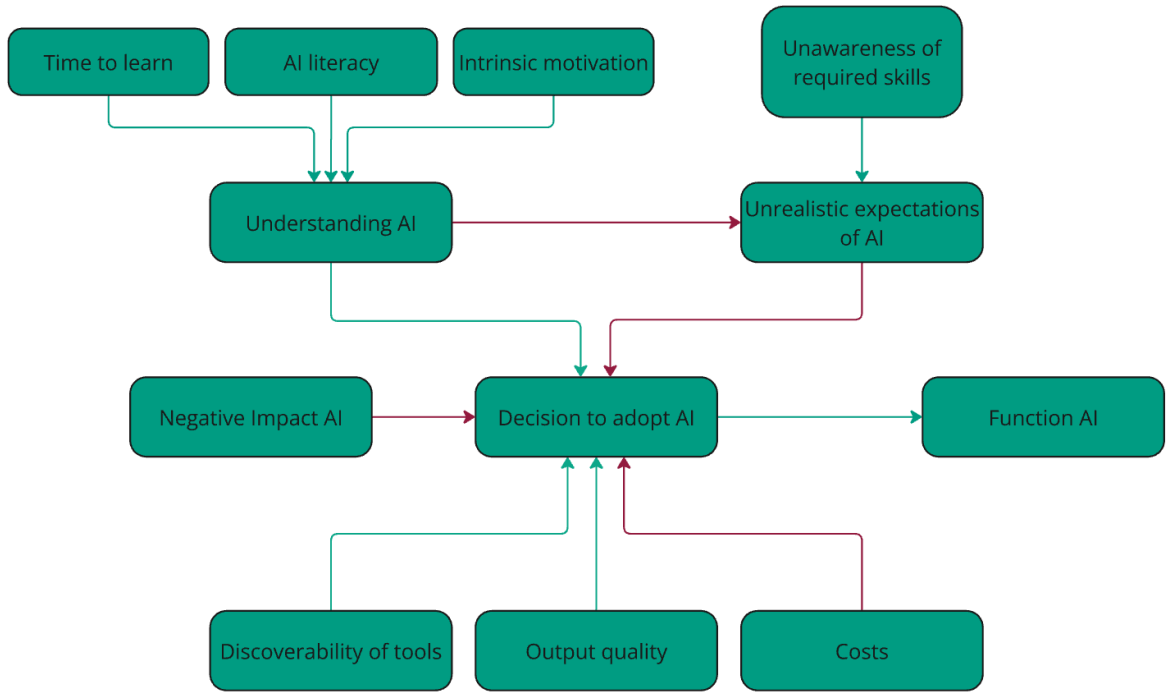


Figure 12. Factors that influence the adoption of AI for designers.

4.3.1. Understanding AI

A certain understanding of AI seems needed to adopt AI technology. The first step in understanding AI is awareness that it exists. There are three aspects that positively influence one's understanding of AI; take time to learn about AI, improve AI literacy and have intrinsic motivation to learn.

Designers experience the need to understand AI tools. The lack of understanding withholds them to adopt it. Although designers seem to be intrinsically motivated, they do not take the time to learn and increase their AI literacy. Designers want to gain knowledge and skills needed for the practical implementation of AI tools in their workflow. This would make it easier for them to assess which AI tools are reliable and worth investing in. Therefore, they want to learn about current developments, how to implement AI into the design process and prompting techniques. There is a strong demand for clarity: what a tool offers, where it fits in the process, and how it adds value.

AI experts express the need for explainable AI. The black-box nature of AI models makes it hard to understand why certain output is generated. Once this is clear, designers can make a well-informed decision about the output. This process helps designers to gain trust in AI. Figure 13 illustrates how explainable AI helps designers in building a relation with AI. These experts also state that AI requires time to learn and to develop the right skills. It is learning by doing. Among AI experts intrinsic motivation seemed to be of positive influence on their AI successes.

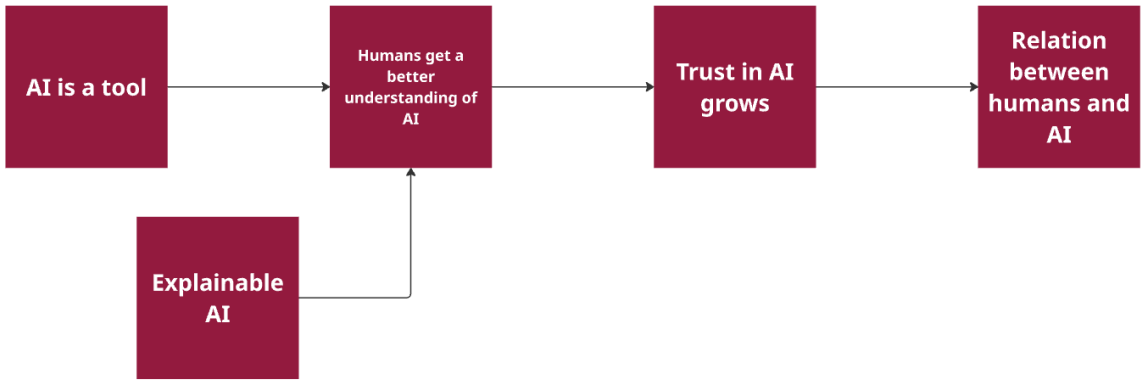


Figure 13. Building trust in AI, a result of the focus group future of AI.

Understanding AI relates to two characteristics of Rogers' (2003) adoption model. Because designers do not have a lot of time to experiment with AI tools, this negatively influences their adoption decision, which relates to the characteristic trialability. At the same time complexity plays a role in understanding AI. Higher complexity results in a lower rate of adoption (Rogers, 2003). Because designers have little understanding of AI tools and how they generate output, they seem more hesitant to adopt it.

4.3.2. Unrealistic expectations of AI

Designers shared that they often see LinkedIn stories or YouTube videos about GenAI tools, and their generated output. This often grows their interest, but it is not useful to them. This has to do with two things. Sometimes this is due to the use cases they present, which are not applicable to the design process. It also has to do with the amount of time these people spend on (a) learning the tools and (b) getting the desired output. This is often not in line with the experiences of designers which causes unrealistic expectations. In the beginning of the research, a lot of design agencies seemed to look at AI as if it were the holy grail. The expectations were super high, and often designers were left disappointed. The output from other people was high quality, and when they tried it, it was not that high. Unrealistic expectations influence the adoption of AI tools negatively.

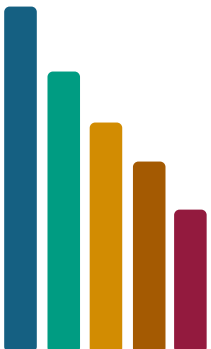
Because time is limited at design agencies, there is a need for use cases that give more context; how much experience does this person have, how much time did this person spend on generating this output, and how much similarities does this share with the idea in their head. This phenomenon closely relates the Rogers (2003) observability characteristic of adoption, which is about the visibility of the innovation's results to others. And in this case, it is mostly about visibility of the result in the right context and with information about the context.

Part of the unrealistic expectations is shaped by the notice that designers are not aware of the required skills they need to possess to use AI tools more smoothly. And this is where GenAI tools seem to be a bit misleading, because the tools *seem* familiar. In conversations with design agencies, it became clear that designers can use the user interface for most of the tested AI tools. The interfaces of LLMs, like ChatGPT and Copilot, show similarities with instant messaging services and search engines. This also applied to tools like Midjourney and Dall-E. They share a similar chat interface, but with some extra functionalities. Even though it was clear to the designers what is expected from the interface, they cannot use it properly. The interviews showed that designers experience big differences in the output quality. They sometimes experience that the output differs from the input, or that output contains statements which are not true. These are so-called intrinsic hallucinations and extrinsic hallucinations (Hua et al., 2024).

Another reason why the usage of AI tools cannot happen without thinking is because a lot of people do not have the required skills to effectively prompt. A lot of the designers mentioned that this is a skill they want to require. The AI experts also considered this as a very valuable skill: context and input make the output. The better the one, the better the other. They also suggest using sketches as input as it is often easier to work from sketch than from a prompt.

4.3.3. Negative impact AI

During this research, various reasons were given about why AI negatively impacts both society and individuals. This varies from risk of losing jobs, to a decrease of creativity or the high energy consumption of AI models. Due to the large number of reasons, another paragraph is dedicated to the negative impact of AI. This negative impact influences the adoption of AI. It relates to the compatibility characteristic described by Rogers (2003), which states that there should be high compatibility between the innovation and the user's needs and values to increase the chance the innovation will be adopted. Therefore, designers should be informed about the negative impact of AI to align those with their company values.



4.3.4. Discoverability of tools

Discoverability of the tools is about how easy it is to find a certain tool. Designers tend to look up the tools they find via acquaintances on social media platforms. They also mentioned that they would try out a tool more easily if the tool is well known and others speak positively of it. This aspect of adoption shows similarities with Rogers' (2003) observability characteristic, which is about the visibility of the innovation's result to others.

4.3.5. Output quality

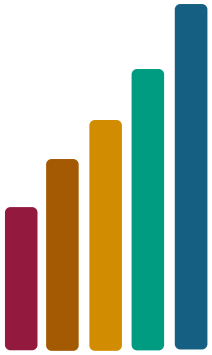
The output quality is of high importance to decide whether to adopt AI tools. This is related to the relative advantages these tools give (Rogers, 2003). If people think the way of working with AI tools is much better compared to their current way, there is a higher chance that they will adopt the tool. Compatibility also plays an important role in the output quality. Designers stated that they cannot spend much time on experimenting with tools. They are looking for efficient ways to experiment with tools and discover their capabilities. If the output quality of an AI tool meets the standards of a design agency, they are more likely to adopt the tool.

The output quality is not a stand-alone feature. Getting a better understanding of AI and acquiring better skills will eventually result in better output quality. In the end, AI tools are tools, and it takes time to learn to work with them.

4.3.6. Costs

In the initial interviews, costs were mentioned by AI experts as a factor that influences their decision to work with a certain tool. For them, it is about the ratio between costs and output quality. According to Sahin (2006) costs are closely related to the relative advantage characteristic of Rogers (2003). If AI tools can speed up certain aspects of the design process it can lower the costs. It is about the money you spend on tools versus the extra time these tools give designers.

Designers did not mention the costs of tools as a factor that influences their adoption. Although, while experimenting with paid tools for free, they did realize that the costs influence the adoption process. When experimenting with tools for free, they did not worry about wasting money on tools they would not use. This is related to Rogers' (2003) trialability characteristic: experimenting with tools for free allows for failure.



4.3.7. Functions AI

Assistant tool - As an assistant tool, AI assists in administrative and repetitive tasks, like summarizing reports, scheduling meetings, generating meeting notes, and drafting mails. These tasks are often considered as boring and time-consuming, and are additional to designers' core task: designing products. Using AI as an assistant gives people more time to work on their core tasks, with an increase of productivity as result.

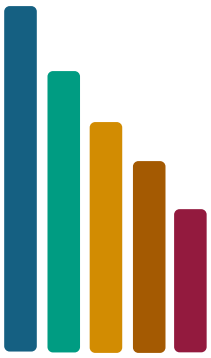
Most interviewed designers and teachers agree that with AI, critical thinking and logical reasoning become more important. They see AI as something people cooperate with, and not something that replaces people. Some AI experts also suggest using AI as an assistant instead of letting it take over everything. That way, people will keep thinking for themselves.

Creative tool - When using AI as a creative tool, the output of an AI offers inspiration and alternative perspectives to the users. It allows them to elaborate on ideas and perspectives that would not have come up while using traditional methods. AI as a creative tool does not replace the creativity of the user, it allows them to get more input for the creative process.

Part of the designers and AI experts see potential in using AI as an inspiration tool, or already use it. AI's output can inspire them to generate more ideas and discover more concepts, variations and design directions. This inspiration comes from textual and visual output. The same group also considers AI a good brainstorm tool.

Quality Improvement tool - Using AI as a quality improvement tool supports people in refining their work. AI tools offer feedback and give suggestions for improvement.

The interviews showed that AI-expert tend to use AI as a critical analyst of their own work. For others, quality improvement means that AI is used as a verification tool. This usage of AI does not result in time reduction. It is still a fair amount of work, but the quality is higher.

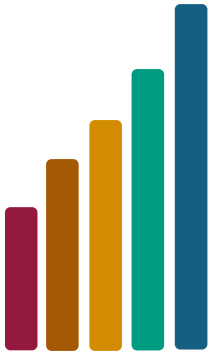


Efficiency tool - Using AI as an efficiency tool helps one work faster and more efficiently. AI takes over repetitive tasks such as documentation and data analysis. This allows people to focus on the more enjoyable and creative tasks. They also have more time for problem solving and decision making.

The interviews showed that designers and teachers are interested in using AI to have better access to internal information. AI experts think AI can help increase the efficiency of designers, because it allows them to quickly make designs and variations.

Skill Extension tool - Using AI as a skill extension tool allows people to work beyond their expertise and skillset. AI acts as a bridge between a person's knowledge and the discipline they do not fully understand yet. AI helps them learn more easily and gives them something to fall back on. This allows people to take on more challenging tasks and projects.

The interviews showed that especially AI experts use AI to extend their current skills. For some of them, this also closely relates to efficiency. Due to AI tools they work more efficiently and therefore have more time to spend on challenging projects in which they acquire new skills.



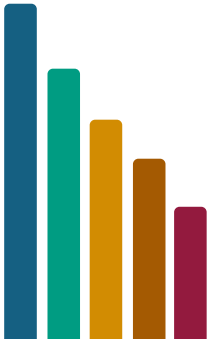
4.4. Negative Impact AI

Designers, AI experts and design educators named various negative aspects of AI that influence their adoption decision. Some of which they experienced themselves, heard from others, or foresee for the future. Rogers (2003) found that the negative impact of an innovation even influences individuals after they decide to adopt a technology if they get exposed to conflicting messages about the innovation.

Due to a broad range of negative aspects and its power to change the adoption decision, further analysis of the negative impact deemed needed. A negative impact analysis is conducted to gain more insight into how AI impacts the user. To align the findings from the interviews with literature, the product impact tool was used. The product impact tool assesses the impact of technical products on people, society and the environment (Dorrestijn & Eggink, 2014). The most relevant findings are shared in this paragraph.

Job uncertainty - AI experts and design educators both mentioned that they see a risk that jobs disappear or that people lose their jobs due to the AI developments. Designers do not share this feeling, at least not for their profession. They feel that how designers use or not use AI can become part of the identity as designer or design agency. The designers do not necessarily fear that they will lose their job. They fear that they will lose the aspects of their job that they like, and the aspects that give meaning to their job. Mirbabaie and colleagues (2021) describe this as AI identity threat in the workplace: AI can negatively impact employees' identification with their job. Their research shows that perceived change of work and perceived loss of status position leads to high AI identity threat. As a result of that, employees may perceive loss of self-esteem in the sense of worth, competence, and authenticity (Craig et al., 2019). Among the interviewed designers, the loss of worth and authenticity in their work are their biggest concerns.

High energy usage - Background conditions are important for successful functioning of a product (Dorrestijn, 2017). Looking at technical products this means that they often need an infrastructure to support it. Although this infrastructure is there for AI tools, it has its downside. Training and using AI models is considered computationally intensive and therefore costs a lot of energy (Van Wynsbergh, 2021; Hua et al., 2024), which has a negative impact on the environment. Design agencies are aware of this impact, although there is some uncertainty about the real numbers of energy consumptions. For some of the agencies this weighs strongly for the adoption decision. These designers are discouraged from using AI due to its high energy demands, because it conflicts with their sustainability values.



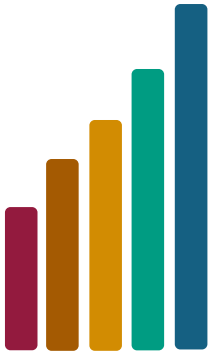
Safety and Privacy - The last subject that was briefly mentioned by designers and AI experts is privacy. AI experts noted that there are some concerns about privacy, because there is no transparency about using user data for training and improving the AI systems. Designers' limited awareness of rules and regulations creates discomforts about data security and raises concerns regarding NDAs.

Besides that, there is uncertainty around ownership of AI-generated content. This raises questions: is the intellectual property owned by the user, the developer, or the data provider? This creates unease around plagiarism and originality.

Biases - Biases in AI models were mentioned as a negative impact of AI. This is one of the reasons designers seemed to have less trust in the output quality. LLMs are trained to act in a certain way and learn how to make decisions based on training data. This data can contain biased human decisions or reflect historical or social inequities (Manyika et al., 2019). This can negatively affect people with certain characteristics as the information can be misleading (Zhong et al., 2024). A good example of this effect is the Amazon AI recruitment tool,developed in 2014. They trained the AI tool with 10 years' worth of résumés they received, but because the tech industry is male-dominated most of these résumés came from men (Winick, 2018). The result was that the system accidently was trained to pick male candidates over female candidates. The type of training data influences the output of an AI system, which can change people's behaviour or objectives about a certain subject. Although this is already an older example and AI models have since increased in quality, it is still important to be aware that biases can creep into algorithms in several ways, without the developers noticing. Therefore, critical thinking skills and checking the output are very important.

Behaviour change - Behaviour change is not a bad thing, but it can become one if the behaviour changes for the worse. The biggest concern that arose from this research were things like AI makes the user lazy, impatient and less critical.

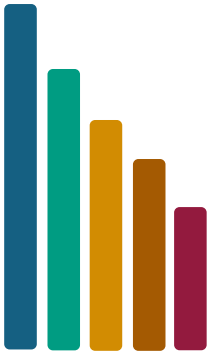
Designers want the future with AI to be a collaboration between humans and AI systems. They want an AI to be some sort of colleague who you can ask questions whenever you want. Retkowsky and colleagues (2024) found something similar: employees go to ChatGPT instead of to colleagues for advice. Although a collaboration between humans and AI systems might sound positive, there are some negative aspects about this approach. As Azeem et al. (2021) state: internal knowledge sharing and integration is important for organizational learning, and the lack of this can result in competitive disadvantages.



Retkowsky and colleagues (2024) also found that employees use LLMs to search for information to make first drafts or to validate work. This research showed similar behaviour at design agencies. A side effect of this behaviour is the chance that low quality knowledge sneaks into the organization (Retkowsky et al., 2024). With employees working more and more with AI tools and become more intertwined with the technology, it might become difficult to control the quality of knowledge within an organization (Retkowsky et al., 2024)

Decreases creativity - In interviews with design agencies, discussions arose about how using AI in the design process influences the image of a design agency. Designers agreed that if a lot of design agencies start to use AI for the design process, not using AI could be a unique selling point. They also think that if a design agency aims for sustainability, not using AI could strengthen this message. The same goes for creativity, if people value craftsmanship or human creativity, not using AI sends out the desired message.

Based on interviews with design agencies, designers experience AI tools both as enrichment and constraint. Some designers feel like GenAI tools take away their creativity, because these tools generate the images, and you don't have to think anymore. Leading to loss of essential skills, creative identity, or control over their work. Others view it as an extension of human creativity. GenAI tools help them to better visualize the ideas in their head. They also use the output from an AI as input for their own creative process. More research shows these mixed feelings about the influence of AI on creativity and creative jobs. Inie and colleagues (2023) say that the potential "threats" these GenAI tools pose for creatives lies in their ability to generate high quality content fast, to increase content variety, and that they can personalize their content easier. Others state that text generated by LLMs generally have a low level of originality, since the texts are combinations of existing ideas (Hua et al., 2024). AI experts and design educators agree with this, they noted that writing styles are disappearing due to LLM usage. At the same time, creatives express curiosity and excitement about this new technology and the potential it might have (Inie et al., 2023).



4.5. Personas

During the interviews, some characteristics and attitudes were observed. These observations showed similarities with the DOI adopter characters described by Rogers (2003). Within this research the following three personas (with their corresponding adopter category) were found:

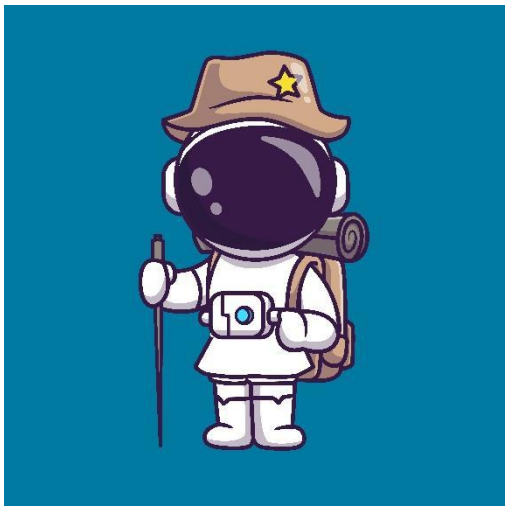
The Explorer (early majority) tries out popular and accessible tools. They are motivated by efficiency and adopt tools relatively quickly, but they tend to accept results at face value, even if quality is limited.

The Executor (late majority) has little knowledge of AI. They may try it because others do so, but they rarely experiment. If the first attempt fails, they easily stop using it. They want the technology to work. They are often sceptical of AI, seeing it as something that encourages laziness. Their lack of understanding makes them more prone to misuse.

The Innovator (early adopter) invests time to explore AI in depth. They have realistic expectations and a strong understanding of how to use AI effectively. For them, AI is a way to extend their skills, improve quality, and support creative thinking.

This paragraph gives some more in-depth information about the personas. Below these descriptions, at Table 5, an overview of all three personas connected to the factors that influence the AI adoption is presented.

4.5.1. The Explorer



People in this group use AI based tools with the sole purpose of doing tasks easier and faster. They want to increase their efficiency to spend more time on tasks they enjoy. There is minimal understanding of how AI based tools work, and they want to put minimal time and effort into understanding this. People in this group mostly look at videos where they do something similar, and copy paste that. They are curious about what AI can mean for them, but they don't want to put in the effort to find out for themselves.

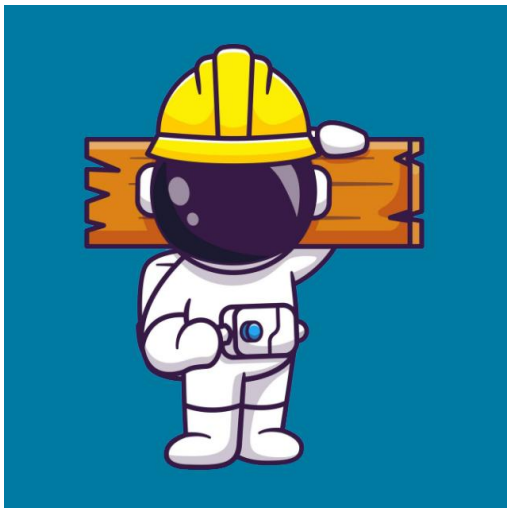
At the same time, this group expects that AI can help them increase their efficiency quite easily. They think it does not take long to acquire the right skills to work with AI based tools. This group tends to accept the output quality often. They check the output a few times by reading through it. If the output lies within their expected quality range for a couple of times, they start to trust the system and use the output without checking it thoroughly. For simple tasks, there could even be no output checking at all.

People who belong to this group are partly aware of the negative impact of AI. But the increase in efficiency they experience weighs stronger than the negative impact these AI based tools have.

These people have the same mindset about understanding AI and finding AI based tools: they want to put minimal time and effort into it. This means that they mostly use tools that are easy to find, or tools that others were positive about.

This group uses AI for the following functions: as an efficiency tool, an assistant tool, and a creative tool.

4.5.2. The Executor



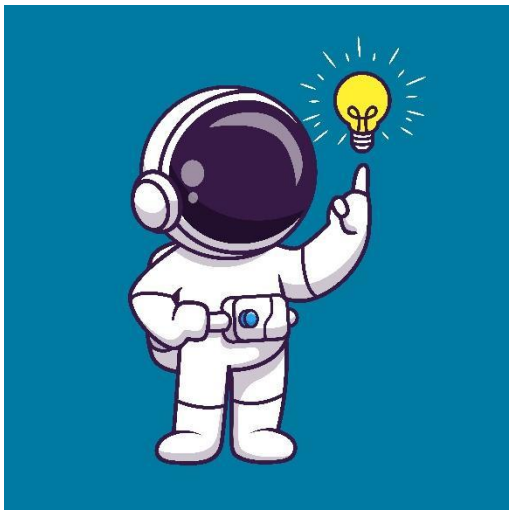
The second group has quite a negative opinion about AI due to their experiences. For this group, it is hard to get the preferred result out of AI based tools. They do not understand how to work with AI based tools, and do not want to put effort and time into trying to understand it. Their limited understanding influences their expectations. These expectations are high: an AI based tool should be better and faster than their current skills and methods. When they try an AI based tool, they expect the perfect outcome with minimal prompting. They are disappointed that the AI based tool does not meet their expectations and stop using the tool. There is no intrinsic motivation to try and understand how to work with these tools. The tools should be there to make their lives easier, and it should work perfectly.

The result is that they feel like the output is not reliable, and that they can do it better. There is little to no trust in the output quality. This is why, when it is used, it is used as a verification tool. But they only use the output if the AI generated a similar answer as the one expected.

Within this group there is also a belief that they might not have found the right application yet. They usually hear about tools from others, who are positive about a certain tool. Most of the time, those are the more popular and widely known tools. They give the newly discovered tool a try, but again, the outcome does not reach their expectations. The people in this group do not have a lot of experience with AI based tools and are not getting more experience unless a tool perfectly fits their needs the first time they use it.

There is another belief in this group: using AI makes you lazy. Some also consider it cheating. Most people in this group do not use AI. If they use it, it is sporadic and as an efficiency tool.

4.5.3. The Innovator



The people in this group have quite some understanding of AI. They have basic knowledge of the principles behind these AI based tools and they know how to use the tools in a way that suits them. They do not necessarily have a background in computer science, but they know more than average about the application of AI in their field. They gained this knowledge by putting time and effort into learning about this subject. This happens both during work time and in their free time. They are intrinsically motivated to learn about this subject and are okay with a trial-and-error approach while learning about and experimenting with new tools. These errors help them to better understand limitations of the tool.

This group already worked a lot with AI based tools and adjusted their expectations to what they learned from experimenting with it. Therefore, their expectations are often in line with what is feasible.

The output quality this group gets is high. That is mainly because they often know how to write the right prompt. And if the output is not what they wanted, they continue to work on it until the result is (close to) what they envisioned. In general, they acquired the right skills in terms of prompting to get good output quality. At the same time, they are still strict about the output. They evaluate and check the output thoroughly: they would not just copy and paste output.

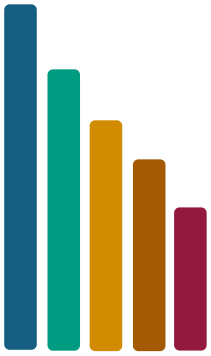
The people in this group are well-informed about the negative impact of AI. They take this into consideration while using AI based tools. They are cautious about privacy when it comes to AI and therefore do not share sensitive information. In a lot of ways, the pros still weigh out the cons and therefore they keep using it.

The tools they use vary a lot, because they put more effort into finding a tool that fits them. They inform themselves about different tools and surround themselves with a network of AI experts and enthusiasts. This makes it quite easy for them to stumble upon different tools and to learn more easily about their applications.

People who belong to this group often use AI based tools as a tool to extend their skillset, improve the quality of their work, and as a creative tool. Most of the time their efficiency increases, but that’s not necessarily their goal. They want to go more in-depth with AI tools and use it as an extension of themselves to accomplish more. This group does not see AI based tools as an assistant, but as more than that. AI based tools, especially LLMs, function as a work partner. They work together with AI.

Table 5. Overview of the three personas related to the adoption factors.

	The Explorer	The Executor	The Innovator
Understanding AI	Limited understanding	No understanding	Understands it to a certain extent
Time to learn	Copies and pastes techniques from videos.	Give it one try to get the right result.	Put a few hours per week in experimenting.
Intrinsic motivation	Slightly motivated for personal gain.	No intrinsic motivation to dive into it.	Motivated to keep learning and staying up to date.
Expectations of AI	Helps increase their efficiency quite easily.	High expectations that are hard to meet.	Realistic. Adjusts their expectations based on their experiences.
Output quality	Accept the output quality quite easily.	Little to no trust in the output quality. Hard to get the preferred result.	High output quality. They continue until their preferred result is generated.
Negative impact AI	Partly aware, but pros weigh out cons.	"AI makes you lazy."	Well-informed and take this information into consideration while using AI.
Discoverability tools	Use the popular tools and the ones they hear others talk about.	Only use popular and widely known tools.	Puts more effort into finding tools that fit them.
Function AI	Efficiency Assistant Creative	Efficiency	Skill-extension Improving quality Creative



4.6. AI Implementation

Designers seem to struggle with understanding AI, having realistic expectations and discovering GenAI tools that both fit their standards and align with their conditions. To overcome these first hurdles, each design agency received a personal AI support document including information about relevant tools, how to use them, tips and tricks, and expectations about the tools. When the interviews about implementation took place, most design agencies seemed to be at AI maturity level 2: as a result of this research, awareness about AI within these companies has grown, there are debates about how AI impacts their work, and employees educate themselves about the technology. At this level, companies take their first implementation steps, but do not align AI with the organizational goals yet.

4.6.1. Challenges

By monitoring the design agencies and organizing focus groups, some challenges were found that hinder the AI implementation.

AI experts - Maturity models state that at this point in their AI journey, a company should have an AI-expert (Pringle et al., 2018). This seems like a good step to create more awareness around AI and to gain knowledge. However, this is not a viable option for design agencies. These design agencies have a maximum of around 15 employees. They do not have the means for one employee to drop part of their tasks to focus on AI or to invest and hire a new employee to take on that responsibility. For companies of such small size, it is more about growing and learning together as a team.

Time consuming - As previously stated, AI tools are time consuming. This was mainly based on how much time it takes to understand the tool. While working more with AI tools, designers found other ways in which this technology is time consuming. They first noted the waiting time for output, although this seems to happen rarely. Additionally, the output of LLMs often contains a lot of text, not all of which is relevant. Reviewing, checking, and evaluating this can be time consuming.

Client communication and expectation management - Concerns arose among designers about the communication with clients about AI usage for projects. As design agencies become aware of their own unrealistic expectations of AI tools, they fear that clients might still have these expectations. Being transparent about AI could lead to clients making unrealistic demands; believing design agencies can do the same work in only a fraction of the time, or clients who believe they can achieve the same results themselves. Although none of the design agencies experienced this, it raises questions about the communication of AI usage. They feel it might reduce the perceived value of professional design services.

4.6.2. Needs

So, there were some issues that made implementation of AI more difficult. But what is it that design agencies need? Observing and interviewing the design agencies in their implementation process, together with focus groups about implementation and the future of AI helped to get a better understanding of this. The most important thing: they need a plan.

The questionnaires showed that the companies do communicate about AI, but most of it stops there (Figure 14). They tend to talk but not make any agreements on how to use it. This makes it harder for designers to implement it in their workflow. Designers expressed the need for some agreements or conditions for AI usage.

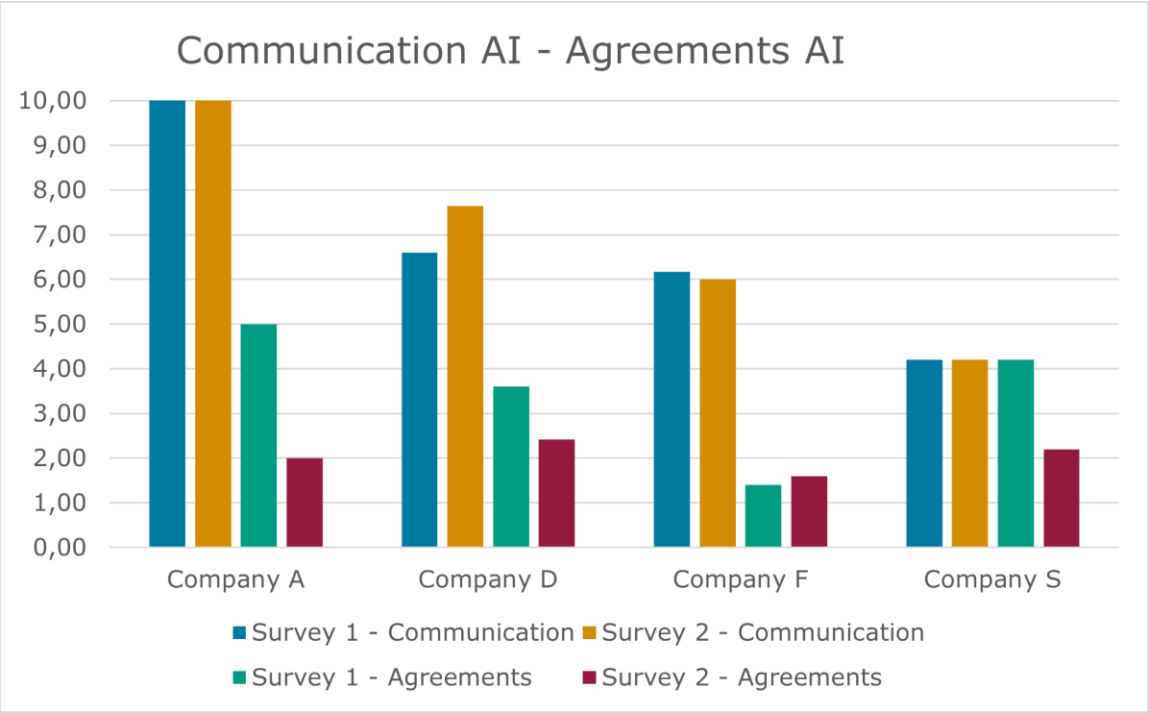


Figure 14. Communication AI and agreements AI at four design agencies.

Figure 15 shows results of the focus group about AI implementation. It gives the conditions for design agencies to come up with an implementation plan which helps to further integrate AI into the design process.

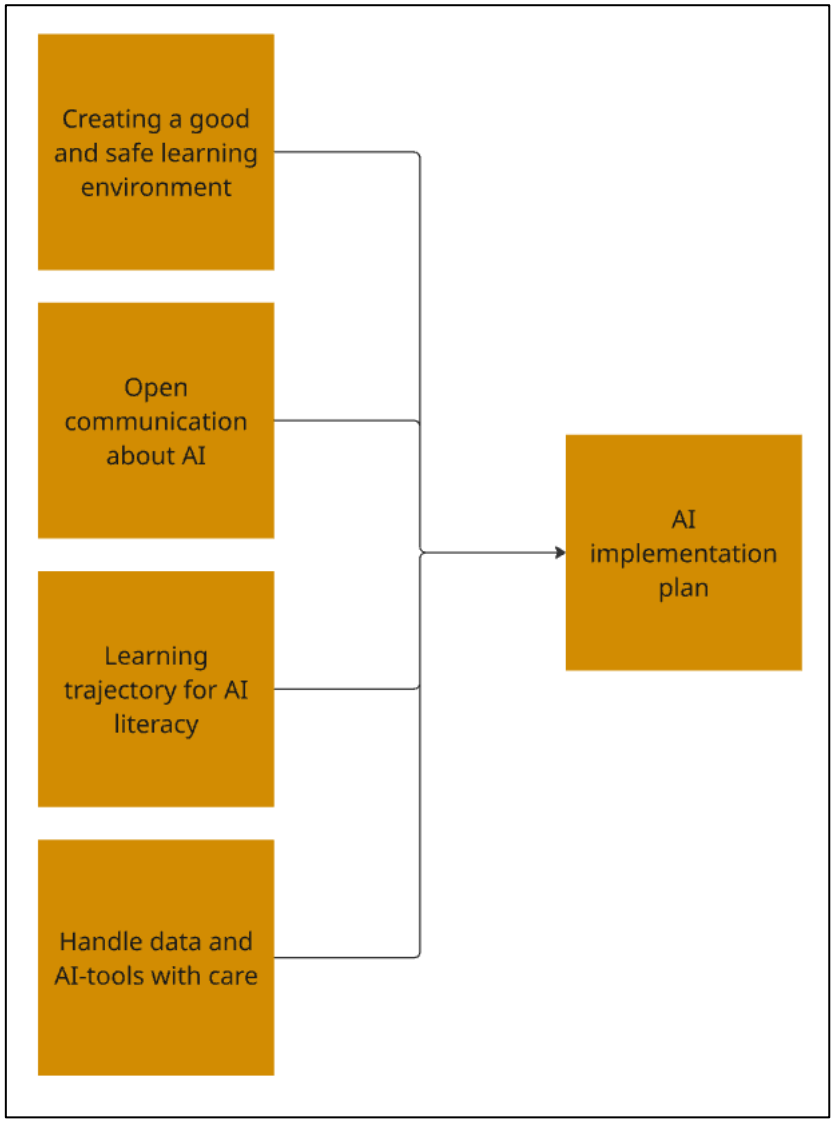


Figure 15. Designers' conditions for better AI implementation.

Creating a good and safe learning environment - Eventually designers want AI to be supportive, enriching and inspiring to their design process. Figure 16 illustrates the process of moving from the current situation (AI is new and chaotic) toward the desired one. This requires an iterative learning process: trying out new things, reflecting on the outcomes, and learning together about AI and its applications. As new knowledge is gained and more successful use cases emerge, the understanding of AI grows.

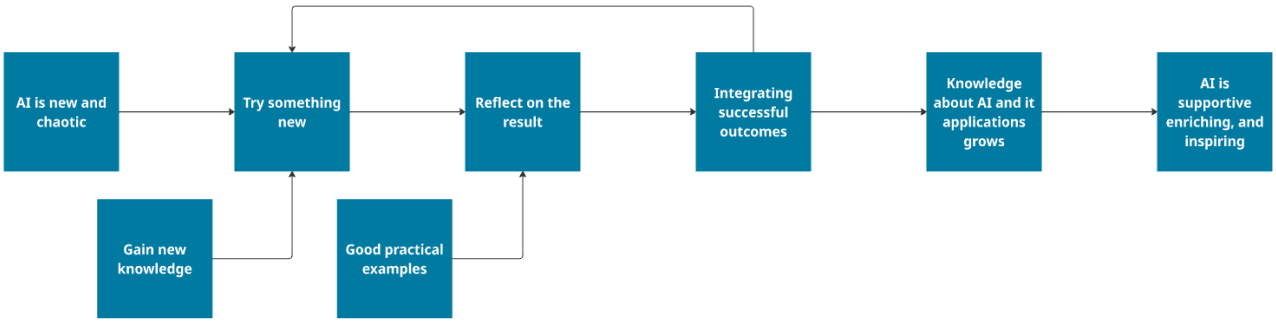


Figure 16. Iterative learning process for AI implementation.

So to implement AI, designers need the creation of a safe and supportive learning environment that enables the iterative learning process. This also means being aware of the unrealistic expectations design agencies have regarding AI, letting go of those unrealistic expectations and acknowledging that learning to use AI involves trial and error. Designers need time and space to experiment with AI tools without the pressure to produce results. Sharing both success stories and less successful attempts within the team helps normalize the learning process and builds collective knowledge. Structured reflection moments, such as peer sessions to exchange experiences and evaluate outcomes, further support this learning. Designers stated that this exchange should not be limited to internal teams but can also take place between design agencies, contributing to a broader and more open learning culture. They are all trying to figure it out and would like each other's help.

Open communication about AI - When it comes to integrating AI into the design process, open communication is essential. Designers express a desire to talk about how AI is used, what it can do, and what they hope it might offer in the future. This helps them to navigate the AI implementation on a longer term. Just as important is open communication about concerns and uncertainties. Open conversations help teams collectively explore what AI means for their profession and support a shared understanding of its role. Transparency about AI usage builds trust, both within the team and with clients.

Open communication also means that there is room for scepticism; designers want to express their opinions without judgement. By sharing different perspectives, designers can learn from each other and challenge assumptions. This helps designers to move beyond beliefs that limit their AI journey, like the idea that using AI is “cheating,” that it lowers the value of one’s work, or that it reduces creativity. Creating room for honest dialogue encourages critical reflection.

Learning trajectory for AI literacy - To support effective and responsible AI use, design agencies benefit from structured learning trajectories aimed to increase AI literacy. This includes following targeted courses for specific AI tools or use cases relevant to design practice. These courses could differ for each design company, based on their needs and values. Such training helps employees build practical skills and better understand the capabilities and limitations of AI in the design process.

Peer group coaching is also considered valuable for increasing AI literacy. Reflecting together on their experiences with AI encourages peer learning and development.

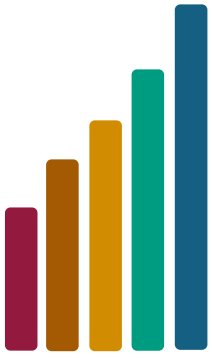
Finally, some people stated that offering a certificate or formal recognition for responsible AI usage can give both employees and companies a shared sense of accountability and professionalism. It signals that they not only experiment with AI but also apply it thoughtfully and ethically within their design processes. It also adds to building trust in AI.

Handle data and AI tools with care - Due to concerns about data security and privacy, design agencies want more awareness and knowledge about how AI models handle input data. Designers need to understand the privacy risks of using AI tools. They feel that using open-source tools or tools that allow for local data storage offer more control and transparency.

It was also noted that AI output should always be treated as advice and never as a final decision-maker. Designers want to stay responsible for interpreting results by critical thinking, and they want to ensure outcomes align with their values and knowledge.

AI implementation plan - A clear plan can support designers in implementing AI effectively. It is important that design agencies define goals and identify what is needed to achieve them. This includes creating the conditions for the use of AI that aligns with their values. This results in clear agreements about when to use or not to use AI. Once goals, conditions, and agreements are established, agencies can select suitable AI tools and apply them to use cases.

Establishing conditions for AI usage helps design agencies in their communication to clients. Design agencies can assure their clients that they take responsibility to ethically use AI and that it aligns with their values.



4.6.3. AI Journey Companies

This paragraph first outlines the shared experiences of design agencies in their AI journey, followed by specific findings for each individual company.

Motivation drops - The motivation to experiment with AI tools dropped over time at most design agencies. As shown in the questionnaires, three out of the four companies experienced a decline in motivation (Figure 17). The companies that started with the most enthusiasm showed the biggest decrease. In interviews, designers described a recurring pattern: the excitement of discovering a new tool, followed by frustrations as they bump into its limitations. When the tool failed to meet expectations, it often got rejected for that specific task.

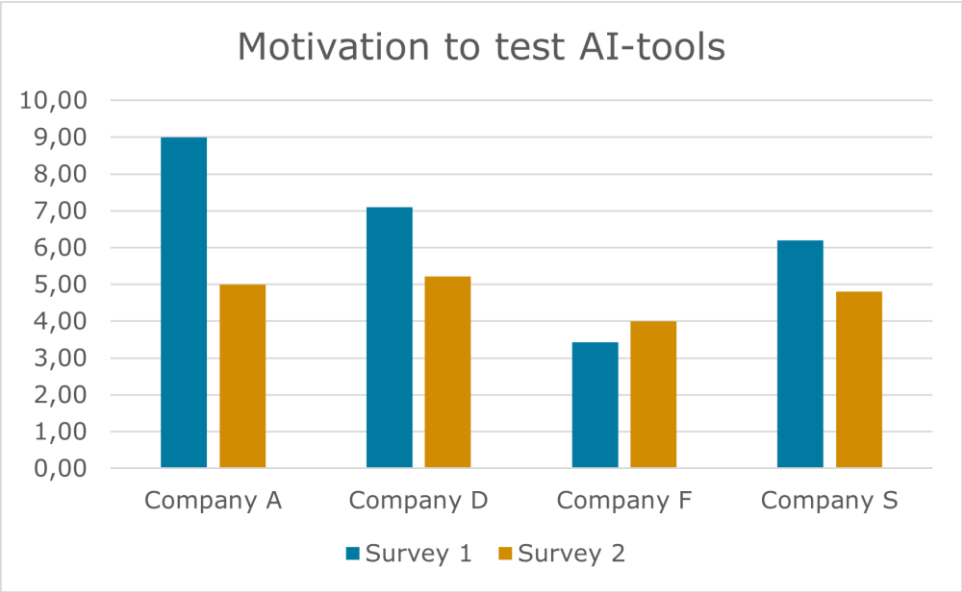


Figure 17. Motivation drops at design agencies while experimenting with AI tools.

This pattern seems to mirror the dynamic of Gartner's hype cycle (n.d.). Designers were initially inspired by the success stories of others, without having faced its practical challenges. The reality set in: tools did not function as hoped or did not fit perfectly in the design process. Part of the design agencies were motivated due to fear of lagging behind. The new insight caused that urgency to fade.

Realistic expectations - One of the most valuable lessons designers took from experimenting with AI was developing more realistic expectations. Initial fears, like AI replacing creative work or enabling laziness were mostly resolved through hands-on experience. Designers learned that AI is not a magical solution, but a developing technology with clear limitations. It can improve efficiency and enhance quality for certain tasks, but it still requires a significant amount of

human input. The fear that it takes over their jobs is lessened, because designers feel that it will probably only slightly shift their role.

Understanding this helped designers to recognize both the strengths and limits of AI more easily. They figured out that generating high-quality results takes time, effort, and the right tools, prompts and context. This understanding helped designers move from hype to practical use.

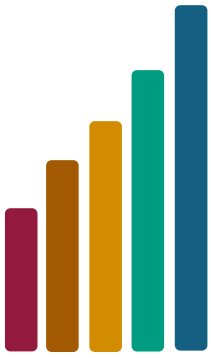
Sharing success stories - Most design agencies experienced that sharing success stories about AI tools and use cases helped them in their AI journey. Thanks to open communication about it, they became more enthusiastic about certain tools, were inspired by use cases, and wanted to try it for themselves. It helps designers to get a better overview of the relevant tools, and they learn more about the practical implementation. This seemed like a good way to experiment more sustainably, because you do not have to do it all by yourself and you have your colleagues to fall back on.

Sharing success stories now remained within the company, but each of the companies also liked to exchange knowledge with other design agencies. This boosts motivation to experiment with AI and increases the collective knowledge about AI. In that way, the discoverability of AI tools and number of use cases increases even more.

Reading - Most designers who experimented with the AI tools did only partly read the AI support document. They just went to the parts that seemed most relevant at the time. When they struggle with AI tools, they tend to read the support document for some extra help. Most of the designers preferred to look up YouTube videos that explain the tools.

Maturity level - At the beginning of this research, Companies D, F and S were all at maturity level 1. All these companies gained more awareness about AI and its ethical considerations. They gained knowledge about AI which resulted in more realistic expectations of the technology. This shows a shift towards maturity level 2.

Most companies expressed open conversations and/or learning moments as next steps in their AI journey. This indicates that they are already moving towards level 3.



4.6.3.1. Company A

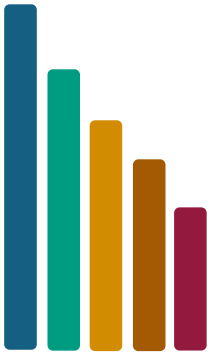
Company A started their experimenting phase with a lot of enthusiasm. They were intrigued by the potential of AI to increase efficiency and spark creativity. The designers at company A mainly used the tool Vizcom, which fitted nicely in the workflow. Vizcom enabled the designers to steer the creative process better and to generate a lot of visual variations. It helped them to communicate the ideas in their head better. This made the process faster and the outcome more diverse. It was successful for the ideation phase, but for detailing and materialization, traditional methods were still required. They were unable to steer Vizcom on a detailed level.

Despite the initial excitement, the motivation to test tools dropped. This is something the company recognizes as a recurring pattern. It is like their earlier innovation attempts: a student or external party is brought in, enthusiasm rises, and when the external factor leaves, the enthusiasm drops and implementation does not follow. This leaves them at maturity level 2.

Company A states that they would benefit from exploratory sessions in which they can experiment, learn and understand the strengths and limits of AI tools. According to them this needs to happen without feeling pressure about project hours. The goal for these sessions would not be efficiency, but meaningful creative collaboration. As they put it: “If AI supports our creativity without taking over, we are on board.”

4.6.3.2. Company B

Company B started to use AI tools more often, especially LLMs for simple tasks like writing mails and asking simple questions. Within the company, some informal discussion took place about AI during the lunchbreaks. There is currently no intention to discuss this subject more formally because of their limited use for AI. Once they start to see more potential for their work and AI is going to play a larger role within their concept phase, they want to introduce formal meetings. The high energy consumption of AI models is also still an important reason for their limited AI usage.



4.6.3.3. Company C

Company C nicely followed the hype cycle. The employees at Company C started out enthusiastic, but after some experimenting, they seem to get disappointed by the output of AI tools. Their motivation drops and they tend to become even more frustrated when it does not work the way they intended it to. At some point, their expectation lowered, and they were able to use the limits of AI tools to decide how to use the capabilities of the tool.

AI is not openly discussed within the company. Discussions happened a bit due to this research, but the company feels that there is still room for improvement. The employees have the need for these discussions so they can talk about ethical considerations and make agreements accordingly.

Having open conversations about AI also helps them understand how others use AI which could increase their own knowledge. Company C believes that openly discussing AI normalizes its usage. Because they work quite individually at Company C, little knowledge is shared.

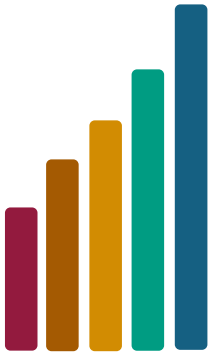
4.6.3.4. Company D

Although their answers to both questionnaires (Appendix G.3) indicate that Company D used AI tools less often during this research, they stated in the interviews that they have been using more AI in their workflow. The questionnaire showed that for this company the motivation to try new AI tools dropped as well. Company D mentioned that although this happened, the topic of AI is more openly discussed within the organization. These conversations even led to a reflection on organizational culture and how AI fits it there.

They also said that over time, more employees began sharing their experiences, making AI usage more widespread. Hearing each other's success stories helps Company D to slowly and more naturally integrate AI tools in their workflow. They now have more realistic expectations about AI and therefore feel less pressure to adopt AI tools.

Company D also learned that appointing one internal AI expert does not fit their culture. They prefer collective learning through internal sessions in which they gain more hands-on knowledge. This would help to create broader support and understanding within their company.

The next step for Company D would be to take their own design process as a base, look at what they want to improve and how AI tools could help with that. That takes a slightly different approach than trying AI tools and seeing how they could fit the design process. Their goals are to embed AI in a way that more naturally integrates into their daily practices.



05 WORKSHOP

This chapter explains the process that came to the development of the workshop. It followed the last four steps of the ADDIE model: Design, Development, Implementation and Evaluation. These steps are addressed one by one.

5.1. Design

The Design phase constructs the general outline of the workshop. This phase specifies the learning process by drafting the learning objectives and maps the learning context (Davis, 2013).

The results show that design agencies benefit from open communication about AI. Sharing success stories and talking about ethical considerations help to facilitate knowledge exchange and increase awareness. Learning more about the successful and less successful stories helped designers to gain realistic expectations of AI, which takes away some of their fears. To reach all of this, companies should change to a culture that stimulates an open and safe learning environment. In addition, three personas were found, each effecting the adoption of an innovation differently. Awareness about the attitudes of these personas and the organizational culture is required for companies to change their organizational culture in such a way that it better facilitates AI adoption (Muscalu, 2014).

The goal of this workshop was to facilitate a platform for design agencies to have an open discussion about AI adoption and implementation in which they touch upon the most relevant subjects.

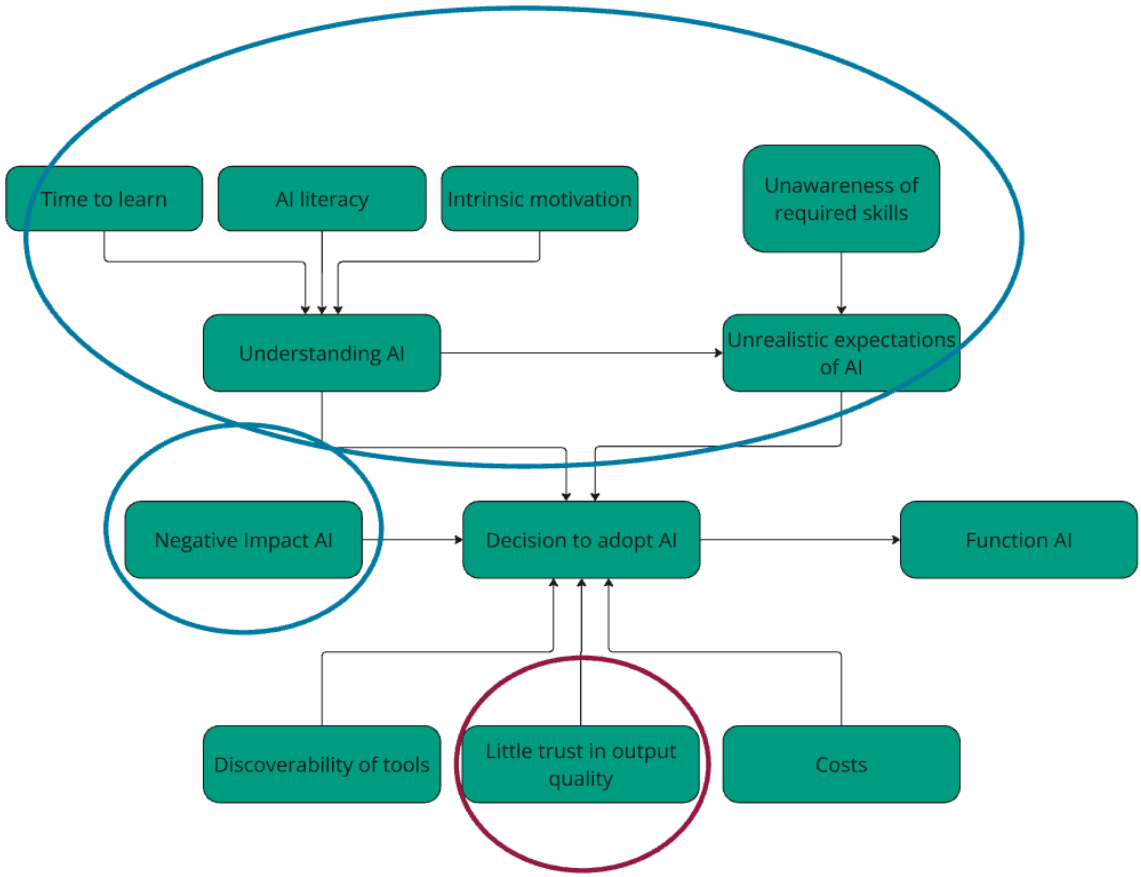


Figure 18. Factors that influence the adoption of AI within design agencies.

The adoption model as shown in Figure 18 contains some of these important subjects. Most of the aspects above are related to 'Understanding AI', 'Unrealistic expectations of AI', and 'Negative impact AI' (the blue circles). This all comes down to gaining knowledge that can be supported with the iterative learning process shown in Figure 19.

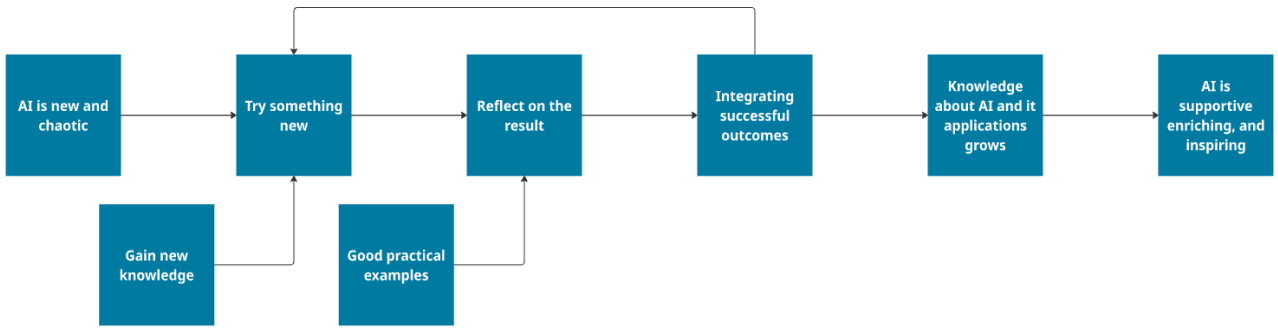


Figure 19. Iterative learning process of AI implementation.

Another adoption factor (Figure 18) is ‘Little trust in output quality’ (red circle). This factor is about gaining trust in AI. Part of gaining more trust is about experimenting and learning more about AI-tools, which is related to Understanding AI in the adoption model. Also, part of it lies in XAI which will help designers to get a better understanding of the reasoning behind AI output (Figure 20).

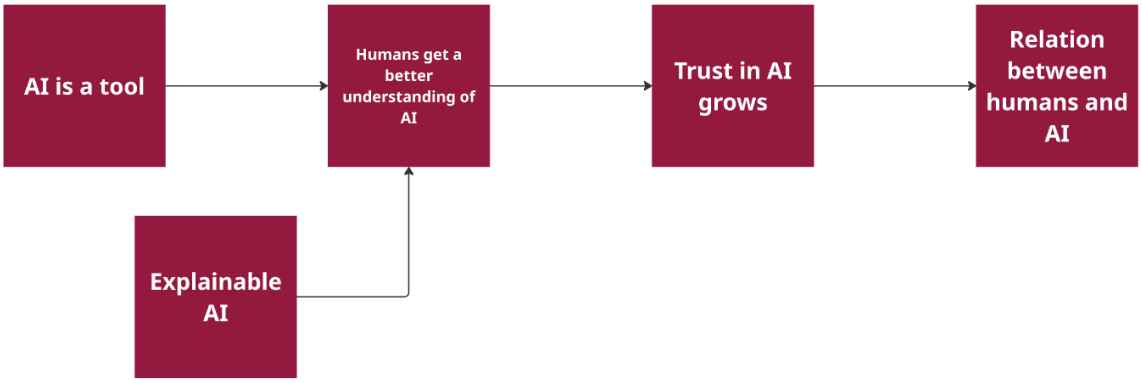


Figure 20. Building trust in AI, a result of the focus group Future AI.

With a workshop, all these aspects could be addressed. However, the adoption model (Figure 18) also shows ‘Discoverability of tools’ and ‘Costs’ as adoption factors. These aspects seem to be not relevant enough to address in a workshop. Listing different AI-tools and talking about their costs does not seem to be a great fit for the setting. The list of AI-tools is long and with all the development going on, it probably needs to be updated for every workshop. Plus, there are already quite some workshops that focus on understanding specific AI-tools. This was found while conducting a small market research, focusing on the learning objectives and target audience of AI workshops and trainings (Appendix H. Market research AI workshops).

Together with the Saxion ‘AI in Ontwerp’ project team, it was decided to develop a toolbox alongside the workshop, which would be developed by Saxion themselves. This makes sure that all the important subjects for designers are addressed, and that only the subjects that are relevant to address in a workshop format are in that workshop. Therefore, little attention is given in this report about the toolbox. *Appendix I. AI Toolbox concept* contains some images of the toolbox to paint a better picture of the idea. The toolbox addresses to following subjects:

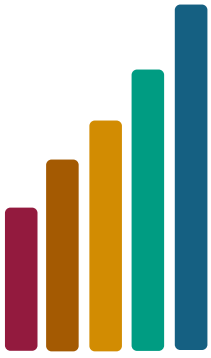
- Basic info about AI: what is it and why is it relevant for designers?
- Prompting techniques and tips for prompt writing.
- Information about personas, adoption factors and functions.
- A community page where designers can share their success stories.
- An AI chatbot that helps designers find the right AI-tools.

All things considered, the goal of the workshop would be to facilitate a space for design agency teams to openly discuss AI adoption and implementation, by addressing their adoption personas, their needs and wishes, the company culture, and ethical considerations. The preferred result would then be to construct a plan together on how to facilitate AI adoption and implementation within their team or company.

Learning objectives contributing to these goals are:

1. At the end of the workshop, the participants are aware of the individual and collective attitudes, opinions and desires of their team members about AI adoption and implementation.
2. At the end of the workshop, the participants know that sharing success stories and a safe learning environment are needed to facilitate better AI adoption and implementation.
3. At the end of the workshop, the participants are aware of the negative impact of AI and how that influences their AI adoption decision.
4. At the end of the workshop, the participants know what steps they need to take to reach their AI goals and make a start with an AI implementation plan.
5. At the end of the workshop, the participants know how to use the provided online toolbox.

The workshop will eventually be carried out by Saxion research group Industrial Design and Saxion FabLab Enschede. FabLab is a workspace where anyone can realize their ideas using machines like 3D printers, laser cutters, CNC mills and more. They offer hands-on workshops for professionals about different technologies. This workshop will be added to that. Their workshops usually take 2.5 to 3 hours, meaning that this workshop should also fit that time frame. The target group for this workshop are teams at design agencies.



5.2. Development

In this phase the learning content, exercises, and assessment will be created. This also includes identifying which learning technologies to use. This paragraph goes over the different elements of the workshop, how it connects to the learning goals and what is expected from its participants. For all sections, a picture of the corresponding slide is added for some more context (Figures 21, 22, 23, 24, 26, 27, 29 and 32).

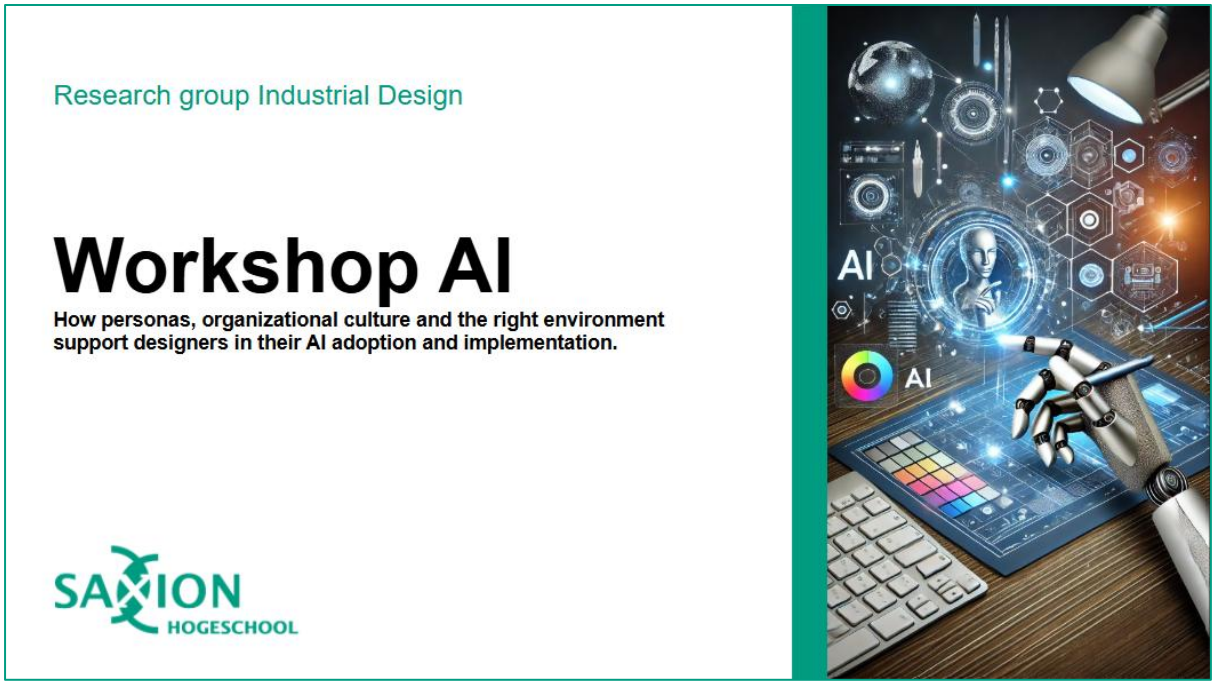


Figure 21. Workshop introduction slide

The workshop starts with in introduction in which the workshop leader welcomes everyone, does an introduction round and explains the reason for this workshop:

- Research showed that design agencies do not talk about AI a lot, which results in unrealistic expectations, a negative image of AI users and an environment where people cannot learn from each other. Now it is time to start talking.
- It also showed that smaller design agencies benefit from a situation where every member of the team joins in on the conversation, instead of management pushing it on to the employees, or one person becoming an AI-expert. It needs to be a shared learning experience.
- The workshops targeted to teams, that are currently on the market emphasise on practical use cases. The available workshops about AI implementation are only for managers. With this workshop everyone will be involved, creating more widespread support.

Then the five learning objectives are shared with the participants. Sharing learning objectives is an important step to engage the participants in the learning process and to create realistic expectations (Moss & Brookhart, 2012).

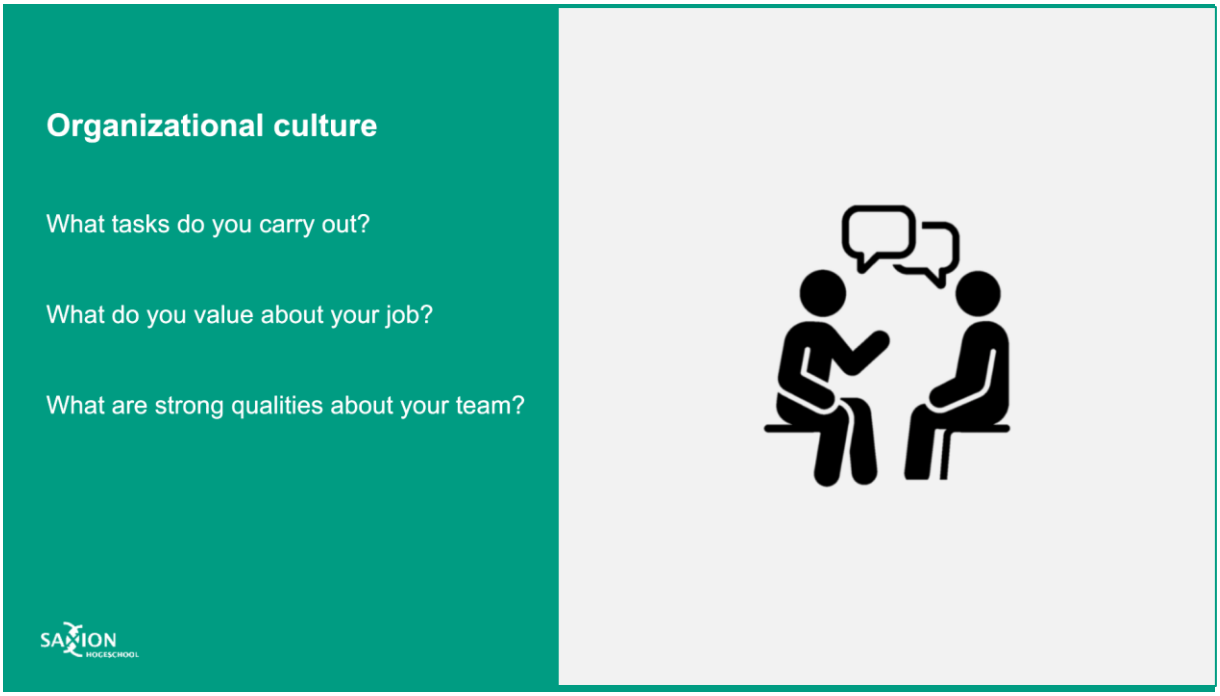


Figure 22. Organizational culture discussion slide.

After the introduction, the workshop leader starts a group discussion in which the participants discuss the values and practices within their organization. The workshop leader explains that first awareness about organizational culture is required to better facilitate the organizational change needed for AI adoption (Muscalu, 2014), which is included in learning objective 2.

A group discussion is a good learning activity to do this, as it actively involves the participants. This results in active learning, greater motivation and improved communication skills (Columbia Center for Teaching and Learning, 2021).

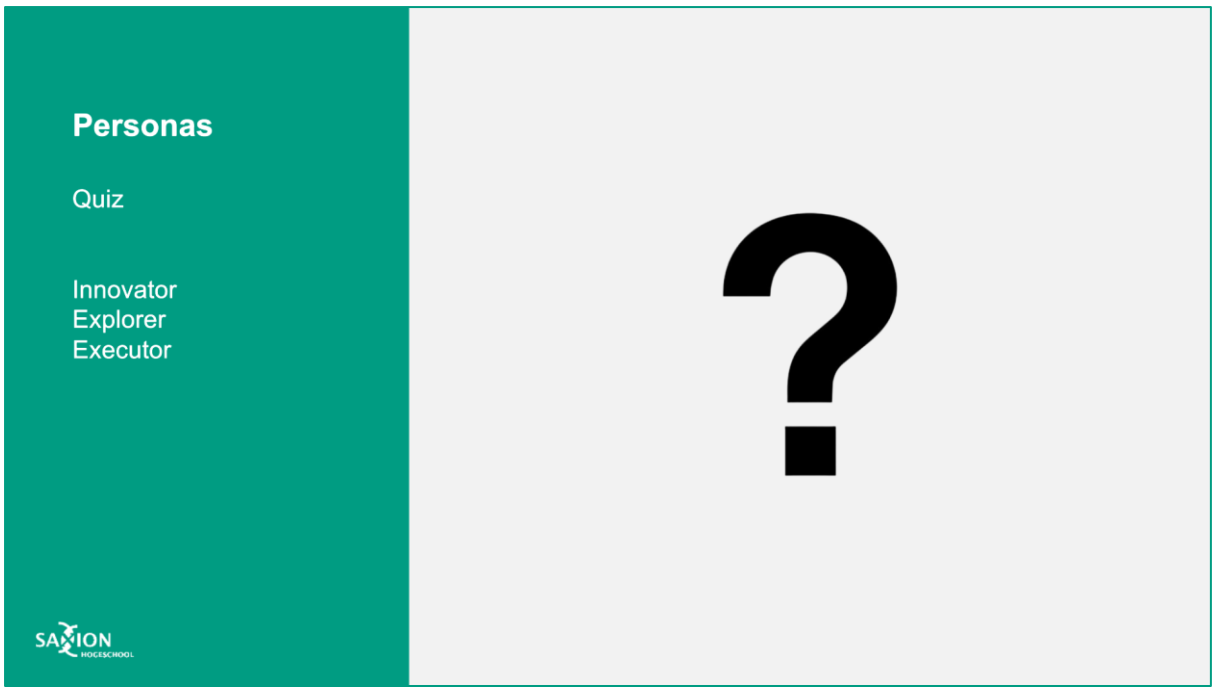


Figure 23. Personas quiz introduction slide.

During this research, the design agencies received a questionnaire twice. The questionnaire included statements that corresponded with characteristics of each of the three personas *(Appendix G2. Relation statement – measurement).* These statements were used to relate the participants to one of the adopter personas: The Innovator, The Explorer and The Executor.

This activity supports the first learning goal by creating awareness about the individual attitudes of the team members about AI adoption.

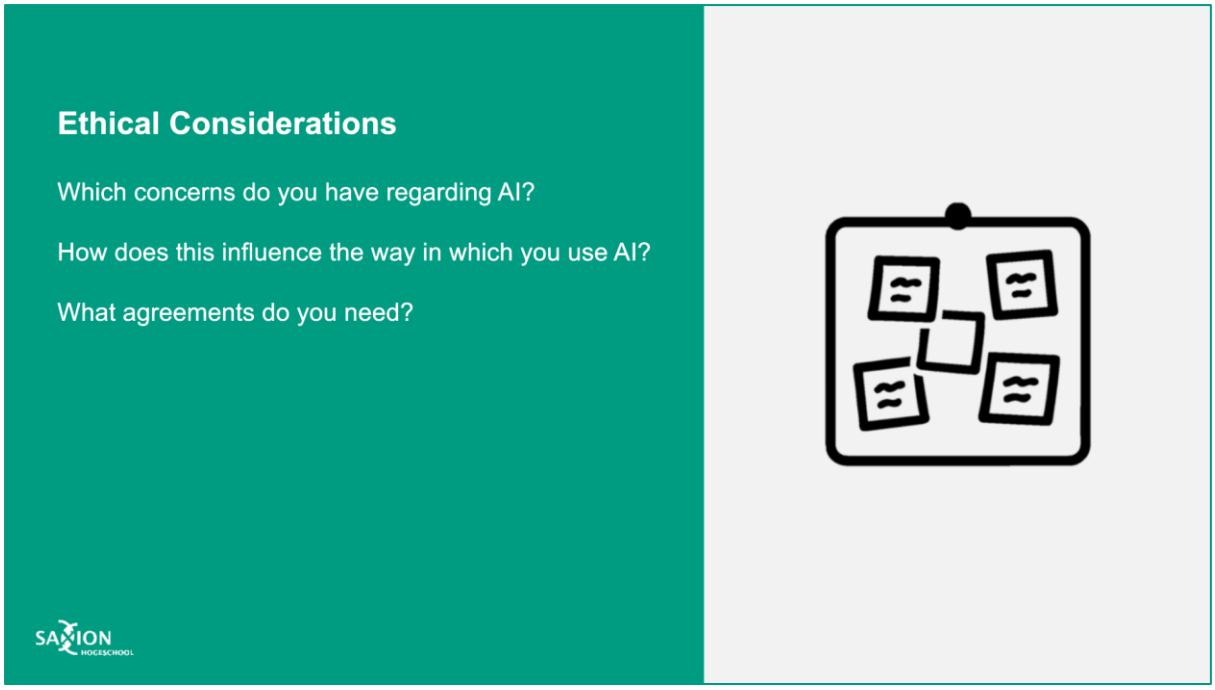


Figure 24. Ethical considerations brainstorm slide.

The next part is related to the third learning goal: making the participants aware of the negative impact of AI and how that influences their AI adoption decision. To start this process, the participants all get a stack of post-it notes, individually think about their AI concerns, write them down, and place the notes on the table. On the table are already seven bigger notes with the themes of ethical considerations found during this research (Figure 25). This helps the participants to cluster their concerns and quickly have a good overview (Matthijssen, 2024). There are also a few empty notes if any other themes come up.

These concerns will be used to start a group discussion. The goal of this discussion is to find out how important the concerns are for the participants and how they influence their AI adoption. After that, the group will create conditions under which the team would want to use AI, so they align with their values and lessen their concerns.

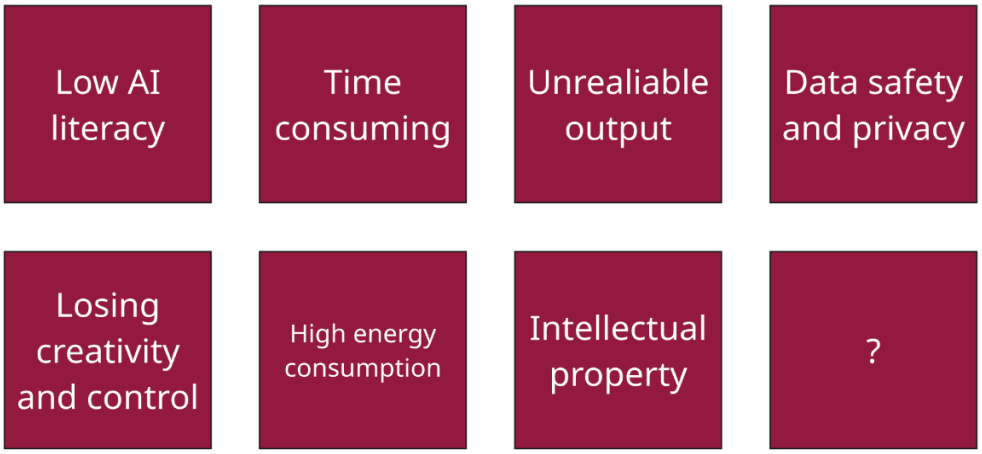


Figure 25. Cards with ethical considerations for AI adoption, as used in the workshop.

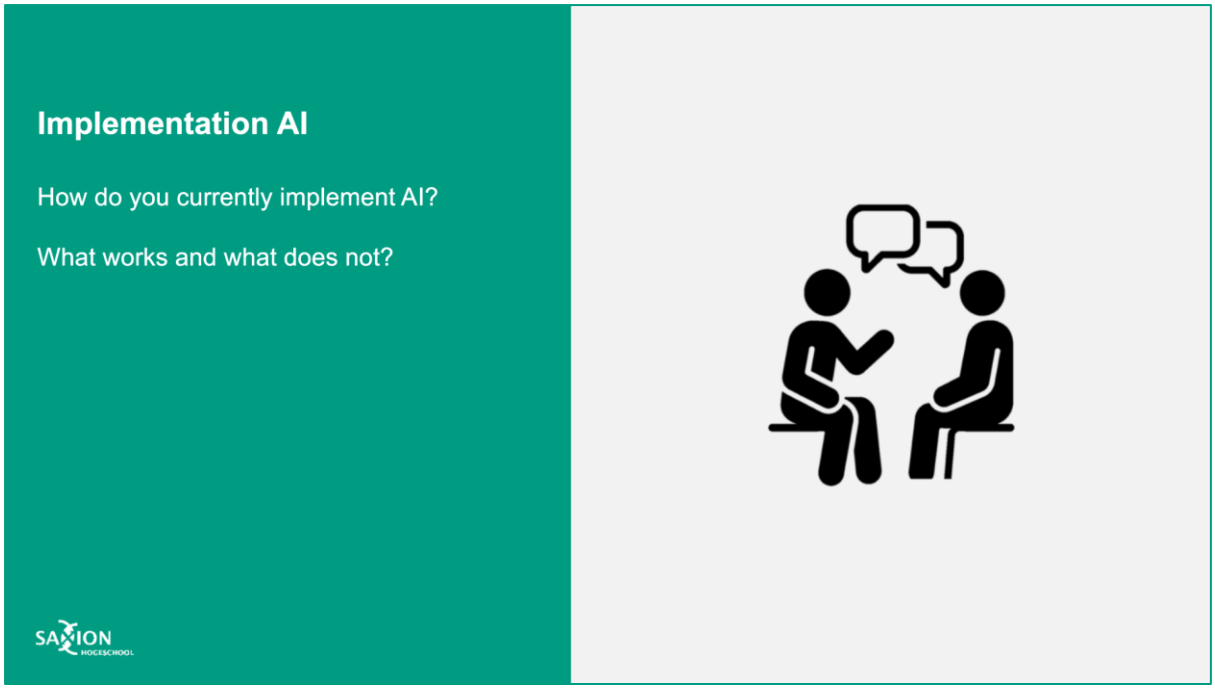


Figure 26. Implementation AI slide for the AI workshop.

Learning about the implementation of AI will also be managed by a group discussion, allowing the participants to experience the added value of sharing successful and less successful stories. It is important for the workshop leader to create a safe learning environment by fulfilling the three basic needs: autonomy, relations and competences (Ebbens & Ettekoven, 2015). It is up to the workshop leader to make sure every participant can express themself freely, feels welcome in the group and can keep up with the subject.

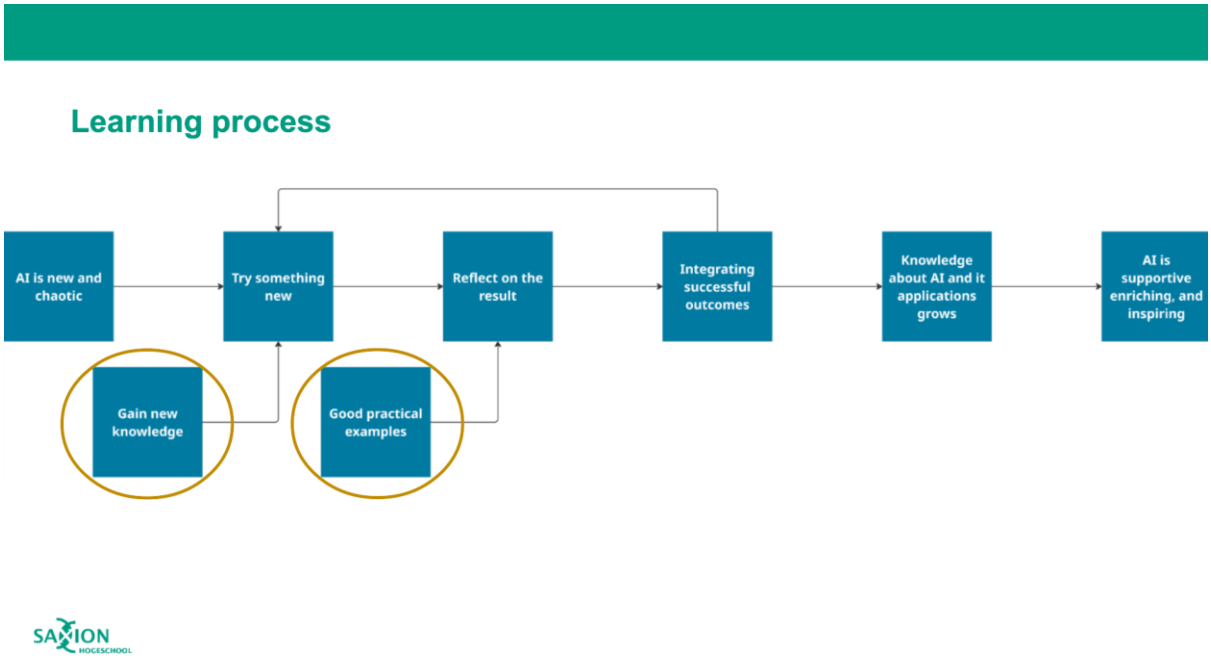


Figure 27. Iterative learning process slides highlighting the important input.

The workshop leader explains the steps of an iterative learning process and explains that gaining new knowledge and good practical examples are important inputs for this learning process. If the designers keep evolving in these areas, this will result in more successful implementation stories. Both slides relate to the second learning objective and closes off by addressing the four conditions for an AI implementation plan. Each condition is put on a card that will be put on the table for the next section (Figure 28).

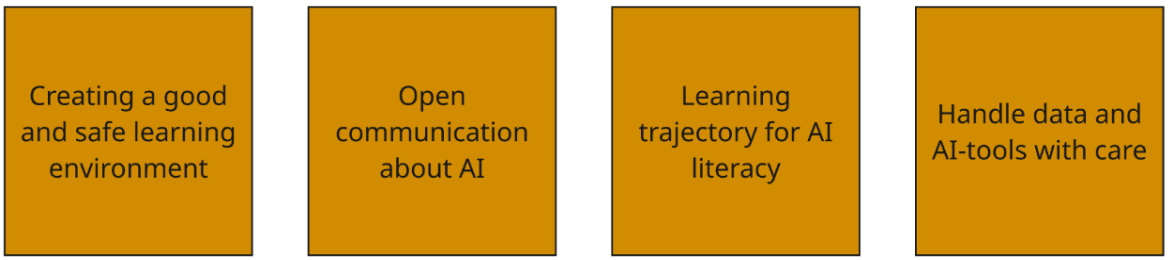


Figure 28. Four cards visualize the conditions for an AI implementation plan.

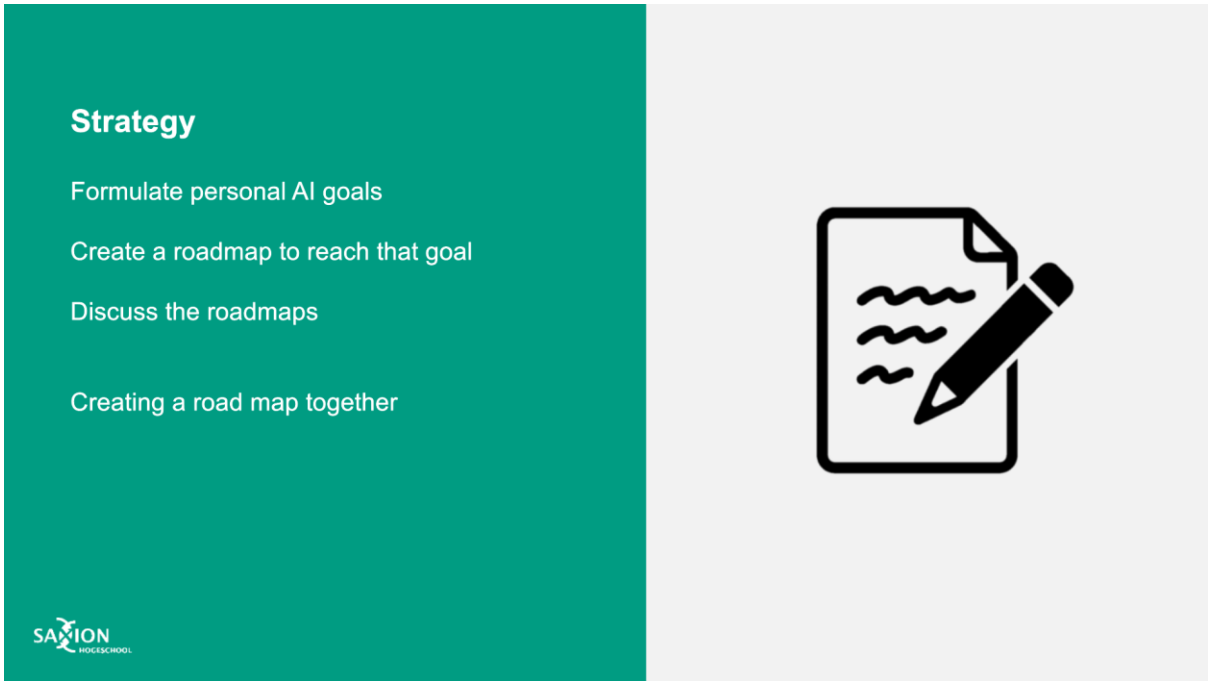


Figure 29. Strategy part of the workshop in which the participants create their own roadmap.

In this part of the workshop, the participants formulate personal AI goals and create a roadmap on how to reach these goals. This approach is similar to the one used in the focus group Future AI, as it worked really well to understand all the steps it takes to get from A to B. For the workshop, a more simplistic version was developed using only four of the eight attributes. During the previous sections, the workshop leader already collected some of the participants' answers. Their organizational culture, personal opinions and AI usage conditions are in this section used as input for the roadmap (Table 6).

First the participants think about their personal AI goals and create a roadmap for it. This allows them to practice with this approach first, and think about their needs and wishes. The participants only use the car attributes for this roadmap, making them consider the required steps only. They receive a short road with a few cars as shown in Figure 30. Afterwards all the participants share their roadmap, so they learn about each others' desires, which relates to the first learning goal.

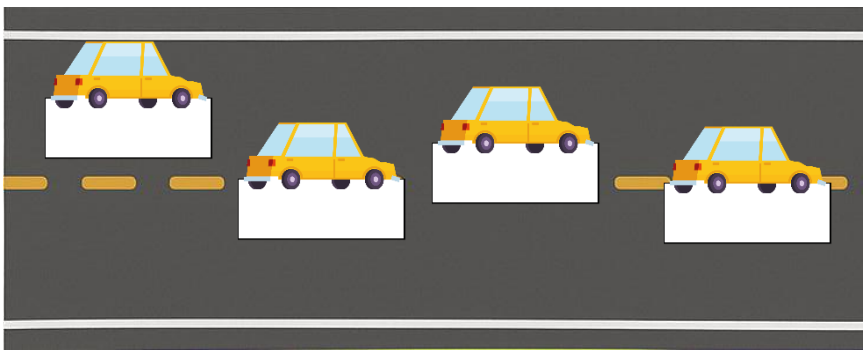


Figure 30. Personal roadmap material.

Table 6. Attributes used for the workshop roadmap.

Attribute	Name	Meaning	Workshop section
	Car	Required steps	
	Gas station	Supportive means to make the required steps	How does AI fit within the team? How can you support each other in AI adoption and implementation? What are strong team qualities? What works for individuals regarding AI implementation?
	Roadblock	Constrains	Ethical considerations What does not work regarding AI implementation?
	Police car	Rules and regulations	How does it fit within the conditions?

The strategy section concludes with the participants creating a roadmap together, based on a goal they want to work on as a team. This supports the teams in the fourth learning objective: understanding the required steps to reach their AI goals. It also teaches the participants to look at goals from both perspectives: what is needed at the beginning, what is needed at the end and which steps need to be taken to meet each other in the middle.

During the roadmap all participants are allowed to bring in all subjects they feel are relevant. The factors for a good implementation plan and the themes that arose from the ethical consideration section are also cards they can use for guidance. Figure 31 shows how this could look like during the workshop.

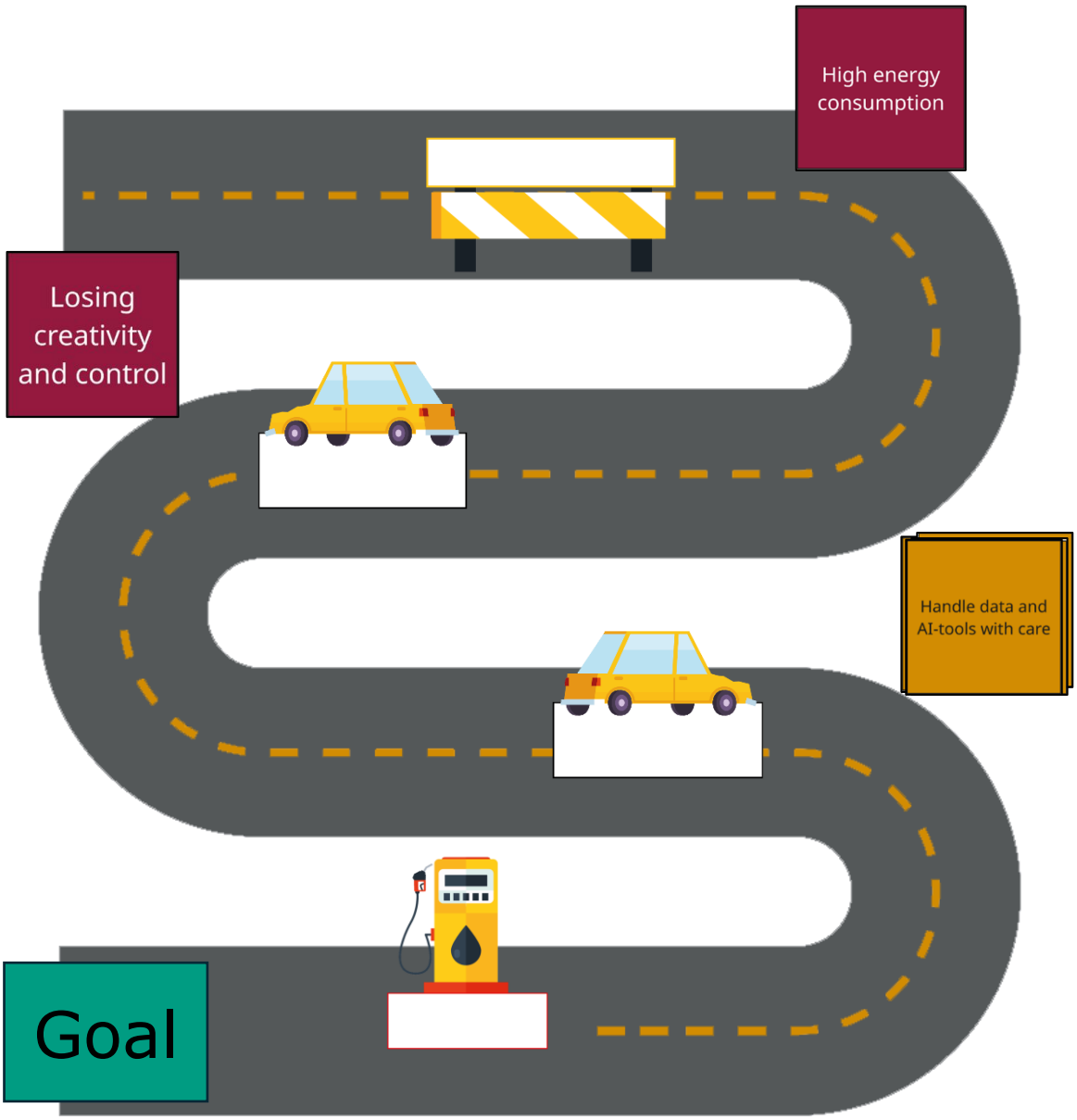


Figure 31. Collective roadmap example during the workshop.

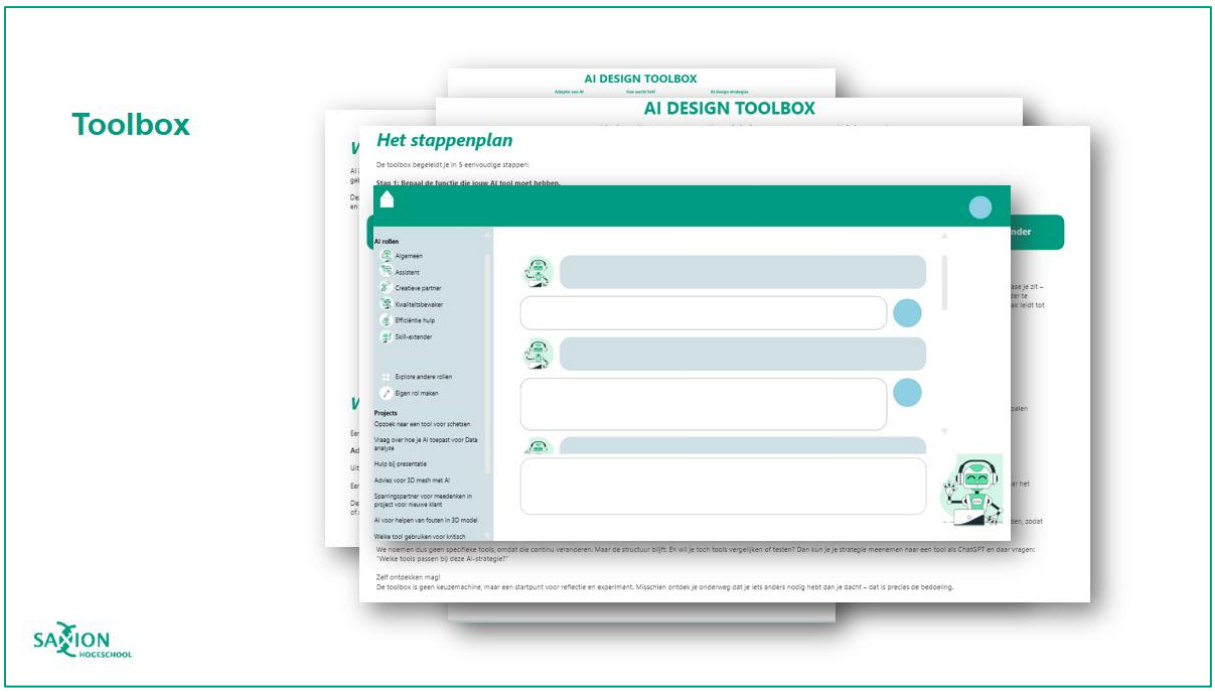


Figure 32. Slide about the toolbox related to the workshop.

The workshop ends with some practical information about the toolbox. Now that the design team has had a moment to openly discuss relevant AI adoption and implementation themes, it is time for more practical information about the tools. The workshop leader goes over the different toolbox pages and gives a brief explanation about its features, such as:

- Basic info about AI: what is it and why is it relevant for designers?
- Prompting techniques and tips for prompt writing.
- Information about personas, adoption factors and functions.
- The community page where designers can share their success stories: how to look up use cases and add your own.
- An AI chatbot that helps designers find the right AI-tools: how to start a chat and what to expect from its output.

5.3. Implementation

The workshop plan is set, which means it is implementation time. The implementation phase includes testing the educational material with the target group. Also, the instruction for the instructors is included in this phase.

Figure 33. Picture taken during the pilot workshop

The test group for the workshop was a group of five teachers related to the study program Industrieel Product Ontwerpen at Saxion. The workshop was given in one of their meeting rooms (Figure 33 shows). Although they are not the target group, testing the workshop with them seemed more valuable. All the teachers have at least a few years of experience as an industrial design engineer, and as teachers. It makes them a great group to evaluate the workshop with, because they can evaluate from different relevant perspectives: both design and education. Another important aspect is that during the initial interview, some teachers mentioned that they struggle with the lack of AI vision in their team.

The presentation for the workshop contains all the information and instructions the workshop leader needs to facilitate it. Also, someone from the Saxion research group Industrial Design attended the test workshop to have an example on how to facilitate this workshop.

5.4. Evaluation

The last step of the ADDIE model is Evaluation. This phase assesses whether the workshop got the desired learning outcome and identifies areas where it could improve. The evaluation is based on Kirkpatrick's training evaluation model, which consist of four levels (Kirkpatrick & Kirkpatrick, 2007):

1. **Reaction** represents the reaction of the participants to the workshop, including the process and feelings about the learning material and instructor.
2. **Learning** measures how much the participants have learned during the workshop.
3. **Behaviour** evaluates to which extent the participants apply what they have learned.
4. **Results** assesses the long-term impact of the workshop.

Levels 3 and 4 can only be evaluated a couple weeks after the learning activity ended. The timeframe of this research did only allow for level 1 and 2 evaluations.

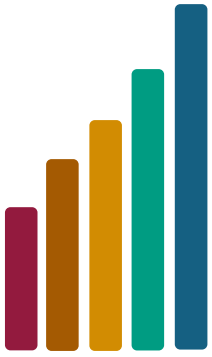
5.4.1. Reaction

The participants' reactions were evaluated right after the workshop by asking them in group settings how they perceived the workshop. A few days later, a mail was sent out with the question if they had additional feedback now that they processed the workshop.

The participants experienced the workshop as well-structured and coherent. They appreciated the approach and the way the group was guided from their current situation towards the desired AI-related future. The workshop successfully facilitated meaningful discussions and exchange of ideas within the team.

Some suggestions for improvement included:

- A clearer framing of what type of AI was being discussed, and how that relates to the team's work would help set a focus.
- Split up the workshop into two sessions or gather input from participants beforehand to make it more efficient.
- Think about how the physical space affects the workshop: the space of the pilot workshop was not ideal, as it did not allow participants to walk around and discuss things in smaller groups.



5.4.2. Learning

The participants' learning was evaluated by two questionnaires: one before and one after the training. This questionnaire consisted of five statements referring to the learning goals. The participants answered them on a rating scale from 'strongly disagree' to 'strongly agree'. The results show that most participants gained better awareness and understanding about the relevant subjects around AI adoption and implementation (Figures 34, 35, 36, 37 and 38).

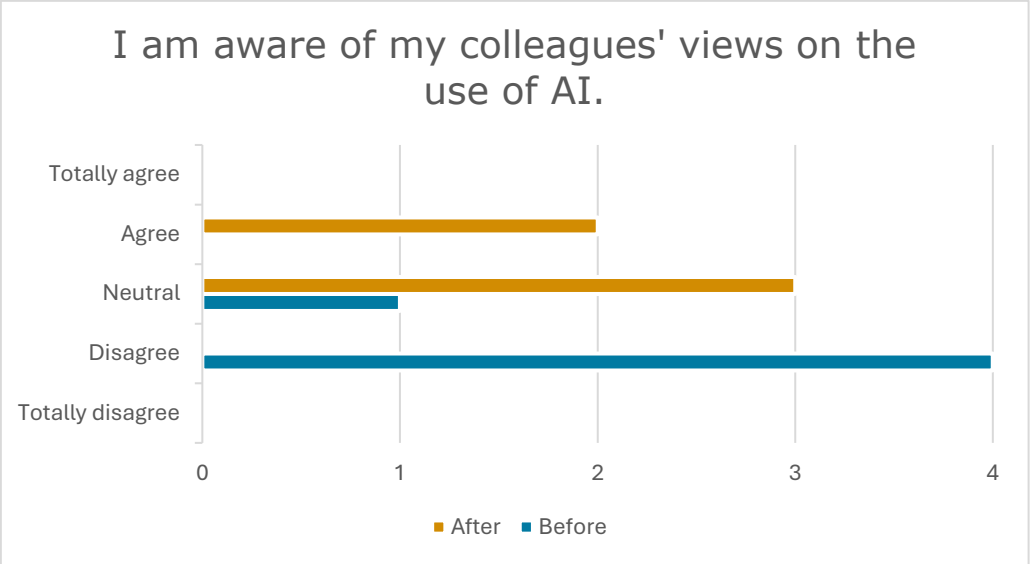


Figure 34. The responses of the test workshop participants to the statement 'I am aware of my colleagues' views on the use of AI'.

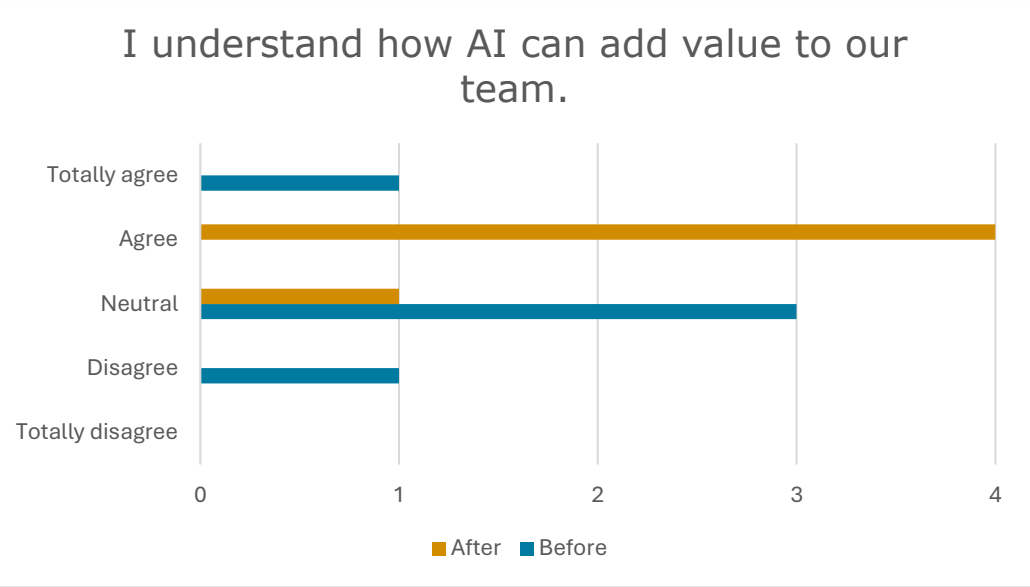


Figure 35. The responses of the test workshop participants to the statement 'I understand how AI can add value to our team'.

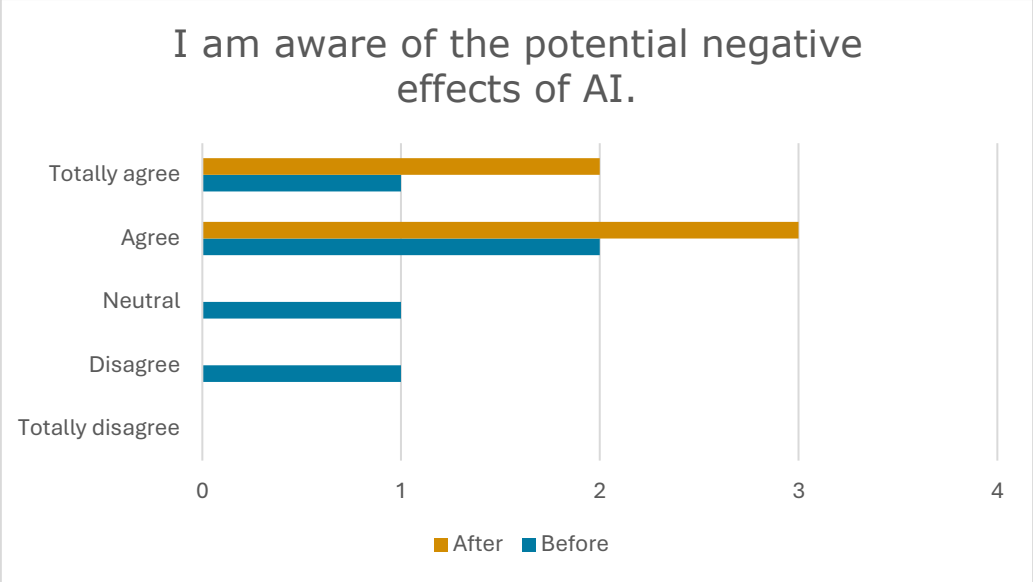


Figure 36. The responses of the test workshop participants to the statement 'I am aware of the potential negative effects of AI'

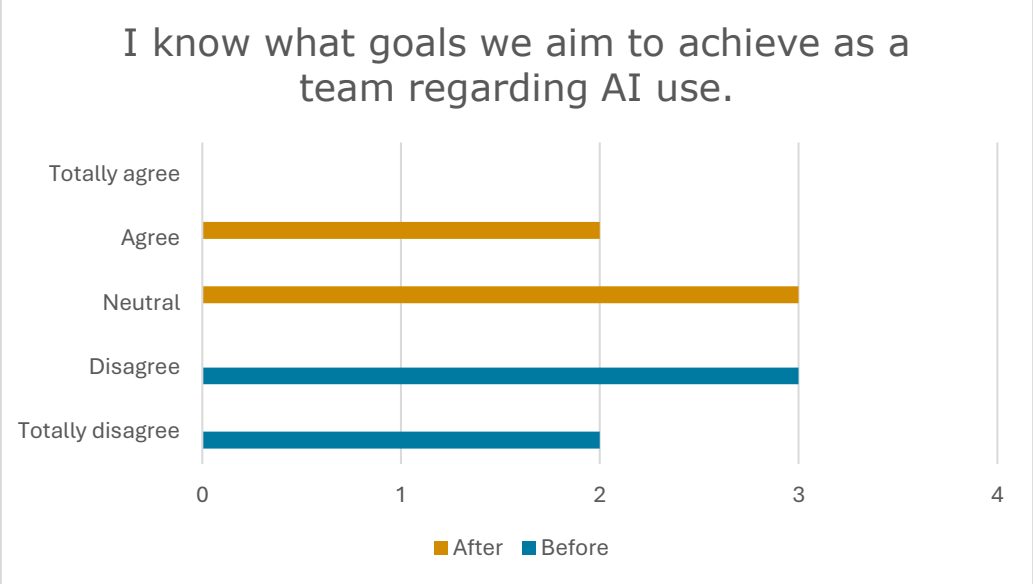


Figure 37. The responses of the test workshop participants to the statement 'I know what goals we aim to achieve as a team regarding AI use'.

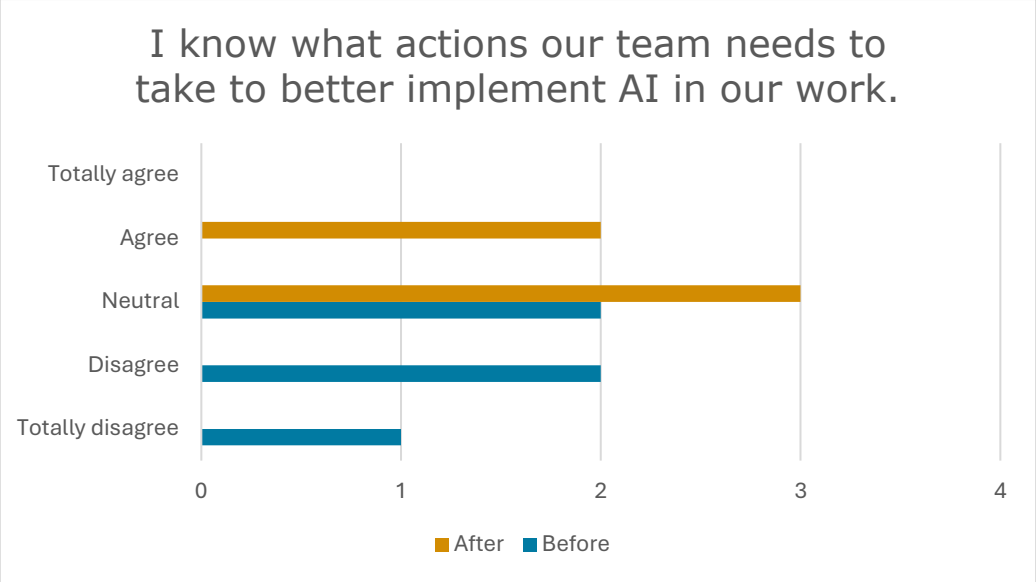


Figure 38. The responses of the test workshop participants to the statement 'I know what actions our team needs to take to better implement AI in our work'.

5.4.3. Observations

The last part of the evaluation describes some observations that were made and how this influenced the development of the workshop.

During the pilot workshop, the personas were named after the adopter categories (early adopter, early majority and late majority) because they showed similarities. The participants were familiar with Rogers' adoption theory (2003) and put themselves into the adopter category that seemed most appropriate for them, instead of looking critically at their test result. Rogers' adopter categories were used to explain part of the findings and are not completely the same. Presenting it as such can give different ideas and therefore it was decided to rename the personas.

In the pilot workshop, the participants had to make a road map by writing down their goals on paper and using post-it notes to indicate the steps needed to reach that goal. This approach was based on the road map during the focus group Future AI, but in a very simplistic way. This was done to create a clear overview for the participants while working on the roadmap. However, this gave the participants too much freedom which resulted in participants getting stuck in old patterns. It was hard to steer them towards a more goal-oriented mindset. Some sort of framework was needed and therefore a middle ground was developed, as explained in *Paragraph 5.2. Development.*

06 DISCUSSION

This chapter reflects on the main findings of this research and places them in context of existing theories and models. It also addresses methodological considerations and how it affected the research.

6.1. Key Factors AI Adoption

Six factors influencing AI adoption at design agencies were identified:

Understanding of AI - Designers felt a strong need to understand how tools work before feeling comfortable using them sustainably. Intrinsic motivation was present at the start, but time and support to increase AI literacy were lacking. This factor resonates with Rogers' (2003) dimensions of complexity and trialability: technologies that are easier to understand and try are adopted more easily.

Unrealistic Expectations - Many expectations were shaped by great examples on social media platforms. These case studies often did not talk about the hidden hours of trial and error, and the difference between perceived and actual performance. This relates to Roger's (2003) adoption factors observability and compatibility, as designers found that show use cases did not match their own practice or context.

Perceived Negative Impact - Concerns ranged from loss of creativity and job displacement to the environmental impact of AI models. Design agencies want to know the negative impact to evaluate if the usage of AI align with their values. This aspect is connected to the compatibility factor of Rogers' (2003) adoption model.

Discoverability of Tools - Designers primarily discovered new tools through acquaintances or social media. This informal discovery method relates to the observability factor in Rogers' (2003) theory. If designers discover good examples, the chances of trying them out are higher.

Output Quality - High output quality was a crucial requirement, especially because time for experimentation is limited. Tools must deliver value quickly to be adopted by design agencies. This is what Rogers (2003) also states: the innovation needs to have a relative advantage compared to the traditional method.

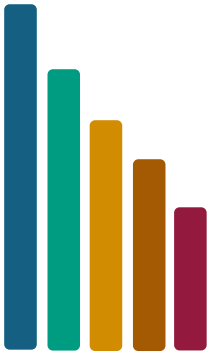
Costs - While not often explicitly mentioned, free experimentation appeared important. Tools with low financial investment enabled designers to try them without the fear of wasting money, which also relates to Rogers' concept of relate advantage (Sahin, 2006).

Together, these findings form an adoption model that builds on Rogers' DOI theory, and adds nuance specific to design agencies.

6.2. Need for Knowledge Exchange

Another important finding from this research is the design agencies' strong need to exchange knowledge and share AI use cases, specifically for the design process. This goes beyond simply being informed about tools: designers need realistic examples from their peers that demonstrate how AI tools add value to the design process. The success stories shared within teams were shown to have a significant motivating effect and helped designers to get more realistic expectations about tools' capabilities. Success stories (and the less successful ones) sparked curiosity, reduced fears, and made the technology more tangible, thereby facilitating AI adoption. This suggests that peer learning plays a crucial role in how AI is perceived and eventually integrated into design workflows.

Design agencies who are open to experimentation are more likely to support this kind of learning environment. Open communication about AI helps to understand the compatibility between the organizational culture, the designers' values and the AI tools. The more compatible these three factors are, the more likely it is that AI tools are implemented.



6.3. Evolving Technology as Solution

Participants expressed many concerns about AI, including creativity loss, job displacement, high energy consumption, low output quality and data privacy. Some of the aspects are related to the perceived hype of GenAI. Currently the technology moves away from the hype peak towards the 'Trough of Disillusionment' in the Hype Cycle (Gartner, n.d.). This model suggests that overtime there will be improvements in output quality, increased clarity about privacy regulations, and more standardized implementation pathways.

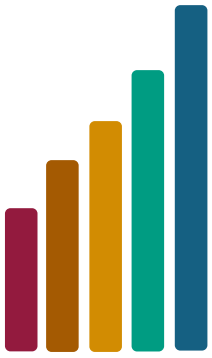
The evolution of AI already showed that as the technology evolves, more rules and regulations will emerge. In 2024, the European parlement introduced the EU Artificial Intelligence Act (Europees parlement en de raad, 2024). This act classifies AI based on its risk, and consists of four classifications: prohibited, high-risk, limited risk, and minimal risk.

That GenAI follows the Hype Cycle also means that it will eventually reach the next phase of the Hype Cycle: the 'Slope of Enlightenment', the phase in which some use cases become successful, and the technology is further developed and refined. This highlights the importance of ongoing experimentation and knowledge sharing to rebuild trust and set realistic expectations.

6.4. Unexpected Results

A surprising outcome was the difference between Rogers' five adopter categories and the three personas identified in this study. This could be due to the limited sample size or because only agencies already interested in AI participated, reducing the visibility of 'laggards'. The 'innovator' category also did not emerge distinctly, possibly because even the more experimental designers still lacked the deep technical expertise that is associated with that group.

Additionally, while most AI maturity models recommend hiring AI experts early on, the design agencies studied emphasized a collective learning culture. AI implementation was not seen as the job of one expert but rather as a shared team responsibility. These challenges assumptions embedded in many maturity models and suggests that AI integration in creative industries may require different dynamics than in more data-driven sectors. Banh (2025) has proposed a GenAI maturity model in which the maturity level is related to the function of GenAI. It follows the following five levels: GenAI as tool (1), as an assistant (2), as a sparring partner (3), as a coworker (4), and as the organization (5). This seems to fit better in the context of this research, since design agencies are more interested in functionalities and the practical implementation.



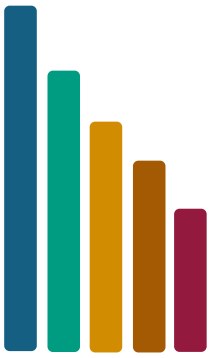
6.5. Limitations

The use of action research suited this research's goals. It enabled flexibility and responsiveness to a complex situation in which limited literature was available. It allowed for adjustments and direct involvement of participants. However, the method also introduces risks of bias, particularly due to the researcher's role in directing interviews and focus groups (Scribbr, n.d.). There was a semi-structured interview format, which gives freedom to the researcher to dive deeper into some subjects. But these 'side tours' are navigated by the researcher, diving into the subject they find interesting or confirms the ideas in their heads. There is a chance that some aspects were overlooked due to this approach.

Another limitation was the involvement of students to test AI tools. Since the assignments were not part of their curriculum, motivation and output quality were much lower than expected. Also, the students lacked working experience, which limited their ability to reflect on tool applicability. Therefore, the output from these sessions was only used to get a general idea of tools and their capabilities.

The questionnaires also posed challenges. Although the sample sizes were reasonable (26 and 29 respondents), anonymity prevented follow-up analysis and cross-checking between the two questionnaire rounds. This limited the ability to link individual changes to interventions, and to find adoption personas within the companies. There was a notable shift in perceptions at Company D, where the second survey showed less experience and more negative attitudes toward AI after they experimented with it. One explanation is that different people completed the second survey possibly those with less experience or more scepticism.

Finally, the outcomes of this research may reflect a selection bias. All participating design agencies were already somewhat interested in AI, leaving out those who are indifferent or resistant. This means the full range of attitudes may not be captured. Looking at the participants pool, there were only design agencies in Twente involved. This may limit the generalizability of findings to other regions. However, the insights have the potential to be applied in different design contexts. Similar research in Finland showed that designers there partly share the same concerns about AI (Kalving et al., 2024). Further research in diverse contexts can enrich this research topic.



07 CONCLUSION

This research showed that designers see the potential of in using GenAI for the design process, it can support them to be more creative, improve quality and work more efficiently. Currently, GenAI cannot meet all the expectations that were set when the hype started. Although this now seem frustrating to a lot of designers, it is important to know that the technology keeps developing. In a few years, the GenAI is further refined and more use cases become available. This highlights the importance of ongoing experimentation and knowledge sharing to rebuild trust and set realistic expectations. Designers need an environment that supports this.

This study suggest that design agencies benefit most from open communication about AI, realistic use cases, peer learning and share exploration of AI tools. Companies should foster AI literacy and experimentation without the fear to fail or waste time. This allows designers to discover the added value of AI for them and their design agency at their own pace.

Although the benefits of AI were clearly recognized, participants expressed concerns about implementing it to their workflow. This includes ethical considerations like data safety and privacy, losing creativity and control, high energy consumption and copyright issues. Designers highly value to remain in control of their process. Developers should prioritize explainability, user control, and workflow compatibility. Trust can be enhanced when tools offer clear reasoning behind outputs.

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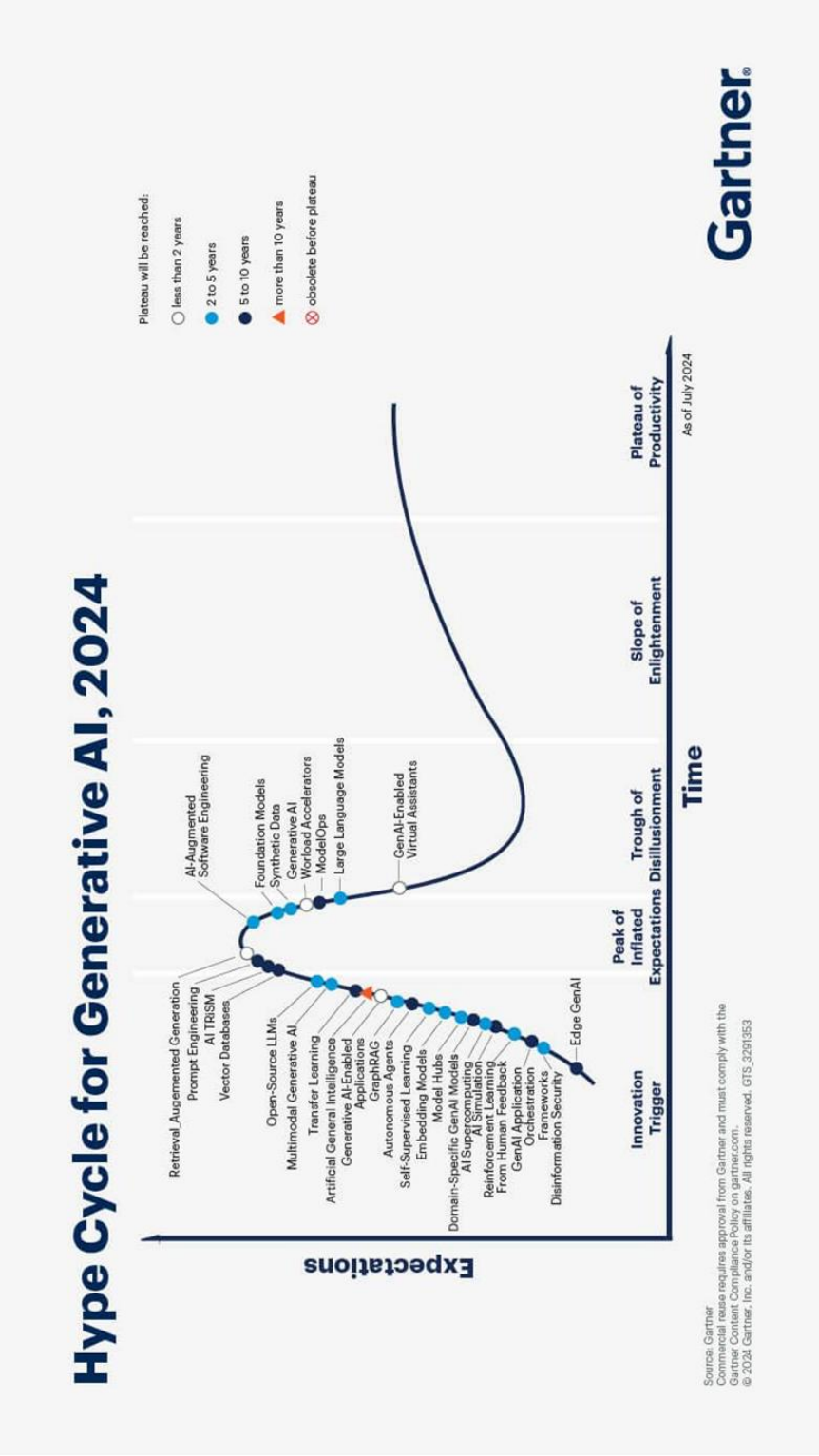
APPENDIX

Appendix A. GenAI Hype Cycle 2024



Appendix B. Interview protocols

Appendix A shows all the interview protocols that were used during this thesis. All interviews that used protocol A.1. up until A.3. were recorded and transcribed using a transcription tool. The recordings and transcription are stored in the Saxion Repository for a period of 10 years after the project has ended. The project ends in September 2025. Only the repository manager can retrieve the data upon request from an authorized member of the research team. The project's metadata, as well as the data itself, may be made available to interested parties.

Up until September 2025 the data is save on the Saxion Research Cloud Drive, a cloud service from SURFsara. To request access to this data, please contact Anne Pasman (project leader) Maran Lamberts (researcher) or Debbie Waninge (student).

B.1. Design agencies

Interviewprotocol: AI in het Ontwerpproces – Ontwerpbureaus

Duur: Maximaal 1 uur
Opzet: Semi-gestructureerd
Doel: Begrijpen hoe AI momenteel wordt gebruikt, welke kansen en uitdagingen er zijn, en hoe AI de rol van de ontwerper kan ondersteunen in de toekomst.

Profiel: bedrijven die zich bezighouden met industrieel ontwerp.

Introductie (5 min)

- Korte uitleg over het project en doel van het interview.
- Vraag naar hoe een (standaard) ontwerpproces er bij hen uitziet en welke rol/functie zij daarbinnen hebben.

Huidig Ontwerpproces (5 min)

1. Welke stappen doorloopt u in het ontwerpproces?
2. Wat zijn tijdrovende taken binnen dit ontwerpproces?

Huidig Gebruik van AI (15 min)

3. Wat is uw ervaring met AI-tools in het ontwerpproces?
    a. Welke tools gebruikt u (bijvoorbeeld ChatGPT, DALL-E)?
    b. Waarom gebruikt u wel/geen AI-tools?
    c. Waarom gebruikt u deze AI-tools?
4. In welke fases van het ontwerpproces gebruikt u AI? (Bijv. ideeëngeneratie, prototyping, of klantcommunicatie)
    a. Hoe heeft u besloten waar AI voor wordt ingezet?
5. Welke voordelen of beperkingen ervaart u bij het gebruik van AI?
6. Hoe is het ontwerpproces veranderd door de implementatie van AI?
    a. Hoeveel invloed heeft AI op de snelheid en kwaliteit van uw werk?

Kansen en Toekomstige Rol van AI (15 min)

7. Welke kansen ziet u voor AI in het ontwerpproces die momenteel nog niet volledig benut worden?
8. Hoe verwacht u dat AI in de toekomst de rol van de ontwerper kan veranderen?
9. Zijn er specifieke taken binnen uw ontwerpproces waar u denkt dat AI een grotere rol kan spelen?
10. Hoe denkt u dat AI-tools beter kunnen worden aangepast aan de behoeften van ontwerpers?

Toepassing en Ondersteuning (15 min)

11. Hoe kan AI-ontwikkeling volgens u het best worden afgestemd op de behoeften van ontwerpers en ontwerpbureaus?
12. Wat zou u helpen om AI beter te integreren in uw dagelijkse werk? (Bijv. training, betere tools, integratie met bestaande software)

Afsluiting (5 min)

13. Zijn er andere aspecten van AI in het ontwerpproces die u belangrijk vindt maar die we nog niet besproken hebben?

B.2. AI-experts

Interviewprotocol: AI in het Ontwerpproces – AI Experts

Duur: Maximaal 1 uur
Opzet: Semi-gestructureerd
Doel: Begrijpen hoe AI momenteel wordt gebruikt, welke kansen en uitdagingen er zijn, en hoe AI de rol van de ontwerper kan ondersteunen in de toekomst.

Profielen:

1. Onderzoeker Saxion lectoraat Employability Transition
2. Onderzoeker Windesheim lectoraat Waardenvolle Journalistiek
3. AI strategie & ontwikkeling bij ChatIT
4. Onderzoeker en docent Hogeschool Arnhem Digital Technology
5. Onderzoeker Saxion lectoraat Ambient Intelligence
6. Klantsucces & bedrijfsontwikkeling bij ChatIT
7. AI implementatie expert Viro
8. Contentmarketeer Independer

Introductie (5 min)

- Uitleg over het project en het doel van het interview.
- Vraag naar hun achtergrond en specialisatie binnen AI.

Huidige Tools en Toepassingen (20 min)

1. …….
2. Welke AI-tools zijn momenteel het meest relevant voor ontwerpprocessen? Welke toepassingsgebieden domineren nu?
3. Wat zijn volgens u de belangrijkste beperkingen van de huidige AI-tools in het algemeen? En voor ontwerpprocessen?
4. Hoe worden AI-tools nu gebruikt door ontwerpers, en welke feedback krijgt u van gebruikers?
5. Wat zijn voorbeelden van succesvolle implementaties van AI in ontwerpprocessen?

Ontwikkeling en Toekomst (25 min)

6. Welke ontwikkelingen verwacht u op het gebied van AI die specifiek de ontwerpwereld kunnen beïnvloeden?
7. Hoe kan AI zich volgens u verder ontwikkelen om complexe ontwerptaken beter te ondersteunen?
8. Hoe kan AI niet alleen de efficiëntie, maar ook de creativiteit en innovatie binnen het ontwerpproces vergroten?
9. Hoe kunnen we de negatieve impact van AI-tools in ontwerp vermijden? Zijn er specifieke risico’s die u ziet?

Afsluiting (5 min)

10. Wat zou voor u de grootste doorbraak zijn in AI voor de ontwerpwereld?
11. Zijn er andere aspecten van AI in het ontwerpproces die u belangrijk vindt maar die we nog niet besproken hebben?

B.3. Industrial Design teachers

Interviewprotocol: AI in het Ontwerpproces – Onderwijs (Docenten + Studenten)

Duur: Maximaal 1 uur
Opzet: Semi-gestructureerd
Doel: Begrijpen hoe AI momenteel wordt gebruikt, welke kansen en uitdagingen er zijn, en hoe AI de rol van de ontwerper kan ondersteunen in de toekomst.

Profiel: docenten Saxion opleiding Industrieel Product Ontwerpen

Introductie (5 min)

- Korte uitleg over het project en doel van het interview.
- Vraag naar hun achtergrond in het onderwijs en ervaring met AI.

AI in het Onderwijs (15 min)

1. Wordt AI al in het curriculum geïntegreerd? Zo ja, op welke manieren?
    1. Welke leerdoelen betreft AI zijn er opgesteld voor studenten Industrieel Product Ontwerpen?
2. Welke tools worden gebruikt door studenten of docenten? (voor ontwerptaken zoals schetsen, prototypes maken, of 3D-modellering?)
    1. Wat vindt u ervan als AI wordt ingezet hiervoor?
    2. Op welke manier wordt door de docent toezicht gehouden op het gebruik van AI?
3. Waar ziet u dat AI kan helpen in het onderwijsproces, zowel voor docenten als studenten?
4. Waar ziet u dat AI op dit moment kan helpen in specifiek het ontwerpproces?
5. Welke ontwerptaken zouden volgens u het meeste voordeel kunnen hebben van AI-tools (bijv. conceptontwikkeling, materiaalkeuze, optimalisatie)?
6. Welke regels/ richtlijnen worden er op dit moment in de opleiding Industrieel Product Ontwerpen gehanteerd om ethisch met AI om te gaan?

Kansen en Vaardigheden (25 min)

7. Welke kansen ziet u voor AI in het onderwijs van industriële ontwerpers?
8. Welke gevaren ziet u voor AI in het onderwijs van industriële ontwerpers?
9. Hoe kunnen AI-tools studenten helpen? Om bijv. sneller of creatiever te werken?

10. Welke specifieke AI-vaardigheden zouden studenten moeten ontwikkelen om AI effectief te gebruiken in hun toekomstige werk als ontwerpers?
11. Hoe kunnen docenten worden voorbereid op het integreren van AI in hun lessen?

De Toekomst van AI in ontwerpproces (10 min)

12. Hoe denkt u dat de opkomst van AI de rol van de ontwerper in de toekomst zal veranderen?
13. Hoe kunnen we ervoor zorgen dat studenten AI op een verantwoorde en effectieve manier gebruiken?
14. Wat denkt u dat AI kan betekenen voor ontwerpers?

Afsluiting (5 min)

15. Zijn er andere dingen die we moeten meenemen in ons onderzoek naar AI in het onderwijs?

B.4. AI implementation and organizational culture

Tools uitzetten – Interviews

Vragen over bedrijfscultuur (15 min)

- [Symbolen] Wat zijn typische DE dingen? (bv. Grapjes, termen, woorden)
- [Helden] Wat voor type mensen hebben de grootste kans om te floreren binnen jullie bedrijf? (bv. Karaktereigenschappen, motivatie, attitude, flexibiliteit, zekerheid, competitief)
- [Rituelen] Wat voor evenementen worden gevierd binnen de organisatie? (bv. Behalen project, verjaardagen, winnen prijs, jubilea)
- [Rituelen] Hoe gedragen mensen zich tijdens meetings? (bv. Actief, passief, oplettend, nieuwsgierig)
- [Waarden] Wanneer zijn jullie tevreden met een project? (bv. Resultaat, samenwerking, communicatie, reactie klant)
- [Waarden] Wat zien werknemers hier graag gebeuren? (bv. Wat drijft hen om beter te preseteren, waar halen ze energie uit)
- [Waarden] Wat is de grootste fout die iemand kan maken? (bv. Niet eerlijk zijn over werk/ gebruik AI, slechte communicatie)

Reflectievragen over de tools/ strategieën (15 min)

Bedrijf	Groep	Ontwerpfase	AI-tools
F	Video en tekst	Eindproduct Prototype testen	Sora, GalaxyAI?, PixVerse.ai, LLM
D	Tekst en beeld	Onderzoeksfase Ideegeneratie	Chatgpt (custom GPT), Copilot Midjourney
A	Beeld	Conceptualiseren Detailleringsfase	Vizcom, Copilot
S	Tekst	Onderzoeksfase Project Management	Fireflies, WhisperAI Connected Papers LLM

- Welke tools en strategieën hebben jullie gebruikt?
- Waarvoor heb je het ingezet?
  - Wat is je algemene indruk van de AI-tools en strategieën die je de afgelopen weken hebt gebruikt?
- Wat werkte goed met deze AI-tools/ strategie?
- Welke uitdagingen kwamen jullie tegen bij het gebruik van de tools en strategieën?

- Welke limieten heb je ontdekt van deze tools en de strategieën?

- Waar ben je het meest trots op?

Reflectievragen over de acceptatie en implementatie (15 min)

- Was de instructie en begeleiding die je vooraf kreeg voldoende?
  - Wat had je eventueel nog meer nodig?

- Hoe reageerden de werknemers op de nieuwe AI-tools?
  - Waren er verschillen tussen collega's?

- Welke discussies en inzichten ontstonden er binnen het team?

- Heb je met klanten gecommuniceerd over AI gebruik?
  - Hoe reageerden zij daarop?

- Welke problemen of zorgen kwamen naar voren met betrekking tot NDA's en vertrouwelijkheid?
  - Waren er verder nog organisatorische factoren die de implementatie en acceptatie hebben beïnvloed?
    - Bv. Tijdsinvestering, ondersteuning etc.

Reflectievragen over het werkproces en resultaat (15 min)

- Wat zou je verbeteren aan de tool om de integratie in jullie werkproces te optimaliseren?

- Wat zou je verbeteren aan het implementatieproces om de integraties in jullie werkproces te optimaliseren?

- Zie je mogelijkheden om deze AI-tools structureler in te zetten in je dagelijkse werkzaamheden?
  - Waarom wel of niet?

- Hoe hebben de tools bijgedragen aan het projectresultaat?

- Heeft de tool invloed gehad op je werkwijze of productiviteit?
  - Zo ja, op welke manier?

- Welke tools/ strategieën zou je echt willen implementeren in jullie werkproces?
  - Met welke tool zouden jullie verder willen?
    - Met oog op TBK studenten

B.5. Reflection entire process

Reflectievragen over de tools/ strategieën (15 min)

Bedrijf	Groep	Ontwerpfase	AI-tools
F	Video en tekst	Eindproduct Prototype testen	Sora, GalaxyAI?, PixVerse.ai, LLM
D	Tekst en beeld	Onderzoeksfase Ideegeneratie	Chatgpt (custom GPT), Copilot Midjourney
A	Beeld	Conceptualiseren Detailleringsfase	Vizcom, Copilot
S	Tekst	Onderzoeksfase Project Management	Fireflies, WhisperAI Connected Papers LLM

- Welke tools en strategieën hebben jullie gebruikt?
    - Zijn jullie verdergegaan met dezelfde tools of strategieën als de vorige keer?
    - Hebben jullie nieuwe tools of strategieën geprobeerd?
        - Waarom wel/niet?

- Hoe hebben jullie bepaald wanneer een waarvoor de tool werd ingezet?
    - Was daar een strategie voor?
    - Wat is je algemene indruk van de AI-tools en strategieën die jullie de afgelopen weken hebben gebruikt?

- Welke inzichten hebben jullie opgedaan over wat voor soort taken je wel of juist niet aan AI kunt overlaten?

- Welke uitdagingen kwamen jullie tegen bij het gebruik van de tools en strategieën?
- Welke limieten heb je ontdekt van deze tools en de strategieën?

- Zijn er situaties geweest waarin een AI-tool een écht van toegevoegde waarde was?
- Waar ben je het meest trots op?

Reflectievragen over de acceptatie en implementatie (15 min)

- Is er sinds het vorige interview iets veranderd in hoe AI-tools besproken worden binnen het bedrijf of in meetings?
    - Zien jullie dat zelf graag anders?

- Zien jullie verschillen tussen teamleden of disciplines in acceptatie en enthousiasme?
    - Waar ligt dat denk je aan?

- Wat heeft volgens jullie geholpen bij het ‘omarmen’ van de tools – en wat werkte juist averechts?

- Zijn er intern nieuwe gewoonten of ‘regels’ ontstaan rondom AI-gebruik?

- Hoe passen de AI-tools binnen jullie bestaande waarden en werkwijzen?

    - Botst het ergens of sluit het goed aan?

Reflectievragen over het werkproces en resultaat (15 min)

- Wat hebben de tools en strategieën jullie opgeleverd wat zonder niet zo snel of zo goed gelukt was?

- Wat zou je verbeteren aan de tool om de integratie in jullie werkproces te optimaliseren?

- Heeft de tool invloed gehad op je werkwijze of productiviteit?
    - Zo ja, op welke manier?

- Zie je mogelijkheden om deze AI-tools structureler in te zetten in je dagelijkse werkzaamheden?
    - Waarom wel of niet?

- Welke tools/ strategieën zou je echt willen implementeren in jullie werkproces?

- Wat zou een logische volgende stap zijn voor jullie als ontwerpbureau in het werken met AI?

Reflectievragen over het hele proces (15 min)

Notulen van het allereerste interview met bedrijf doornemen.
Kijken waar de problemen, uitdagingen, kansen en angsten zaten.
Terugkoppelen naar hen en vragen of dit nog steeds zo is.

Kijkend naar het hele proces (start van project en nu):

- Wat is jullie mening over AI in het ontwerpproces?
    - Hoe is deze mening de afgelopen maanden veranderd?

- Wat is voor jou persoonlijk de grootste eye-opener geweest van dit experiment?

- Hoe ziet jullie ideale AI-ondersteunende werkproces eruit?

- Hoe kijken jullie nu aan tegen verdere integraties van AI in jullie organisatie?

- Welke voorwaarden zijn voor jullie essentieel om verder te gaan met AI in de toekomst?
    - Wat missen jullie nog?
    - Wat moet een AI-tool kunnen?

- Wat hebben jullie nodig om AI structureel te kunnen integreren in het ontwerpproces?
    - Is die structurele integratie iets waar jullie naar streven?

Invullen enquête

- Stuur naderhand een mail met het verzoek de enquête in te vullen.

Appendix C. Student Session

C.1. Student session assignments

Opdracht: Persona's creëren met behulp van ChatGPT
Doel: In deze opdracht gebruik je ChatGPT om gebruikerspersona's te creëren voor een product of dienst. Je gaat evalueren hoe effectief ChatGPT is bij het genereren van persona's en vergelijkt dit met methoden die je eerder hebt gebruikt. Het doel is om de voor- en nadelen van het gebruik van AI voor deze ontwerpstap te identificeren.

Instructies: Volg de onderstaande stappen om de opdracht te voltooien. Voor elke stap noteer je je bevindingen en observaties. Je onderzoekt hoe goed ChatGPT heeft geholpen in dit proces.

Stap 1: Een basispersona genereren
Opdracht: Vraag ChatGPT om een basis gebruikerspersona te genereren voor jouw product/dienst. Gebruik de volgende prompt om te starten:
"Maak een gebruikerspersona voor een 25-jarige werkende professional die een mobiele app gebruikt om fitnesstracking te doen."

1. Hoe relevant is de gegenereerde basispersona van ChatGPT?
   Beoordeel van 1 (Niet relevant) tot 5 (Zeer relevant).
   Leg uit.

2. Bevat de persona de kerninformatie die je zou verwachten, zoals demografische gegevens, doelen, uitdagingen en gedragspatronen?
   Ja / Nee
   Wat zou je zelf nog aan deze persona toevoegen?

Stap 2: De persona verfijnen
Opdracht: Vraag ChatGPT nu om de persona te verfijnen door meer details toe te voegen. Gebruik vervolgvragen zoals:

"Kun je meer informatie toevoegen over de dagelijkse routine en fitnessdoelen van deze persona?"

"Welke frustraties of uitdagingen ervaart deze persona met fitness-apps?"

3. Bedenk nog een vervolgvraag om de persona te verfijnen. Noteer deze vraag hier:

4. Is het ChatGPT gelukt om nuttige en realistische details aan de persona toe te voegen?
   Beoordeel van 1 (Niet gedetailleerd) tot 5 (Zeer gedetailleerd).
   Leg uit.

5. Hoe realistisch zijn de aanvullende details die door ChatGPT gegenereerd zijn?
   Beoordeel van 1 (Niet realistisch) tot 5 (Zeer realistisch). Leg uit.

Stap 3: De persona aanpassen
Opdracht: Vraag ChatGPT om een nieuw persona te creëren die aansluit bij een specifieke doelgroep uit je project. Zorg ervoor dat je al wat informatie over de context en het product meegeeft.

6. Wat heb je op ChatGPT ingevoerd?

7. Hoe goed past ChatGPT zich aan op meer specifieke verzoeken? Hoe relevant is dit persona ten opzichte van het basispersona uit stap 1?

Stap 4: Vergelijken
Opdracht: Reflecteer op hoe je normaal gesproken persona's maakt zonder AI-tools.

8. Vergelijk het proces van het gebruik van ChatGPT met jouw eerdere methode voor het creëren van persona's. Beantwoord de volgende vragen:
   Wat waren de belangrijkste verschillen in hoe de persona's werden
   gegenereerd?

   Heeft het gebruik van ChatGPT je tijd bespaard? Ja / Nee

   Hoe is de kwaliteit van de ChatGPT persona's vergeleken met die van jou? Beter / Hetzelfde / Slechter

   Leg uit.

Stap 5: Experimenteren met ChatGPT voor persona's maken
Opdracht: Nu je enkele vaste stappen hebt doorlopen, krijg je de kans om wat meer te experimenteren met ChatGPT voor het maken van persona's. Probeer verschillende manieren van interactie en prompts uit om te zien hoe ChatGPT reageert op andere invalshoeken. Je kunt deze ideeën gebruiken ter inspiratie:

Experimenteren met variabelen:
Vraag ChatGPT om een persona te maken met verschillende demografische of gedragsvariabelen. Bijvoorbeeld: "Maak een persona voor iemand van middelbare leeftijd die geïnteresseerd is in technologie en duurzaamheid."
Vraag: Hoe goed kan ChatGPT zich aanpassen aan de nieuwe informatie die je geeft? Wat zijn de sterke en zwakke punten in de antwoorden die je krijgt?

Complexiteit toevoegen:
Geef ChatGPT meer complexe en gelaagde prompts, zoals: "Creëer een persona voor een jonge professional die zowel carrièremogelijkheden als een goede werk-privébalans belangrijk vindt, en die ook milieubewuste keuzes maakt in zijn of haar dagelijkse leven."
Vraag: Hoe verwerkt ChatGPT de meer complexe details in de persona? Welke nuances worden goed weergegeven, en waar ontbreekt het aan diepgang?

Testen van prompts:
Probeer dezelfde persona te maken met verschillende manieren van formuleren. Vraag bijvoorbeeld eerst: "Maak een persona voor een klant die geïnteresseerd is in luxe auto's" en daarna "Maak een persona voor een high-end consument die een luxe auto overweegt te kopen."

Probeer daarna dezelfde persona te maken door een gesprek te voeren met ChatGPT. Voorbeelden van prompts: "Wat weet je van luxe auto's?" "Wat vinden klanten belangrijk als ze een luxe auto willen kopen?" enzovoorts.
Vraag: Welke verschillen zie je in de resultaten van ChatGPT? Welke formulering levert het beste resultaat op, en waarom denk je dat dat zo is?

Creatieve vrijheid:
Laat ChatGPT een volledig willekeurige persona genereren, zonder specifieke input, om te zien hoe goed het tool is in het creëren van realistische en interessante persona's met minimale informatie.

Vraag: Hoe presteert ChatGPT als het veel vrijheid krijgt? Zijn de persona's nog steeds nuttig of te algemeen?

Stel dat je een Custom GPT zou bouwen voor het opstellen van persona's, welke basis instructies moet deze hebben om een efficiënte en ethische GPT te zijn?

Opdracht: Geef aan welke aanpak je het meest succesvol vond en welke het minst, en waarom. Op wat van manier beïnvloedt jouw input de output die ChatGPT genereerd?
Heb je een andere aanpak gebruikt dan de voorbeelden hierboven? Noteer je aanpak hier en neem dit mee in de reflectie.

Stap 6: Voor- en nadelen van het gebruik van ChatGPT voor persona's identificeren
Opdracht: Op basis van je ervaring tijdens deze sessie, maak een lijst met de voor- en nadelen van het gebruik van ChatGPT voor het genereren van persona's.

9. Wat zijn de voordelen van het gebruik van ChatGPT voor het creëren van persona's? (Denk aan tijdsefficiëntie, creativiteit, variëteit, etc.)

10. Wat zijn de beperkingen of uitdagingen van het gebruik van ChatGPT voor deze taak? (Denk aan nauwkeurigheid, specificiteit, realisme of andere mogelijke nadelen.)

Stap 7: Reflectie over AI voor persona-creatie
Opdracht: Reflecteer op het gebruik van AI-tools zoals ChatGPT voor deze specifieke fase van het ontwerpproces.

11. Hoe kunnen AI-tools zoals ChatGPT het ontwikkelen van persona's in Industrieel Product Ontwerpen verbeteren of veranderen?

12. Zijn er specifieke gebieden waar AI tekortschiet of juist uitblinkt op dit gebied?

13. Hoeveel informatie geven de door AI gegenereerde persona's ten opzichte van praten met de doelgroep?

C.2. Student session output

ChatGPT

	Algemeen	Persona's	PvE	Marktonderzoek	Gebruikscenario's	Brainstormen
Pros	Snel Tijdbesparend Efficiënt Inspiratie Creatief Nieuwe blik Eerste stap Effectief Divers	Goede basis maken Realistisch Gedetailleerd Specifiek (2) Overzichtelijk Makkelijk Snelle aanpassingen Inspiratie Creatief Snel (2)	Goed in eisen uit tekst halen Verbetert eisen Duidelijker beeld van gewenste product eigenschappen Onderscheid maken essentiële en optionele eisen Esthetische eisen zorgen voor inspiratie vormgeving Duidelijk (2) Snel	Actueel en consistent met marktontwikkeling Up-to-date Relevant Linkjes naar artikelen Algemeen overzicht Goed voor eerste indruk Uitgebreide uitleg van trends Toegankelijk	Relevant Gedetailleerd Realisitisch Bevat de essentiële elementen Diverse output Verschillende perspectieven	Veel ideeën Creatief Andere invalshoeken Stimulans voor eigen ideeën Toegankelijk Nieuwe ideeën Stimuleert om zelf meer ideeën te bedenken Divers
Cons	Te algemeen Verlies creativiteit	Oppervlakkig Veel tekst met irrelevante info Slechte kwaliteit persona's Incompleet Tegenstrijdigheden in het persona Verliest creativiteit Eentonig beeld Niet altijd realistisch Onpersoonlijk (2) Stereotyperende output (2) Breed	Niet alle eisen die je uit tekst haalt zijn toepasbaar Niet altijd meetbaar Niet smart Je moet altijd zelf nog wat toevoegen Wordt niet altijd begrepen wat je bedoelt Meetbare eisen blijven schattingen	De meest recente data kan ontbreken Mist diepgang of gedetaileerde cijfers Weinig nuance in details Minder context Data niet traceerbaar Te algemeen Stereotype beschrijvingen Oppervlakkig Lastig te controleren	Meer context nodig Meer details nodig in context Gebrek aan diepgang; vooral mens-product interactie Onzekerheid over juistheid Veel onnodige info Niet heel specifiek Mist gebruikersinzichten Geen visuele output	Ontbreken van details Discussie niet mogelijk Mindmap maken werkt niet Soms mist creativiteit Geen visuele output Algemeen Niet specifiek Beperkt tot bepaalde data

Other	Hoe vager de input, hoe vager de output	Gegenereerde persona's worden gebruikt als input om zelf een persona te maken	Je moet het een rol geven, de situatie eromheen beschrijven en extra informatie toevoegen over wat het antwoord moet geven en hoe het de vraag moet beantwoorden	Sommige data vereist externe verificatie	Kan geen onderscheid maken tussen relevante en irrelevante informatie in bepaalde contexten	Kan helpen om je idee te evalueren
	Input beïnvloedt de output	Kan goed omgaan met vrijheid	Hoe effectief het is in opstellen van realistische eisen hangt af van hoe duidelijk de prompt was	Het werkt het beste om in gespreksvorm dingen te vragen		Specifieke prompts met het doel van het product werken het best
		Praten met de doelgroep is alsnog nuttiger en zorgt voor meer diepgang		Meest succesvolle resultaat verkegen door een specifieke rol te geven		
		Veel creativiteit als je vrijheid geeft		AI moet ethisch verantwoord zijn met nadruk op data privacy en gevarieerde bronnen		
				De input beïnvloedt de output		
				Krijgt de AI meer vrijheid, dan wordt de output algemener		

Persona's. Het werkt goed ter inspiratie voor persona's. Je mist soms de diepgang of specifieke informatie die je nodig hebt.
PvE. Handig om eisen uit een tekst te halen en te vragen hoe eisen verbeterd kunnen worden. Het is niet altijd evengoed in de eisen smart maken.

Expectation AI. Je leest vaak terug dat de studenten dingen als “je moet zelf nog dingen toevoegen” of “de informatie is incompleet” zien als nadeel. Het lijkt alsof ze daarin de aanname doen dat AI met één matige prompt alles voor de kan doen.

Copilot

	Algemeen	**Persona's**	**PvE**	**Marktonderzoek**
Pros	Snel Efficiënt Gedetailleerd Goed als basis Overzicht genereren	Gedetailleerd (3) Geeft waardevolle inzichten Duidelijk Foto's genereren Efficiënt (2)	Plaatst eisen in juiste categoriën Beknopte antwoorden Snel Goede sparringspartner Goed in smart notatie Afbeeldingen genereren voor overzicht	Met doorvragen krijg je meer overzicht Met doorvragen krijg je kortere antwoorden
Cons	Onzekerheid over juistheid output Weinig diepgang Oppervlakkig Veel tekst	Mist diepgang Algemeen Oppervlakkig Maakt geen geheel van het persona Geeft geen correct antwoord op verdiepende vragen Veel tekst Moeilijk overzicht bewaken in grote hoeveel tekst	Functionele elementen waren zwak Oppervlakkig Valt in herhaling Weigert verbeteringen door te voeren Niet creatief	Geeft lange antwoorden Minder overzichtelijk
Other	Input beïnvloedt de output Vrijere input zorgt voor algemenere output Een brede input geeft een breed onzinnig antwoord, dus kun je beter googlen	Combinatie van AI en interactie met doelgroep zorgt voor diepgaand persona		

	Morfologisch schema	**Gebruikscenario**	**Brainstormen**	**Interview protocollen**
Pros	Snel Creeërt overzicht Basis om vanuit te werken Laat je nadenken over dingen waar je niet bij stil stond Relevant Structureert gedachten	Gedetailleerd Realistisch Past zich goed aan de gebruikscontext aan	Breed Dekken veel aspecten Veelzijdig Bruikbaar Effectief Snel (2) Veel ideeën (2)	Goede interview vragen Geen aanpassingen meer nodig Behandelt alle gevraagde punten Gedetailleerd

	Duidelijk Nuttig voor categorieën bedenken Goed schema Redelijk praktisch Goede oplossingen		Stimulans voor ideegeneratie Inspiratie	
Cons	Redelijk algemeen Ideeën waren niet zo goed Schetsen soms makkelijker dan tekst Niet creatief Geen verrassende uitkomsten die je zelf niet kan bedenken Koppeling tussen opties ontbreekt Geen geheel	Minder nuances Minder vertrouwen in juistheid Incompleet Diepgang ontbreekt	Minder diepgang Weinig ontwerpmogelijkheden Weinig opties Vage ideeën Had niet allemaal betrekking tot de input Lage kwaliteit van de ideeën Beperkt door info die al op internet te vinden is Niet zeker over juistheid Niet goed in combineren van ideeën Niet goed in out-of-the-box denken (2)	
Other	Erg nuttig voor categorieën bedenken en om daar vervolgens zelf oplossingen voor te bedenken omdat die van copilot niet heel goed waren. Onwaarschijnlijk dit zelf toe te passen door het eigen denk proces die je overslaat. Jij kan niet echt creative dingen ontwerpen maar copilot doet het voor je doormiddel van de aanwijzingen die je hem geeft.	Traditionele methodes bieden vaak meer genuanceerde inzichten Traditionele methodes geven meer vertrouwen in de juistheid van het scenario doordat ze gebaseerd zijn om directe interacties en observaties van de doelgroep	Er worden ideeën gegeneerd die je zelf niet snel zo bedenken (2) Minder diepgang door gebrek aan discussie en feedback Een beetje matig maar bij het doorvragen naar meer duidelijkheid en ideeen komt die soms wel met wat leuks. Bij het vragen om 3 verschillende ideeen is het programma minder "creatief" dan bij het vragen wat er in de toekomst mogelijk bedacht kan worden Om creatieve ideeën te krijgen zijn er manieren, maar die moet je wel weten/ ontdekken	

Perplexity

	Algemeen	Persona's	PvE	Marktonderzoek
Pros	Gedetaileerd Bedenkt dingen die je zelf niet had bedacht Snel	Goede basis Bevat de kerninformatie (2) Gedetailleerd (4) Realistisch (2) Bronnen zijn handig (2) Goed uitgewerkt Goed ter inspiratie Bedankt andere dingen dan jij doet Komt in de buurt van perfectie Inzichten in verschillende categorieën	Goed geheel Duidelijke eisen Meeste eisen uit stuk tekst verwerkt Uitgebreid	Weergave belangrijke trends Actueel Goed in vergelijken van producten Snel Diepgaand Nuttige informatie Volledige informatie Uitgebreid Overzichtelijk
Cons	Veel tekst Weinig diepgang	Vertelt niks over gedragspatronen De gegenereerde foto's passen niet bij het persona Standaard antwoorden (2) Niet origineel (2) Niet persoonlijk (2) Past zich niet goed aan op specifieke verzoeken Veel tekst Niet tijd besparend door controleren van alle tekst	Veel tekst Heel specifiek	Neemt vormgeving niet mee Weinig uitleg bij feiten Onderbouwing ontbreekt Weinig diepgang
Other	Een duidelijke prompt zorgt voor de meest bruikbare informatie Het zou handig zijn als een AI zelf aangeeft welke informatie nog nodig is voor een goede prompt	Doorvragen naar details helpt om een duidelijker persona te krijgen Persona’s zijn beter uitgewerkt en met meer detail dan wanneer ze het zelf doen (2) Het verschil tussen AI en traditionele methoden is vooral de woordkeuze en formulatie; de informatie was inhoudelijk hetzelfde		

	Morfologisch schema	**Gebruikscenario's**	**Brainstormen**
Pros	Geeft voorbeelden bij elk punt Geeft een paar ideeën waar je zelf minder snel opkomt Geeft uitleg functie keuze	Uitgebreid (2) Realistisch Volledig (2) Relevant Gedetailleerd (2) Tijdbesparend Genereert dingen waar je zelf niet over na hebt gedacht Snel	Genereert meer ideeën dan je zelf zou bedenken Creatief Divers Goed als basis Makkelijk Snel Nuttig Goede ideeën
Cons	Geen plaatjes Niet duidelijk in oogopslag Willekeurige combinaties Veel tekst	Diepgang mist Veel tekst	Visuele aspect ontbreekt Niet heel uitgebreid Korte informatie Irrelevante informatie
Other	Je hebt hier niet per se een AI voor nodig		Output verschilt niet echt afhankelijk van prompts Als je meer details vraagt dan krijg je meer details

Midjourney

	Algemeen	**Moodboards**	**Schets naar render**
Pros	Goed in realistische beelden genereren Snel Kleurrijk	Nuttig Snel (2) Makkelijk foto's veranderen Creatief Kleurrijk Meerder opties per generatie Kan goed input verwerken Realistische beelden Makkelijk (2) Goed te sturen Consistent	Mooie afbeeldingen (2) Realistisch Goed in felle kleuren (2) Realistische beelden (2) Snel Scherpe afbeeldingen
Cons	Moeilijk te sturen	Minder goed in details verwerken Als het eenmaal een richting op gaat kan je niet makkelijk wisselen	Moeilijk te gebruiken (2) Moeilijk te sturen (3) Maakt weinig gebruik van de afbeeldingen die je geeft (3) Minder sterk in neutrale kleuren
Other		Het begin is nog uitzoeken hoe het werkt, maar daarna is het heel eenvoudig te gebruiken. Als je het specifiek genoeg vraagt je er hele mooie resultaten	Wij zouden midjourney niet aanraden want het is niet heel eenvoudig in het gebruik en daarnaast luistert midjourney ook niet naar je vragen.

OpenArt AI

	Algemeen	**Moodboards**
Pros	Makkelijke basisfuncties (2) Goed in input interpreten	Afbeelding als basis helpt om variaties te sturen Afbeelding als basis behoudt voor consistentie (2) Afbeelding als basis zorgt voor een nauwkeuriger resultaat Stijlen toevoegen als prompt heeft veel invloed op de uitkomst Makkelijk Makkelijk te sturen Mooie beelden Goed in thema's en kleurpaletten interpreteren Nuttig Efficiënt Flexibel Ideaal voor digitale projecten Snel Zelf afbeeldingen maken in plaats van zoeken Makkelijk afbeeldingen aan te passen Inspiratie
Cons	Detailering is moeiljk	Lastig om exact het gewenste resultaat te halen (3) Details in structuur kloppen niet (3) Details veranderen moeilijk (2) Details aanbrengen moeilijk (2) Niet veel controle over output Weinig stijlkeuze Verhoudingen tussen objecten kloppen niet Algemeen Niet authentiek door AI Moodboard zelf is lastig te genereren
Other	Suggesties voor prompts toevoegingen zouden helpen Uitgebreidere prompts gaven beter resultaat Duidelijkere prompts helpen om consistentie te verbeteren Prompts waarvan veel beelden op internet te vinden zijn, zijn makkelijker te gebruiken Nauwkeurigheid van de output is afhankelijk van de complexiteit van de prompt; hoe hoger de nauwkeurigheid, hoe minder tevreden men was	Vooral handig voor moodboards afbeelding, maar niet de moodboards zelf

Dall-E3

	Algemeen	**Moodboards**
Pros		Makkelijk Kan stijl namaken Te sturen zolang het in kleine stappen gaat
Cons		Met lange of moeilijke prompt gaat sturen moeilijk Bij lang door prompten gaat de orginele prompt verloren Tekst in afbeeldingen schrijven Je moet specifiek vertellen dat je afbeeldingen wilt die een gevoel overbrengen Kost veel moeite om afbeeldingen te laten overlappen Afbeeldingen blijven vaak in een eigen hokje
Other		

Vizcom

	Algemeen	Materialisatie	Schets naar render
Pros		Plaatjes uploaden is makkelijk Begrijpt kleuren goed Kleurenvariaties werken goed Mooie afbeeldingen Sparringspartner Inspiratie Gedetailleerde materiaal weergave Snel Makkelijk Geeft leuke interpretaties van een prompt	Renders maken werkt goed Goed in kleuren Mat effect werkt goed Out-of-the-box
Cons		Begrijpt kleurtinten niet goed Niet goed in natuurlijke kleuren Delen van plaatjes kloppen niet Materialen werken niet goed Paletten werken niet goed Niet bruikbaar voor productvariaties Niet intuïtief Veel hallucinaties Bepaalde onderdelen materialen of kleuren geven is onmogelijk Materiaal aanpassingen zijn lastig Gericht een idee uitwerken is niet mogelijk Spelen met licht- en schaduweffecten geeft weinig resultaat Detaillering aanbrengen is onmogelijk Geestdodend Vervuilend Onorigineel	Kwaliteitsverlies van schets naar render Achtergrond toevoegen onmogelijk Verder uitwerken van render Glimeffect is niet realistisch Hoe meer stappen je maakt, hoe minder de kwaliteit Andere invalshoek niet mogelijk Willekeurige resultaten Materialen niet realistisch genoeg Gewenst resultaat kost veel tijd Minimale controle Moeilijk te sturen Eigenwijs
Other		Handiger prompts te gebruiken via een tekstvak dan afbeeldingen Kan termen zoals waardevol, duurzaam of goedkoop niet vertalen naar logische plaatjes.	Ik denk dat je dit programma kan inzetten om concepten voor een daadwerkelijke presentatieschets te maken, maar om de resultaten van dit programma direct in te zetten als eindpresentatie is onrealistisch.

Appendix D. AI support document

Briefing onderzoek "AI in Ontwerp" - Implementatie van AI Tools bij bedrijf A

Het doel van dit onderzoek is om te onderzoeken hoe ontwerpbureaus, nieuwe AI tools op een effectieve manier kunnen implementeren in hun ontwerpproces. We willen inzicht krijgen in de voordelen, uitdagingen en acceptatie van AI binnen het bedrijf en bij hun klanten.
Jullie, bedrijf A, gaan AI-tools gebruiken in de concept- en detailleringsfase van huidige projecten. We voorzien jullie van voorbeelden, tips en tricks om mogelijk geschikte tools optimaal te benutten. Voor de implementatie delen we een vragenlijst om inzicht te krijgen in de huidige situatie en verwachtingen. Na een test periode van ongeveer 4 weken plannen we een voortgangsgesprek in om feedback te verzamelen over de tools en de implementatie ervan. Drie à vier weken daarna volgt de eindevaluatie inclusief vragenlijst.

Vul deze vragenlijst in voordat je begint met de implementatie van AI-tools:
https://qualtricsxm8nhtt4mxt.qualtrics.com/jfe/form/SV_eKck6RXgGOBOvRA

1. Overzicht tools en verwachtingen

Zoals aangegeven is jullie bedrijf voornamelijk geïnteresseerd in het gebruiken van AI voor beelden genereren. Het doel is om te onderzoeken in hoeverre dit soort AI tools geschikt zijn om te gebruiken in de concept- en detailleringsfase van een ontwerpproces. Wij hebben een voorselectie gemaakt van verschillende tools die gebruikt kunnen worden. Maar eigen invulling voor andere tools is ook mogelijk. Er is een budget voor het aanschaffen van betaalde lidmaatschappen van €200, deze kunnen jullie declareren bij ons.

Name	Voordelen	Nadelen	Kosten Pro account (Dollars)
Vizcom	• Goed in finetunen van afbeelding • Gericht op product design	• 3D generatie nog niet heel goed	40
Midjourney	• Goed in realistische afbeeldingen	• Niet altijd coherent in aanpassingen • Past vaak dingen in afbeelding aan die niet moeten of random zijn	30-60
Freepik	• Goedkoop vergeleken andere tools • Combineert verschillende ai tools (Luma, Kling, Runway) tegelijk • Goedkoper vergeleken andere tools • Heel snel in generaties • Goed in finetunen van generaties	• Niet altijd coherent in aanpassingen	10
3D ai studio	• Kan van 2D naar 3D modellen gaan geschikt voor 3D printen	• Geen gratis versie	14 – 29
Meshy Ai	• Meerdere tools zoals tekst naar beeld, beeld naar beeld, upscaling tool. • Vooral goed in personen of bestaande dingen. • Goed in generatie finetunen	• 3D generaties zijn niet hele hoge kwaliteit • Minder goed in niet bestaande dingen • Goede kwaliteit van afbeelding vereist • Beperkte gratis versie, 200 credits per maand zonder nieuwe pogingen	16
Trellis	• Gratis versie is redelijk goed; via huggingface	• Nieuwe niet bestaande producten vormen zijn lastiger	gratis

	• Blender file downloaden met textures		
BlenderGPT	• Addon voor in blender • Simpeler dan Meshy	• Geen goede gratis versie	14

Om frustratie te voorkomen adviseren wij om niet veel tijd te stoppen in gratis versies uitproberen. YouTube video's laten veelbelovende resultaten zien, maar in de praktijk blijkt dit een tijdrovend proces met een lagere kwaliteit. Op basis van ons verkennend onderzoek zijn bovenstaande tools op dit moment de meest gebruikte generatieve AI-tools voor afbeeldingen en 3D modellen. Ons advies is om te experimenteren met Trellis voor gemakkelijk experimenteren van image to 3D voordat je betaalde versies zoals Blender GPT gaat gebruiken. Voor goeie gedetailleerde concept renders lijkt op dit moment Vizcom het meest geschikt om van schets zonder 3D model een gedetailleerde render te maken, om bijvoorbeeld deze vervolgens als input voor image-to-3D te gebruiken.

2. Voorbeeld processen in projecten

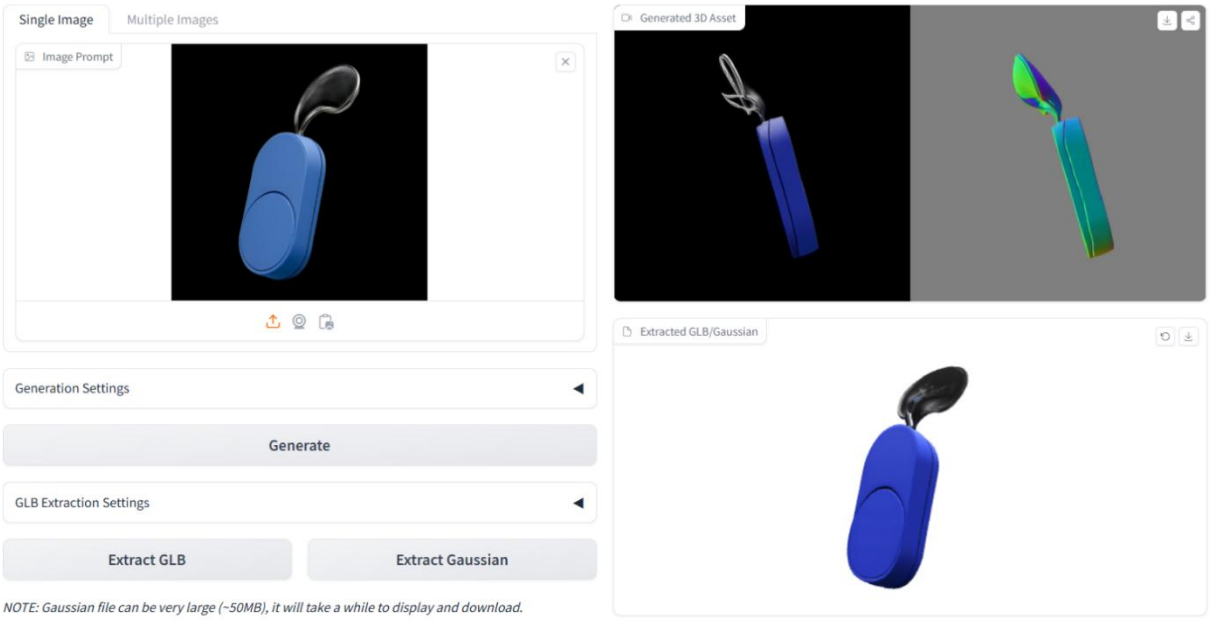
Algemeen zijn de image to 3D generaties vrij goed in realistische afbeeldingen omzetten naar een blender file. Van schetsen naar 3D modellen is het lastiger om een realistisch model te genereren, wat zou helpen is om Vizcom of Midjourney te gebruiken om je schets om te zetten naar een realistische render, en deze vervolgens naar een 3D model te generen waar je vervolgens in detail verder kan werken.

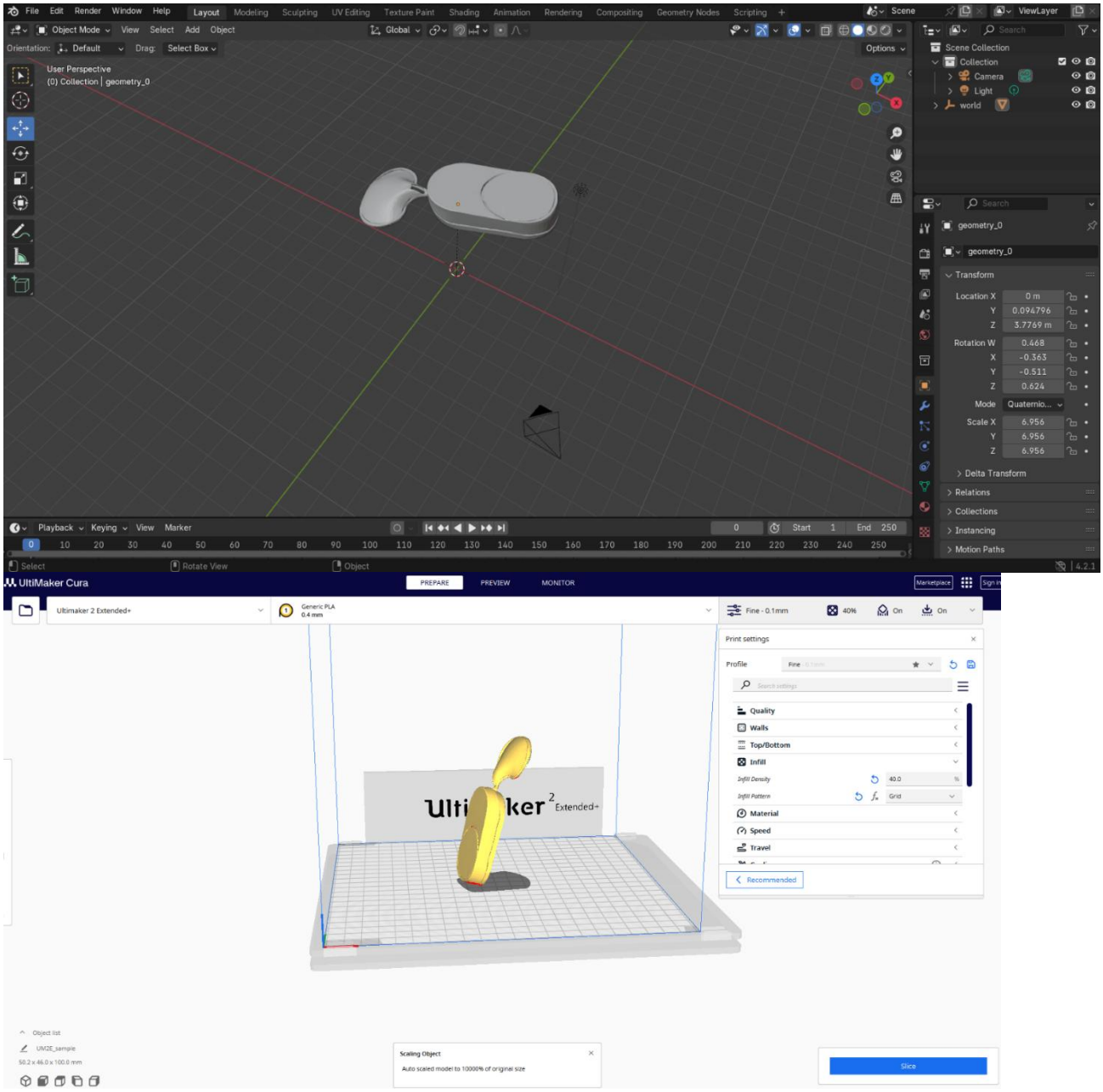
Een voorbeeld proces is hieronder weergegeven. Hierbij hebben we Vizcom gebruikt om van schets tot een render te komen met verschillende perspectieven. Waarbij we de 3D tool van Vizcom hebben gebruikt verschillende perspectieven toe te voegen.

Prompt: "*Create a realistic product render of a sleek, modern keychain with a minimalist design. The keychain should have smooth, rounded edges and a matte finish, similar to soft-touch plastic or silicone. Use a vibrant, solid color like cobalt blue, with a subtle contrasting detail—perhaps a thin red line or seam where two parts connect. The keychain should be compact and ergonomic, designed to fit comfortably between the fingers, emphasizing functionality and simplicity. Place it in a clean, neutral background (light Blue) with soft shadows, and include hands interacting with the keychain to showcase its size and tactile feel. The lighting should be bright but soft, highlighting the smooth texture and design details*"

Als je dan de 3D tool gebruikt om een ander perspectief te krijgen en dezelfde prompt gebruikt voor de render krijg je wat hieronder is weergegeven.

De eerste render hebben we vervolgens in Trellis gezet om van image-to-3D te gaan. Vervolgens het GLB gedownload om snel tot een vorm model te komen die vervolgens geprint kan worden. Of kan aanpassen in Blender.





3. ChatGPT + detaillering: uitbreiden van skills

Uit onze eerste interviews kwam naar voren dat het gebruiken van AI ook waardevol kan zijn voor taken waar je zelf weinig kennis over hebt, om zo je skills gemakkelijk uit te bereiden. Als je bekend bent met software zoals Blender of Grasshopper voor Rhino, kan ChatGPT je helpen bij het schrijven van eenvoudige scripts om taken te automatiseren voor parametrisch ontwerpen. Of bijvoorbeeld bij het programmeren van een prototype. Andere voorbeelden zijn: LCA, Patentonderzoek, business plan opstellen, kostenberekening etc.
Voorbeeld en tips: Prototyping met Arduino en sensoren met gebruik van ChatGPT om snel en eenvoudig prototypes te bouwen en te programmeren zonder externe hulp.

a. **Onderdeelselectie**: Vraag ChatGPT om een lijst met benodigde onderdelen voor je prototype.

Prompt: “Welke onderdelen heb ik nodig om een slimme lamp te maken die reageert op beweging?”

b. **Aansluitschema Opstellen**: Vraag ChatGPT om een gedetailleerd aansluitschema en beschrijving van de bedrading.

Prompt: “Hoe sluit ik een PIR-bewegingssensor aan op een Arduino Uno?”

c. **Few-Shot Prompting voor Codegeneratie**: Voorbeeld van een prompt waarmee je ChatGPT in de juiste richting stuurt voor het schrijven van code:

Prompt: “Schrijf Arduino-code om een LED aan te zetten wanneer beweging wordt gedetecteerd door een PIR-sensor. Formatteer de code netjes en voeg commentaar toe.”

d. **Chain of Thought Redenering**: Vraag ChatGPT om stap-voor-stap uit te leggen waarom bepaalde programmeerstappen worden genomen.

Prompt: “Waarom gebruik ik een 220 ohm weerstand voor de LED in mijn Arduino-project?”

e. **Debuggen en Testen**: Gebruik ChatGPT om fouten in je code op te sporen en oplossingen voor te stellen.

Prompt: “Mijn Arduino-sensor werkt niet. Welke veelvoorkomende fouten kan ik controleren?”

4. Blender x Stable diffusion

Je kunt blender samen laten werken met stable diffusion via ComfyUI Blender AddOn. In blender kun je dan van Text-to-Image en Image-to-Image.

De Blender ComfyUI AddOn is een tool waarmee je geavanceerde AI-renderings kunt genereren rechtstreeks binnen Blender, dus zonder steeds je 3D model te renderen en te expoteren. Deze add-on integreert de functionaliteit van Stable Diffusion in Blender en maakt het mogelijk om met eenvoudige tekstprompts 3D-afbeeldingen te creëren (Text-to-Image), bestaande afbeeldingen te bewerken en transformeren (Image-to-Image), en karakters of objecten te riggen en animeren met behulp van ControlNET en OpenPose. Dit biedt ontwerpers en animators de mogelijkheid om sneller en efficiënter creatieve content te ontwikkelen zonder diepgaande programmeerkennis. Bijvoorbeeld, je kunt een Disney-achtig karakter genereren voor een animatiefilm, bestaande concept design snel aanpassen tot nieuwe variaties, of een 3D-model riggen en animeren door simpelweg lijnen te tekenen met de grease pencil in Blender. Hierdoor is de add-on ideaal voor het versnellen van het proces, het verbeteren van texturen en het automatiseren van complexe modelleer- en animatiewerkzaamheden.

Voor een snelle workflow om van idee tot een 3D model te komen en daarbij een snellere variatie aan renders, die niet steeds je compositie verandert (zoals Midjourney vaak wel doet), zou je dus eerst via Trellis een 3D model kunnen generen en deze vervolgens in Blender importeren. Vervolgens kun je via ComfyUI via Image-to-Image snel realistische renders maken en variaties.

- Voeg een Image-to-Image Node toe en selecteer je basisafbeelding.
- Stel een prompt in voor de gewenste stijl, zoals: “Realistische fotorealistische textuur, natuurlijke verlichting, hoge resolutie”.
- Pas instellingen aan zoals de sterkte van de AI-bewerking en het gekozen model (bijvoorbeeld SDXL voor realistische resultaten).

Voor het goed snappen hiervan is wel enige tijd investering nodig. Hieronder een video die handig is om eerst te bekijken + een word document en een website met meer informatie over ComfyUI en het installeren hiervan:

- https://www.youtube.com/watch?v=oy2RzUbUk_4
- https://docs.google.com/document/d/1pYqbkeAbtiyraGRkzECaQx1Libbf_MKbu1tpOFfJc8E/edit?tab=t.0
- https://medium.com/kinomoto-mag/generate-ai-rendering-blender-comfyui-addon-a116a3deee7c

5. Tips & Tricks

Vizcom

- **3D generaties**: De image-to-3D tool in blender is nog niet heel goed in gedetailleerde 3D modellen genereren. Maar door een goeie shape te krijgen die je vervolgens in verschillende perspectieven kunt zetten, kun je vervolgens in Vizcom deze weer opnieuw renderen. Waardoor je gemakkelijk van een 2D render naar een 3D render kan gaan met verschillende perspectieven.
  - Voorbeeld: https://www.youtube.com/watch?v=ErwFayjq394
- **Materialen**: Gebruik referentie afbeeldingen van het materiaal dat je wilt en upload deze in Vizcom. Door alleen de gebieden te selecteren die je wilt aanpassen kun je volledige controle hebben over welke delen wel of niet aangepast mogen worden.
  - Voorbeeld: https://www.youtube.com/watch?v=4eyMDpbdEng
  - Voorbeeld: https://www.youtube.com/watch?v=KlcrlXMGsJY
- **Achtergrond:** Ook voor de achtergrond te veranderen is het gemakkelijk om de select tool te gebruiken en een referentie afbeelding te gebruiken. Tekst-to-image kan ook, maar referentie afbeeldingen gebruiken geeft vaak een beter resultaat voor wat je zoekt
  - Voorbeeld: https://www.youtube.com/watch?v=bUF0CDeUT2E

Midjourney

- **Gebruik van Prompt Enhancers**

Voor betere resultaten kun je gebruik maken van tools zoals de **Midjourney Prompt Enhancer & Prompt Writing Assistant**. Deze tool helpt je bij het verfijnen en verbeteren van je prompts zodat je gedetailleerdere en nauwkeurigere beelden krijgt.

- **Gebruik van Parameters**

Midjourney ondersteunt verschillende parameters om je resultaten aan te passen. Dit doe je door ze te typen aan het eind van je prompt. Een parameter begint altijd met – gevolgd door het woord of een afkorting. Om meerdere parameters toe te voegen voeg je deze gewoon daarachter toe met een spatie er tussen. Bijvoorbeeld [Tekst prompt} –ar 3:4 --weird 5

- **Aspect Ratio:** Gebruik --ar 16:9 om een breedbeeldverhouding te krijgen.
- **Stijl Sterkte:** Gebruik --stylize gevolgd door een getal (bijv. --stylize 1000) om de artistieke interpretatie te beïnvloeden.
- **Uitsluiting van Elementen:** Gebruik negatieve prompts, bijvoorbeeld: --no text als je geen tekst in het beeld wilt.

Overzicht parameters:

Code	Naam	Uitleg
--v, --version	Version	Specificeert een Midjourney model. Voeg het model toe in de code. Dus: *--v 5.2 of –version 5.2*. Huidige modellen zijn: 1, 2, 3, 4, 5, 5.1, 5.2, 6, 6.1
--test, --testp	Version	Dit zijn ook oudere Midjourney modellen die je kunt gebruiken en uitproberen.

--niji	Version	Deze code is specifiek voor anime versie toepassen. Hier zijn ook weer verschillende versies van; --niji 4 –niji 5 –niji 6
--ar	Aspect Ratio	De relatie tussen de breedte en de hoogte van de afbeelding. Het is altijd geschreven als B:H. Dus voor een portret afbeelding kun je –ar 9:16 typen. Default = 1:1, een vierkant
--chaos, --c	Chaos	Chaos ofwel variatie, beïnvloed de diversiteit van de vier afbeeldingen. Range = 0-100. Default = 0.
--stylize, --s	Stylize	Een stijl parameter. Deze regelt de sterkte van de default Midjourney aesthetics. Range = 0-1000. Default=100. Hoe hoger de waarde hoe minder promt coherence
--sref	Style reference	Een afbeelding als referentie nemen voor de gewenste stijl. Midjourney neemt de kleuren, textuur en overal stijl over van de referentie afbeelding. Je kunt meerder referenties toevoegen door de url van de afbeeldingen achter elkaar te typen achter de code: –*sref [url1] [url2]* Of de code nummer van een afbeelding. Als je –sref random gebruikt zal Midjourney een random stijl voor je kiezen, wat interessant kan zijn voor brainstormen.
--sw	Style weight	Regelt de zwaarte of de mate van influence van een style reference. Range = 0-1000. Default = 100.
--style	Style	Dit is niet hetzelfde stylize. Je kunt hier een style mode kiezen. Als je bijvoorbeeld meer realistische afbeeldingen wilt kun je --*style raw* gebruiken.
--quality, --q	Quality	Regelt hoeveel tijd/effort Midjourney neemt voor het fine-tunen van je resultaten. Default = 1. Hoe lager de waarde hoe sneller de generatie is, maar ook hoe lager de details/kwaliteit.
--repeat, --r	Repeat	Voert de zelfde prompt meerder keren achter elkaar uit. Wil je iets twee keer runnen typ je --*r 2*.
--video	Video	Creëert een timelaps gebaseerd op je initiële afbeelding. Als je de prompt hebt getypt en de afbeeldingen ziet, moet je reageren met de envelop emotie en krijg je een link naar de timelaps. Dit kan enkel in Discord.
--cref	Character reference	Zorgt voor het matchen van een constante karakter in je afbeeldingen. Typ de code en dan spatie en dan de url van de reference foto.
--cw	Character weight	Regelt hoe dichtbij je bij de reference karakter blijft, vooral bij de kleren en haar stijl. Range = 0-100. Default = 100.
--p, --personalize	Personalize	Laat je een eigen stijl in Midjourney maken, en door deze code te typen gebruikt hij ipv Midjourney default stijl je eigen gepersonaliseerde stijl. Deze video legt uit hoe je je eigen stijl kunt maken; https://www.youtube.com/watch?v=5PrcfuU4EXM
--no	No	Het werkt beter om een --no parameter te gebruiken achter je prompt dan in je prompt zelf dingen zeggen die je niet wilt. Typ --no met het geen wat je niet wilt, bijv; --no green, --no leaves.
--w, --weird	Weird	Creëert onverwachte gekke samenvoegingen. Kan interessant zijn voor brainstormen. Range = 0-3000.

		Default = 0. Hoe hoger de waarde hoe gekker en onvoorspelbaarder de uitkomst.

- **Experimenteer met Versies en Upgrades**

Midjourney heeft verschillende modelversies. Experimenteer met de nieuwste versie (--v 5 of hoger) voor betere resultaten. Oudere versies kunnen soms betere resultaten geven voor specifieke stijlen.

- **Gebruik van Seeds voor Consistentie**

Gebruik --seed <nummer> om consistente resultaten te krijgen wanneer je meerdere afbeeldingen maakt met dezelfde prompt.

Voorbeeld: *Een futuristische stad bij zonsondergang --v 5 --ar 16:9 --seed 12345*
Dit zorgt ervoor dat elke keer als je deze prompt met seed 12345 gebruikt, je dezelfde afbeelding krijgt.

Appendix E. Focus groups protocol

E.1. Focus group Implementation AI

Algemene informatie

Duur: 2 uur (exclusief pauze)
Datum: Donderdag 7 maart – 11:30 – 13:45
Aantal deelnemers: 5

Benodigdheden:

- Veel A4 en A3 papier.
- Stiften en pennen.
- Notitieblokken.
- Post-its.
- Presentatie voor introductie.
- Opname apparatuur.
- Laptop met Teams.
- Dit papier (geprint).
- Koffie, thee en taart/lunch.
- Parkeerbord

Doel van de focusgroep

- Identificeren van factoren die de adoptie van AI negatief beïnvloeden.
- Verkennen van manieren om bovengenoemde factoren positief te beïnvloeden om zo de AI-adoptie te bevorderen.
- Inzicht krijgen in de wrijving tussen wat bedrijven willen en wat AI-technologie kan, en mogelijke oplossingen bespreken.
- Achterhalen welke toekomstbehoeften bedrijven hebben met betrekking tot AI-functionaliteiten.

Deelnemers

Ethiek & technologie: Onderzoeker met expertise in ethische vraagstukken rondom technologie en de acceptatie daarvan.
Technologische implementatie: Specialist in de invoering van nieuwe technologieën binnen bedrijven of organisaties.
AI-expert: Kennisdrager van ontwikkelingen en de werking van AI.
Praktijkervaring: Iemand met praktijkervaring in het toepassen van AI binnen het ontwerpproces.

Methode

Negatief brainstormen
Negatief brainstormen is een brainstormtechniek die gebruik maakt van de menselijke eigenschap om sneller naar de negatieve kant van dingen te kijken. Wanneer een onderwerp of probleem wordt aangesneden vindt men het vaak makkelijker om redenen te bedenken waarom het niet werkt in plaats van kijken naar oplossingen.

Negatief brainstormen kent de volgende stappen:

1. Probleem identificeren.
2. Probleem omkeren.
3. Ideeën verzamelen.

4. Ideeën omkeren.
5. Oplossingen evalueren.

Sessiestructuur

1. **Introductie (15 min)**
   - Welkomswoord en doelstellingen benoemen.
   - Kennismakingsronde deelnemers.
     - Papier uitdelen
     - Naambordjes maken
       - Naam
       - Functie
       - Benoemenswaardige AI-ervaring
     - Tekst op naambordje delen
   - IJsbreker
     - AI-definitie opstellen door doorgeven?
     - Verhaal maken samen over AI in de toekomst
     - Vergelijken AI of mens gemaakt

   - Delen van huidige kennis.
     - Thematisering interviews.
     - Negatieve Impact Analyse met Product Impact Tool.
   - Uitleg over sessie.
     - Gespreksregels.
     - Rol van moderator (Saxion).

2. **Probleem identificeren (20 min)**
   - Wat zijn de huidige uitdagingen bij AI-adoptie?
     - Als hulpmiddel relateren aan interview thema's.
   - Hoe kunnen bedrijven zich voorbereiden op de huidige toepassingen van AI?
   - Hoe kunnen bedrijven zich voorbereiden op de toekomstige toepassingen van AI?
   - Mogelijkheid om praktijkervaring te delen.

3. **Probleem omkeren en ideeën verzamelen (25 min)**
   - De centrale vraag: Hoe kunnen we het voor bedrijven zo moeilijk mogelijk maken om AI te implementeren en accepteren?
   - Brainstormen over mogelijke belemmeringen op verschillende aspecten.

Deelnemers ideeën laten bedenken op basis van de volgende thema's:
     - **Technologisch:** Ontwerpproces en functionaliteiten van AI-tools.
     - **Organisatorisch:** Attitude en weerstand bij medewerkers, bedrijfscultuur.
     - **Ethisch:** Privacy, duurzaamheid en maatschappelijke acceptatie.
     - **Juridisch:** Wet- en regelgeving en aansprakelijkheid.
     - **Economisch:** Kosten en winstgevendheid van AI-oplossingen.
     - **Kennis & Begrip:** Toegankelijkheid en interpretatie van AI-tools.
   - De moderators zorgen ervoor dat de deelnemers de vrijheid hebben om alle ideeën kwijt te kunnen. Tegelijkertijd proberen ze de deelnemers ook weer richting de verschillende thema's te laten bewegen.

PAUZE

4. **Ideeën omkeren (20 min)**
   - Hoe kunnen deze belemmeringen veranderen in kansen?
   - Aan het eind van deze fase zijn er een aantal oplossingsrichtingen bekend.

5. **Oplossingen evalueren (20 min)**
   - Welke oplossingen zijn praktisch en haalbaar?
   - Wat kan op de korte termijn veranderen om bedrijven op weg te helpen met AI adoptie?
   - Welke lange termijnstrategieën kunnen bijdragen aan AI adoptie?

6. **Afsluiting (5 min)**
   - Iedereen bedanken voor diens tijd.
   - Vervolgstappen bespreken.

Vervolgstappen

Verwachte uitkomsten

- Overzicht belangrijke belemmeringen.
- Overzicht mogelijke oplossingen.
- Aanbevelingen verbetering AI-adoptie.
- Inzichten toekomstige AI-behoeften bij bedrijven.

Vervolgacties

- Sessie analyseren: opname terugkijken, aantekeningen maken.
- Sessie resultaten samenvatten.
- Delen van bevindingen.

E.2. Focus group Future AI

Algemene informatie

Duur: 2 uur (exclusief pauze)
Datum: VR 4 april – 11:30 – 13:45 (incl. lunch)
Aantal deelnemers: 7

Benodigdheden:

- Veel A4 en A3 papier.
- Stiften en pennen.
- Notitieblokken.
- Post-its.
- Presentatie voor introductie.
- Opname apparatuur.
- Laptop met Teams.
- Koffie, thee en taart/lunch.

Doel van de focusgroep

- Verkennen van de verwachtingen rondom toekomstige AI-mogelijkheiden, zowel in algemene zin als specifiek binnen het ontwerpproces.
- Ontwikkelen van een roadmap die bedrijven helpt zich voor te bereiden op toekomstige AI-ontwikkelingen.

Deelnemers

- Ontwerper DE Design
- Docent en onderzoeker Windesheim Data Driven
- Docent Saxion Industrieel Product Ontwerpen
- Onderzoeker Ambience Intelligence
- AI Expert bij Viro
- Productontwerper Dynteq
- Head of Design Dynteq

Methode

Denken-delen-uitwisselen
Denken-delen-uitwisselen is een werkvorm die veel gebruikt wordt binnen het onderwijs om coöperatief leren te bevorderen. Het wordt vooral ingezet om voorkennis te activeren of om te oriënteren op een opdracht. De werkvorm bestaat uit drie stappen:

1. Denken: de deelnemers formuleren individueel hun antwoorden.
2. Delen: de deelnemers bespreken hun inzichten met de persoon naast hen.
3. Uitwisselen: de belangrijkste bevindingen worden plenair gedeeld.

Sessiestructuur

1. **Introductie (20 min)**
   - Welkomstwoord en doelstellingen benoemen.
   - Kennismakingsronde deelnemers.
   - IJsbreker
   - Project uitleg
   - Ontwerpproces uitleggen
   - Uitleg over sessie.

    - Gespreksregels.
    - Rol van moderator (Saxion).

2. **Huidige situatie (25 min)**
   - Het Denken-Delen-Uitwisselen principe wordt toegepast.
   - De volgende vragen worden gesteld:
     - Wat zijn de huidige uitdagingen met AI in het ontwerpproces?
     - Wat zijn de huidige kansen met AI in het ontwerpproces?
     - In welke aspecten presteer jij significant beter dan AI?
     - Voor welke taken gebruik je AI niet omdat de technologie nog niet voldoet?
   - Dit onderdeel afsluiten door de huidige situatie in één zin samen te vatten.

3. **Toekomstige mogelijkheden (30 min)**
   - Het Denken-Delen-Uitwisselen principe wordt toegepast.
   - De volgende vragen worden gesteld:
     - Wat zijn jouw verwachtingen voor de toekomstige mogelijkheden van AI in ontwerp?
     - Wat zijn jouw wensen voor de toekomstige mogelijkheden van AI in ontwerp?
     - Welke potentiële toepassingen van AI zie je voor je in het ontwerpproces?
   - Als inspiratie reflectie kick-off meeting laten zien. Omschrijf nu in één zin:
     - Je toekomstige ideaalbeeld/ utopisch beeld
     - Je toekomstige realistische beeld
     - Je toekomstige dystopische beeld
   - Dit onderdeel afsluiten door de toekomstige situatie in één zin samen te vatten.

4. **Ontwikkeling van een Roadmap (40 min)**
   - Visualiseren van de huidige situatie en de gewenste toekomstige situatie.
     - De twee zinnen uit vorige onderdelen.
     - Aan weerskanten van de tafel plaatsen.
   - Deelnemers noteren welke stappen, middelen en veranderingen er nodig zijn om van de huidige naar de toekomstige situatie te komen door een tijdslijn te maken.
     - De input hoeft niet chronologisch op te komen.
     - De input dient wel op de juiste plek op de tijdlijn worden gelegd.
   - Dit dient als eventuele inspiratiebron: https://qubitrocket.com/ai-roadmap-2025shape-the-future-of-artificial-intelligence/

5. **Afsluiting (5 min)**

Iedereen bedanken voor diens tijd.
Vervolgstappen bespreken.

Vervolgstappen

Verwachte uitkomsten

- Overzicht van huidige uitdagingen en kansen rondom AI in het ontwerpproces.

- Inzichten in de wensen en verwachtingen voor toekomstige AI-toepassingen binnen het ontwerpproces.
- De eerste opzet voor een roadmap, waarmee bedrijven zich kunenn voorbereiden op toekomstige AI ontwikkelingen.

Vervolgacties

- Sessie analyseren: opname terugkijken, aantekeningen maken.
- Sessie resultaten samenvatten.
- Delen van bevindingen.

Appendix F. Miro boards

Thematic analysis interviews ‘Interviews needs and challenges AI adoption’ and ‘Interviews current state of AI (in design)’ at Miro board: https://miro.com/app/board/uXjVLM9Xnms=/

Thematics analysis focus group ‘Implementation AI’ at Miro board: https://miro.com/app/board/uXjVIJblq2w=/

Thematic analysis focus group ‘Future AI’ at Miro board: https://miro.com/app/board/uXjVIFjvSfk=/

Appendix G. Questionnaire

G.1. Questionnaire content

AI technologie en bedrijfscultuur

Start van blok: Introductie

Toestemming Beste deelnemer, Ik nodig u uit om deel te nemen aan dit onderzoek door de volgende enquête in te vullen. Deze enquête is onderdeel van mijn master thesis voor de opleiding Industrial Design Engineering aan de Universiteit Twente, en het Project 'AI in Ontwerp' van Saxion Lectoraat Industrial Design. Het doel van dit onderzoek is om inzicht te krijgen op de invloed van de bedrijfscultuur op de adoptie van AI in het ontwerpproces. Het invullen de vragenlijst duurt ongeveer 5 minuten. U bent in geen enkel opzicht verplicht om de vragen te beantwoorden en u kunt op elk moment stoppen met de vragenlijst. De verzamelde gegevens blijven vertrouwelijk; ze worden anoniem verwerkt in het onderzoek en uitsluitend ingezet voor academische doeleinden. Heel erg bedankt voor uw tijd en hulp! Met vriendelijke groet, Debbie Waninge (M-IDE) d.waninge@saxion.nl

○ Ik verklaar dat ik de inhoud van bovenstaande tekst volledig begrijp en toestemming geef om mijn antwoorden te gebruiken voor dit onderzoek. Ik ben mij er van bewust dat ik op elk moment deze toestemming kan intrekken door een mail te sturen naar d.waninge@saxion.nl. (1)

Bedrijf Voor welke bedrijf werkt u?

_____

_____

_____

Einde blok: Introductie

Start van blok: Vragenlijst

Ervaring AI Hieronder staan een aantal stellingen. Geef per stelling aan in hoeverre deze betrekking heeft op u.

	Nooit	Zelden	Regelmatig	Vaak	Altijd
	0 1 2 3 4 5 6 7 8 9 10				
Ik genereer teksten met behulp van AI. ()					
Ik stel vragen aan AI. ()					
Ik genereer afbeeldingen met behulp van AI. ()					
Ik gebruik AI voor complexere taken, zoals planning, documentatie en data analyse. ()					
Ik pas AI toe binnen projecten. ()					
Ik maak eigen GPTs. ()					
Ik identificeer mijzelf als iemand met veel kennis van AI. ()					

Persona Hieronder staan een aantal stellingen. Geef per stelling aan in hoeverre deze betrekking heeft op u.

	Helemaal niet mee eens	Enigszins mee oneens	Noch eens noch oneens	Enigszins mee eens	Helemaal mee eens	Niet van toepassing
	0	1 2	3 4	5 6	7 8	9 10
Ik raak gefrustreerd als een AI-tool binnen 15 minuten niet het gewenste resultaat geeft. ()						
Ik ben gemotiveerd om nieuwe AI-tools te testen. ()						
Ik zoek informatie op over technologische ontwikkelingen op het gebied van AI. ()						
Ik kan mijn ontwerptaken beter uitvoeren dan een AI. ()						
Ik kan mijn ontwerptaken beter uitvoeren door een AI-tool te gebruiken. ()						
Het gebruik van AI-tools in het ontwerpproces voelt als valsspelen. ()						
Door AI-tools te gebruiken daalt de waarde van het eindproduct. ()						
Ik ben bang dat we de boot missen als we AI gebruik uitstellen. ()						
Ik pak moeilijkere taken op omdat ik weet dat ik op AI kan terugvallen. ()						

AI gebruik Hieronder staan een aantal stellingen. Geef per stelling aan in hoeverre deze betrekking heeft op u.

	Helemaal niet mee eens	Enigszins mee oneens	Noch eens noch oneens	Enigszins mee eens	Helemaal mee eens	Niet van toepassing
	0	1 2	3 4	5 6	7 8	9 10
Ik verifieer de output die een AI genereert altijd. ()						
Hoe vaker AI goede output geeft, hoe minder vaak ik deze output grondig doorlees. ()						
Ik ben bekend genoeg met de privacy risico's om in te schatten wat ik wel en niet met een AI kan delen. ()						
Ik zie AI als een waardevolle toevoeging voor mijn vakgebied. ()						
De hoge energieconsumptie van AI zorgt ervoor dat ik het minder vaak toepas. ()						
Ik stel vragen aan een AI-tool in plaats van aan een collega. ()						

Bedrijfscultuur Hieronder staan een aantal stellingen. Geef per stelling aan in hoeverre deze betrekking heeft op het bedrijf.

	Helemaal niet mee eens	Enigszins mee oneens	Noch eens noch oneens	Enigszins mee eens	Helemaal mee eens	Niet van toepassing
	0	1 2	3 4	5	6 7	8 9 10
Ik weet naar wie ik toe kan voor AI relateerde vragen. ()						
Er zijn binnen het bedrijf afspraken gemaakt over AI gebruik. ()						
Er wordt open over het gebruik van AI gesproken binnen het bedrijf. ()						
Er wordt positief gesproken over het gebruik van AI binnen het bedrijf. ()						
Medewerkers inspireren elkaar in het gebruik van AI. ()						

AI gebruik Wie initieert AI gebruik binnen het bedrijf ? [Benoem de functie]

_____

_____

_____

Toekomst AI Noem een werkgerelateerde taak die u het liefst door AI over wil laten nemen.

_____

_____

_____

Functies AI Met welk doel wilt u AI het liefst inzetten voor uw werkzaamheden?

- ○ Efficiëntie verhogen (1)
- ○ Creativiteit vergroten (2)
- ○ Kwaliteit van mijn werk verbeteren (3)
- ○ Uitbereiden van mijn skillset (4)
- ○ Persoonlijk assistent (5)

Einde blok: Vragenlijst

G.2. Relation statement - measurement

Experience AI (E)

No.	Item	Functions AI	GenAI maturity
E1	I generate texts using AI.	Efficiency	Tool (level 1)
E2	I ask questions to AI.	Assistant	Assistant (level 2)
E3	I generate images using AI.	Efficiency	Tool (level 1)
E4	I use AI for more complex tasks, such as planning, documentation, and data analysis.	Quality improvement	Sparring partner (level 3)
E5	I apply AI within projects.	Assistant	Assistant (level 2)
E6	I create my own GPTs.	Quality improvement	Sparring partner (level 3)
E7	I identify myself as someone with extensive knowledge of AI.	Understanding AI	

Persona AI (P)

No.	Item	Persona
P1	I get frustrated if an AI tool does not give the desired result within 15 minutes.	Persona 1
P2	I am motivated to test new AI tools.	Persona 2
P3	I look up information about technological developments in the field of AI.	Persona 2
P4	I can perform my design tasks better than an AI.	Persona 3
P5	I can perform my design tasks better by using AI tools.	Persona 1
P6	Using AI tools in the design process feels like cheating.	Persona 3
P7	The use of AI tools lowers the value of the final product.	Persona 3

P8	I am afraid we will miss the boat if we delay AI adoption.	Persona 1
P9	I take on more difficult tasks because I know I can rely on AI.	Persona 2

Usage AI (U)

No.	Item	Adoption factors
U1	I always verify the output generated by AI.	Little trust in output quality
U2	The more often AI produces good output, the less thoroughly I review it.	Little trust in output quality
U3	I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	Negative impact AI (privacy)
U4	I see AI as a valuable addition to my field.	Unrealistic expectations of AI
U5	The high energy consumption of AI makes me use it less often.	Negative impact AI (energy consumption)
U6	I ask questions to an AI tool instead of a colleague.	Negative impact AI (isolation)

Company culture (C)

No.	Item	Maturity level
C1	I know who to turn to for AI-related questions.	Level 3 or higher
C2	Agreements have been made within the company regarding AI use.	Level 4 or higher
C3	AI use is openly discussed within the company.	Level 2 or higher
C4	AI use is talked about positively within the company.	Level 5
C5	Employees inspire each other by using AI.	Level 4 or higher

G.3. Results questionnaires

All companies

	Survey I (n = 26)					Survey II (n = 29)				
Experience AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I generate texts with AI	0,00	10,00	4,70	2,91	8,47	0,00	10,00	4,46	2,83	8,00
I ask questions to AI	0,00	9,00	5,26	2,42	5,84	2,00	9,00	5,58	2,44	5,94
I generate images using AI	0,00	8,00	3,33	2,51	6,32	0,00	8,00	3,45	2,52	6,34
I use AI for more complex tasks like, planning, documentation and data analysis	0,00	7,00	2,29	2,27	5,15	0,00	7,00	2,70	2,16	4,65
I use AI within projects	0,00	9,00	4,05	2,85	8,14	1,00	10,00	4,20	2,80	7,84
I create my own GPTs	0,00	4,00	0,58	1,19	1,41	0,00	6,00	1,53	2,25	5,05
I identify myself as someone with extensive knowledge about AI	0,00	5,00	2,43	1,56	2,42	0,00	7,00	2,83	2,09	4,39
Persona AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I get frustrated if an AI tool does not give the desired result within 15 minutes.	0,00	8,00	4,52	2,24	5,03	1,00	10,00	5,04	2,92	8,54
I am motivated to test new AI tools.	0,00	10,00	6,00	3,03	9,17	0,00	10,00	4,88	2,58	6,64
I look up information about technological developments in the field of AI.	0,00	9,00	5,32	2,75	7,58	0,00	10,00	4,46	3,19	10,16
I can perform my design tasks better than an AI.	0,00	10,00	6,76	2,69	7,23	1,00	10,00	7,09	2,66	7,08
I can perform my design tasks better by using AI tools.	0,00	10,00	4,95	2,60	6,77	1,00	8,00	4,43	2,17	4,72
Using AI tools in the design process feels like cheating.	0,00	9,00	3,15	2,85	8,13	0,00	10,00	4,05	2,84	8,04
The use of AI tools lowers the value of the final product.	0,00	8,00	2,46	2,69	7,25	0,00	8,00	3,26	2,49	6,19
I am afraid we will miss the boat if we delay AI adoption.	1,00	10,00	6,13	2,55	6,53	1,00	10,00	5,68	2,56	6,54
I take on more difficult tasks because I know I can rely on AI.	0,00	9,00	1,48	2,11	4,44	0,00	6,00	1,71	2,07	4,30
Usage AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I always verify the output generated by AI.	3,00	10,00	7,64	2,16	4,69	1,00	10,00	6,88	2,45	6,03
The more often AI produces good output, the less thoroughly I review it.	0,00	8,00	4,76	2,79	7,80	0,00	7,00	4,36	1,94	3,75
I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	0,00	10,00	4,65	2,79	7,79	1,00	10,00	5,31	2,92	8,52
I see AI as a valuable addition to my field.	1,00	10,00	6,52	2,06	4,25	2,00	10,00	6,00	2,09	4,38
The high energy consumption of AI makes me use it less often.	0,00	10,00	3,00	2,81	7,90	0,00	10,00	3,88	3,04	9,23
I ask questions to an AI tool instead of a colleague.	0,00	9,00	2,96	2,65	7,00	0,00	8,00	3,72	2,44	5,96
Company culture	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I know who to turn to for AI-related questions.	0,00	10,00	3,87	2,83	8,03	1,00	9,00	4,08	2,23	4,95
Agreements have been made within the company regarding AI use.	0,00	7,00	3,29	2,27	5,16	0,00	8,00	2,17	2,13	4,56
AI use is openly discussed within the company.	0,00	10,00	6,46	3,29	10,80	2,00	10,00	6,85	2,61	6,82
AI use is talked about positively within the company.	1,00	8,00	5,52	2,12	4,51	2,00	10,00	5,69	1,88	3,52
Employees inspire each other by using AI.	0,00	9,00	4,87	2,59	6,72	1,00	10,00	4,92	2,43	5,92

Company A (n=2)

	Survey I (n = 2)					Survey II (n = 2)				
Experience AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I generate texts with AI	2,00	3,00	2,50	0,50	0,25	3,00	3,00	3,00	0,00	0,00
I ask questions to AI	3,00	5,00	4,00	1,00	1,00	2,00	6,00	4,00	2,00	4,00
I generate images using AI	2,00	7,00	4,50	2,50	6,25	2,00	7,00	4,50	2,50	6,25
I use AI for more complex tasks like, planning, documentation and data analysis	1,00	1,00	1,00	0,00	0,00	3,00	3,00	3,00	0,00	0,00
I use AI within projects	2,00	2,00	2,00	0,00	0,00	2,00	4,00	3,00	1,00	1,00
I create my own GPTs	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
I identify myself as someone with extensive knowledge about AI	4,00	5,00	4,50	0,50	0,25	1,00	5,00	3,00	2,00	4,00
Persona AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I get frustrated if an AI tool does not give the desired result within 15 minutes.	1,00	8,00	4,50	3,50	12,25	6,00	9,00	7,50	1,50	2,25
I am motivated to test new AI tools.	9,00	9,00	9,00	0,00	0,00	4,00	6,00	5,00	1,00	1,00
I look up information about technological developments in the field of AI.	2,00	8,00	5,00	3,00	9,00	1,00	7,00	4,00	3,00	9,00
I can perform my design tasks better than an AI.	8,00	10,00	9,00	1,00	1,00	4,00	7,00	5,50	1,50	2,25
I can perform my design tasks better by using AI tools.	3,00	6,00	4,50	1,50	2,25	1,00	2,00	1,50	0,50	0,25
Using AI tools in the design process feels like cheating.	0,00	2,00	1,00	1,00	1,00	0,00	3,00	1,50	1,50	2,25
The use of AI tools lowers the value of the final product.	1,00	1,00	1,00	0,00	0,00	1,00	3,00	2,00	1,00	1,00
I am afraid we will miss the boat if we delay AI adoption.	8,00	8,00	8,00	0,00	0,00	8,00	9,00	8,50	0,50	0,25
I take on more difficult tasks because I know I can rely on AI.	1,00	1,00	1,00	0,00	0,00	0,00	1,00	0,50	0,50	0,25
Usage AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I always verify the output generated by AI.	8,00	10,00	9,00	1,00	1,00	4,00	5,00	4,50	0,50	0,25
The more often AI produces good output, the less thoroughly I review it.	2,00	3,00	2,50	0,50	0,25	2,00	2,00	2,00	0,00	0,00
I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	1,00	3,00	2,00	1,00	1,00	4,00	4,00	4,00	0,00	0,00
I see AI as a valuable addition to my field.	3,00	8,00	5,50	2,50	6,25	3,00	8,00	5,50	2,50	6,25
The high energy consumption of AI makes me use it less often.	2,00	2,00	2,00	0,00	0,00	0,00	4,00	2,00	2,00	4,00
I ask questions to an AI tool instead of a colleague.	2,00	3,00	2,50	0,50	0,25	1,00	5,00	3,00	2,00	4,00
Company culture	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I know who to turn to for AI-related questions.	2,00	10,00	6,00	4,00	16,00	5,00	8,00	6,50	1,50	2,25
Agreements have been made within the company regarding AI use.	5,00	5,00	5,00	0,00	0,00	1,00	3,00	2,00	1,00	1,00
AI use is openly discussed within the company.	10,00	10,00	10,00	0,00	0,00	10,00	10,00	10,00	0,00	0,00
AI use is talked about positively within the company.	3,00	5,00	4,00	1,00	1,00	5,00	6,00	5,50	0,50	0,25
Employees inspire each other by using AI.	3,00	9,00	6,00	3,00	9,00	6,00	8,00	7,00	1,00	1,00

Company D (n=12, n=16)

	Survey I (n = 12)					Survey II (n = 16)				
Experience AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I generate texts with AI	1,00	8,00	5,70	2,45	6,00	0,00	8,00	4,62	2,59	6,71
I ask questions to AI	3,00	8,00	6,30	1,73	2,99	2,00	9,00	5,93	2,40	5,76
I generate images using AI	0,00	7,00	3,44	2,45	6,00	0,00	7,00	2,92	2,53	6,40
I use AI for more complex tasks like, planning, documentation and data analysis	0,00	6,00	2,50	2,29	5,24	0,00	6,00	1,92	1,86	3,46
I use AI within projects	0,00	8,00	4,30	2,69	7,24	1,00	7,00	3,86	2,10	4,41
I create my own GPTs	0,00	0,00	0,00	0,00	0,00	0,00	6,00	1,22	2,30	5,29
I identify myself as someone with extensive knowledge about AI	1,00	5,00	2,78	1,40	1,96	0,00	5,00	2,50	3,25	10,56
Persona AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I get frustrated if an AI tool does not give the desired result within 15 minutes.	0,00	7,00	4,00	2,24	5,02	1,00	9,00	4,08	2,69	7,24
I am motivated to test new AI tools.	2,00	10,00	7,10	2,47	6,10	0,00	10,00	5,21	2,98	8,88
I look up information about technological developments in the field of AI.	3,00	8,00	6,00	1,94	3,76	0,00	10,00	4,17	3,24	10,50
I can perform my design tasks better than an AI.	5,00	10,00	7,43	2,19	4,80	1,00	10,00	7,36	3,34	11,16
I can perform my design tasks better by using AI tools.	2,00	10,00	6,13	2,15	4,62	1,00	8,00	4,90	1,97	3,88
Using AI tools in the design process feels like cheating.	0,00	6,00	2,33	2,36	5,57	0,00	10,00	3,90	3,36	11,29
The use of AI tools lowers the value of the final product.	0,00	7,00	1,00	2,10	4,41	0,00	8,00	2,73	2,49	6,20
I am afraid we will miss the boat if we delay AI adoption.	1,00	10,00	6,70	2,37	5,62	1,00	8,00	5,38	2,56	6,55
I take on more difficult tasks because I know I can rely on AI.	0,00	5,00	1,40	1,62	2,62	0,00	6,00	2,27	2,18	4,75
Usage AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I always verify the output generated by AI.	3,00	9,00	6,10	1,97	3,88	1,00	10,00	6,71	2,81	7,90
The more often AI produces good output, the less thoroughly I review it.	0,00	8,00	4,00	3,07	9,42	2,00	7,00	4,71	1,71	2,92
I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	1,00	10,00	5,30	2,87	8,24	1,00	10,00	5,36	3,08	9,49
I see AI as a valuable addition to my field.	5,00	10,00	7,50	1,63	2,66	2,00	10,00	6,14	2,17	4,71
The high energy consumption of AI makes me use it less often.	0,00	5,00	1,78	1,93	3,72	0,00	9,00	3,15	2,82	7,95
I ask questions to an AI tool instead of a colleague.	0,00	8,00	3,10	2,84	8,07	1,00	8,00	4,36	2,12	4,49
Company culture	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I know who to turn to for AI-related questions.	0,00	7,00	3,80	2,52	6,35	1,00	9,00	3,86	2,50	6,25
Agreements have been made within the company regarding AI use.	1,00	7,00	3,60	2,37	5,62	0,00	8,00	2,42	2,63	6,92
AI use is openly discussed within the company.	2,00	10,00	6,60	2,80	7,84	3,00	10,00	7,64	2,02	4,08
AI use is talked about positively within the company.	2,00	8,00	6,30	1,90	3,61	3,00	10,00	6,57	1,76	3,10
Employees inspire each other by using AI.	1,00	8,00	5,80	2,23	4,97	1,00	10,00	5,21	2,73	7,45

Company B (n=7, n=5)

	Survey I (n = 7)					Survey II (n = 5)				
Experience AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I generate texts with AI	0,00	6,00	2,67	1,97	3,88	0,00	5,00	2,25	1,79	3,20
I ask questions to AI	0,00	5,00	3,17	1,57	2,46	2,00	7,00	4,20	1,72	2,96
I generate images using AI	0,00	3,00	1,60	1,02	1,04	1,00	3,00	2,33	0,94	0,88
I use AI for more complex tasks like, planning, documentation and data analysis	0,00	1,00	0,33	0,47	0,22	0,00	4,00	2,00	1,41	1,99
I use AI within projects	0,00	5,00	2,25	1,92	3,69	1,00	3,00	2,00	0,71	0,50
I create my own GPTs	0,00	1,00	0,33	0,47	0,22	0,00	1,00	0,50	0,50	0,25
I identify myself as someone with extensive knowledge about AI	0,00	5,00	1,71	1,58	2,50	0,00	7,00	2,40	2,58	6,66
Persona AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I get frustrated if an AI tool does not give the desired result within 15 minutes.	1,00	7,00	4,83	2,03	4,12	2,00	9,00	4,60	2,65	7,02
I am motivated to test new AI tools.	0,00	8,00	3,43	2,50	6,25	2,00	6,00	4,00	1,67	2,79
I look up information about technological developments in the field of AI.	0,00	9,00	5,00	3,34	11,16	1,00	10,00	4,00	3,29	10,82
I can perform my design tasks better than an AI.	0,00	10,00	5,57	3,33	11,09	7,00	10,00	8,20	0,98	0,96
I can perform my design tasks better by using AI tools.	0,00	5,00	2,57	1,76	3,10	2,00	5,00	3,40	1,20	1,44
Using AI tools in the design process feels like cheating.	0,00	9,00	3,14	3,00	9,00	2,00	7,00	5,00	1,67	2,79
The use of AI tools lowers the value of the final product.	0,00	8,00	4,14	2,80	7,84	5,00	8,00	6,00	1,26	1,59
I am afraid we will miss the boat if we delay AI adoption.	1,00	7,00	4,29	2,12	4,49	1,00	6,00	4,60	1,96	3,84
I take on more difficult tasks because I know I can rely on AI.	0,00	1,00	0,50	0,50	0,25	0,00	2,00	1,00	0,82	0,67
Usage AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I always verify the output generated by AI.	7,00	10,00	9,20	1,17	1,37	4,00	10,00	7,25	2,17	4,71
The more often AI produces good output, the less thoroughly I review it.	1,00	7,00	5,00	2,10	4,41	0,00	6,00	4,00	2,45	6,00
I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	0,00	7,00	4,00	2,83	8,01	1,00	10,00	5,20	3,43	11,76
I see AI as a valuable addition to my field.	1,00	8,00	5,17	2,19	4,80	3,00	6,00	5,00	1,10	1,21
The high energy consumption of AI makes me use it less often.	0,00	10,00	3,50	3,40	11,56	5,00	10,00	7,80	1,72	2,96
I ask questions to an AI tool instead of a colleague.	0,00	4,00	1,33	1,25	1,56	0,00	4,00	1,75	1,48	2,19
Company culture	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I know who to turn to for AI-related questions.	0,00	7,00	3,17	2,61	6,81	4,00	6,00	5,25	0,83	0,69
Agreements have been made within the company regarding AI use.	0,00	5,00	1,40	1,96	3,84	0,00	4,00	1,60	1,36	1,85
AI use is openly discussed within the company.	0,00	10,00	6,17	4,26	18,15	2,00	10,00	6,00	3,03	9,18
AI use is talked about positively within the company.	1,00	8,00	4,50	2,69	7,24	2,00	6,00	4,40	1,62	2,62
Employees inspire each other by using AI.	0,00	9,00	3,67	2,75	7,56	1,00	6,00	3,40	1,62	2,62

Company C (n=5, n=6)

	Survey I (n = 5)					Survey II (n = 6)				
Experience AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I generate texts with AI	1,00	10,00	6,00	3,41	11,63	1,00	10,00	6,40	3,14	9,86
I ask questions to AI	1,00	9,00	6,20	2,93	8,58	2,00	9,00	6,60	2,42	5,86
I generate images using AI	1,00	8,00	4,40	2,73	7,45	2,00	8,00	5,00	2,28	5,20
I use AI for more complex tasks like, planning, documentation and data analysis	1,00	7,00	3,40	2,24	5,02	3,00	7,00	5,20	1,60	2,56
I use AI within projects	1,00	9,00	5,80	3,06	9,36	1,00	10,00	7,40	3,32	11,02
I create my own GPTs	0,00	4,00	1,50	1,66	2,76	0,00	6,00	2,75	2,17	4,71
I identify myself as someone with extensive knowledge about AI	0,00	3,00	2,00	1,10	1,21	1,00	6,00	4,00	1,79	3,20
Persona AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I get frustrated if an AI tool does not give the desired result within 15 minutes.	3,00	7,00	5,20	1,47	2,16	2,00	10,00	6,80	2,79	7,78
I am motivated to test new AI tools.	2,00	9,00	6,20	2,79	7,78	2,00	7,00	4,80	2,32	5,38
I look up information about technological developments in the field of AI.	0,00	7,00	4,80	2,64	6,97	1,00	8,00	5,80	2,64	6,97
I can perform my design tasks better than an AI.	4,00	8,00	6,60	1,74	3,03	4,00	7,00	5,75	1,09	1,19
I can perform my design tasks better by using AI tools.	3,00	9,00	6,60	2,06	4,24	3,00	8,00	6,00	2,12	4,49
Using AI tools in the design process feels like cheating.	2,00	9,00	5,00	2,61	6,81	1,00	7,00	4,40	2,33	5,43
The use of AI tools lowers the value of the final product.	0,00	8,00	3,60	2,15	4,62	0,00	5,00	2,20	1,72	2,96
I am afraid we will miss the boat if we delay AI adoption.	1,00	10,00	6,80	2,56	6,55	2,00	10,00	6,40	2,58	6,66
I take on more difficult tasks because I know I can rely on AI.	0,00	9,00	3,25	3,42	11,70	0,00	6,00	1,40	2,33	5,43
Usage AI	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I always verify the output generated by AI.	6,00	10,00	8,60	1,50	2,25	7,00	9,00	8,00	0,63	0,40
The more often AI produces good output, the less thoroughly I review it.	7,00	8,00	7,50	0,50	0,25	2,00	7,00	4,60	1,74	3,03
I am knowledgeable enough about privacy risks to assess what I can and cannot share with AI.	1,00	7,00	5,20	2,23	4,97	2,00	8,00	5,80	2,23	4,97
I see AI as a valuable addition to my field.	5,00	8,00	6,60	1,20	1,44	3,00	9,00	6,80	2,04	4,16
The high energy consumption of AI makes me use it less often.	2,00	8,00	5,25	2,17	4,71	1,00	4,00	2,60	1,02	1,04
I ask questions to an AI tool instead of a colleague.	1,00	9,00	4,80	2,71	7,34	1,00	8,00	3,80	3,06	9,36
Company culture	**Min**	**Max**	**Mean**	**SD**	**Variance**	**Min**	**Max**	**Mean**	**SD**	**Variance**
I know who to turn to for AI-related questions.	1,00	7,00	4,00	2,68	7,18	2,00	4,00	2,80	0,75	0,56
Agreements have been made within the company regarding AI use.	3,00	6,00	4,20	1,17	1,37	1,00	5,00	2,20	1,60	2,56
AI use is openly discussed within the company.	2,00	6,00	4,20	1,47	2,16	3,00	6,00	4,20	1,17	1,37
AI use is talked about positively within the company.	5,00	7,00	5,80	0,98	0,96	2,00	6,00	4,60	1,36	1,85
Employees inspire each other by using AI.	2,00	7,00	4,00	1,90	3,61	2,00	6,00	4,80	1,60	2,56

Appendix H. Market research AI workshops

The Gen AI

Website: https://thegenai.ai/workshops/

What they offer:

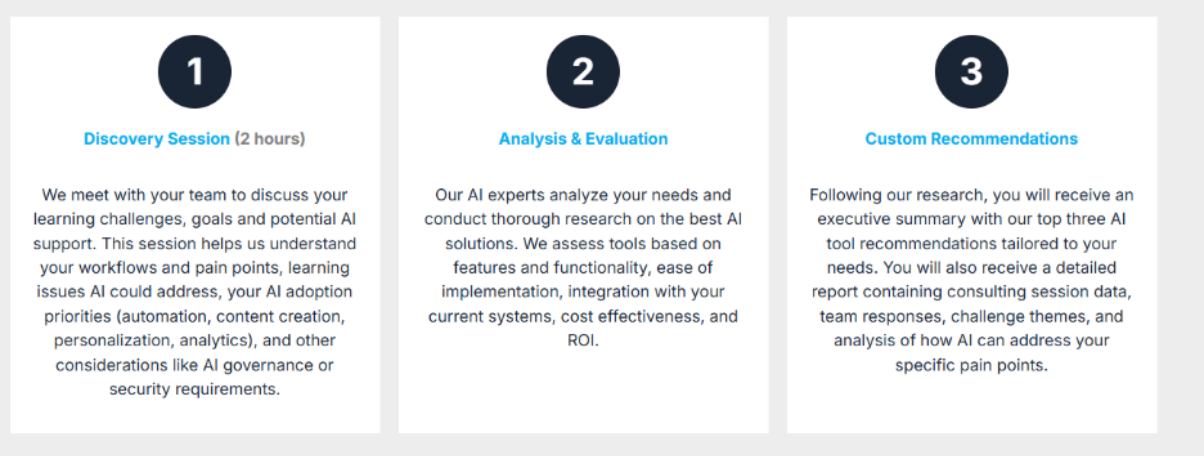
- Applied AI for Professionals
  - Discover and prioritize AI use cases and pilot projects that align with your business goals.
- Strategic AI for Business Leaders
  - Identify and address business challenges more effectively and intelligently with AI solutions.
- AI-Driven Innovation
  - Go beyond efficiency. Use AI to drive innovation, unlock new markets, and create transformative business models.
- Prompt Engineering for Teams
  - Master the art of crafting effective prompts and develop ready-to-use templates for your workflows.

By the end of each workshop, the team will have:

- A comprehensive understanding of AI's potential impact on your business.
- A collection of function-specific AI pilot project ideas.
- A use case worksheet with prioritized project rankings.
- A workshop summary report detailing key findings and insights.
- A recommended action plan for AI implementation over the next year

Mindspring

Website: https://gomindspring.com/ai-workshops/



Dr Joni Multimedia

Website: https://jonigutierrez.com/ai-workshops.html

Workshop they offer related to the context of this research:

6. Creative Futures: Co-Creating with AI
Reimagine creativity with AI as your co-pilot. This session blends storytelling, experimentation, and design thinking for ethically driven innovation.
Focus: Creative workflows, brand integrity, AI-assisted content
Duration: Half-day or full-day
Ideal for: Creative teams, marketers, innovation leads

9. Writing AI Use Policies that Reflect Your Values
This hands-on session helps teams draft clear, inclusive AI guidelines—whether for internal use, teaching, or product development.
Focus: Policy language, ethical boundaries, internal alignment
Duration: 60–90 minutes
Ideal for: HR, legal, IT, DEI, academic or administrative leadership

AI.nl

Website: https://www.ai.nl/ai-workshops

Relevant information from there website:

De workshops zijn zo opgebouwd dat medewerkers van alle niveaus hands-on ervaring opdoen, met specifieke voorbeelden en oefeningen die relevant zijn voor hun dagelijkse werk. We leren ze werken met specifieke AI-tools én ze krijgen grip op de werking van de technologie en hoe het voor hen een aanvulling kan zijn bij de uitvoering van taken.

De lengte van een workshop varieert van een uur tot een dag(deel) en zijn gericht op trends, tooling, data analytics, machine learning, taalmodellen (LLM) zoals ChatGPT en de praktische toepassingen.

Er zijn meer dan 20.000 slimme AI tools op de markt die je helpen bij het oplossen van problemen in je rol, team of organisatie. Maar hoe vind je de juiste tool, hoe gebruik je deze effectief en hoe integreer je deze in bestaande processen? Onze trainers helpen met interactieve sessies.

De AI workshop

Website: https://www.deaiworkshop.nl/

Results they promise on their website:

- Je begrijpt de impact en mogelijkheden van AI
- Je hebt basiskennis over wat AI is en hoe een AI model werkt
- Je kunt AI-tools inzetten om efficiënter te werken
- Je weet wat prompten is en kunt goede prompts opstellen
- Je herkent de risico's en valkuilen van het gebruik van AI
- Je werkt veilig, privacy-bewust en ethisch met AI

They also offer workshop for companies. On their website they explain briefly what participants will do during this workshop:

Duik in de wereld van Artificial Intelligence met onze workshop 'Wat betekent AI voor mij?'. Deze interactieve ervaring, bedacht door studenten aan de Technische Universiteit Eindhoven, legt in simpele termen uit wat AI is, hoe het werkt en laat je ChatGPT/ Copilot zelf ervaren.

In het eerste gedeelte van 30 minuten duiken we in de basis van AI en ChatGPT/ Copilot, waar we belangrijke concepten uitleggen en tips delen over prompt engineering. Tijdens het praktijkgedeelte gaan we dieper in op drie op maat gemaakte gebruikssituaties en organiseren we een brainstormsessie om de potentiële toepassingen van AI binnen jouw organisatie te verkennen.

AI Wat Nu?

Website: https://www.aiwatnu.nl/

They offer:

- AI inspiratie lezing: Inspirerende keynote voor ondernemers, professionals en medewerkers. Doelen:
    - Inzicht in AI-trends en innovaties
    - Inspireren en draagvlak creëren
    - Concrete praktijkvoorbeelden
    - Toekomst van werk
- AI strategie management workshop: Ontwikkeling concreet plan van aanpak voor management teams om AI organisatie-breed in te zetten. Voor de ontwikkeling van een AI-strategie en concreet implementatieplan. In deze workshop komt aan bod:
    - Inzicht in actuele AI-ontwikkelingen
    - Inspirerende praktijkcases
    - Strategische verkenning
    - Opzet plan van aanpak
- AI ambassadeurs (medewerkers workshop): Opleiden en inspireren van interne AI ambassadeurs voor draagvlak en versnelling. Dit is nodig voor een succesvolle AI implementatie en het wegnemen van barrièrs.
    - Uitleg AI theorie en toepassingen
    - Casestudies afgestemd op organisatie
    - Praktische oefeningen en demo's
    - Verhogen AI-geletterdheid

Dutch AI

Website: https://www.dutch-ai.nl/diensten/workshops/ai-model-professionals

What they offer:

- Workshop AI in één middag
    - Ontwikkel in slechts één (mid)dag een diepgaand begrip van AI, met praktische inzichten van AI-experts en een grondige behandeling van de regelgevende aspecten. Bereid je voor op boeiende gesprekken en een solide kennisfundament over AI na deze informatieve workshop. Aan het einde van de workshop beschik jij over de volgende kennis:
        - Nieuwste ontwikkelingen in AI voor innovatieve inzichten
        - Impact van AI op jouw beroep: Europese AI Act, Toezicht, en AVG-relatie
        - Beveiliging binnen AI-context: Bescherming van AI-systemen en data
        - Ethiek in vraagstukken: Privacy, vooroordelen, en discriminatie in AI
- Workshop Gebruik en Implementatie ChatGPT / CoPilot
    - Leer in één dag hoe je taalmodellen die gebruik maken AI op een professionele en verantwoorde manier kunt benutten in je dagelijkse werkzaamheden. Bij deze workshop behandelen we niet alleen het gebruik van o.a. ChatGPT, maar ook hoe generatieve AI je kan helpen in je dagelijkse werkzaamheden. Bij deze workshop

komen een hoop diverse onderwerpen aan bod. Aan het einde van de dag beschikt je team over de volgende kennis en competenties:

- Algemene kennis van AI en begrip van de opbouw van ChatGPT
- Verschillen tussen betaalde en gratis versies en verschillende aanbieders
- Mogelijkheden en beperkingen van ChatGPT
- Prompt-engineering: context, one-shot learning, chain-of-thought
- Praktisch gebruik van ChatGPT: opstellen van brieven, rapporten, plannen, vacatureteksten, offertes, teksten, contracten en vertalingen
- Afdeling-specifieke Prompt-templates ontwikkelen die leiden tot een eenduidig en kwalitatief gebruik van ChatGPT of andere taalmodellen
- Uitrol van het proces om ChatGPT te implementeren in de organisatie, waarbij rekening wordt gehouden met ethische overwegingen, wet- en regelgeving en de doelen van de organisatie
- Genereren van beelden en video's met Midjourney, DALL-E, InVideo, etc.

AI in Action

Website: https://www.ai-inaction.nl/ai-workshop-basis

What they offer:

AI workshop voor beginners!

- Ontdek de basisprincipes van Kunstmatige Intelligentie met onze AI Workshop Basis bij AI In Action. Onze AI workshop biedt een kennismaking met de fundamentele concepten en technieken die aan de basis liggen van AI, waaronder machine learning en neural networks, met praktische oefeningen en interactieve discussies. Of u nu een fundamenteel begrip van AI wilt krijgen of de mogelijkheden ervan voor uw bedrijf wilt verkennen, onze AI Workshop Basis is de perfecte plek om te beginnen.

Appendix I. AI Toolbox concept

Home page

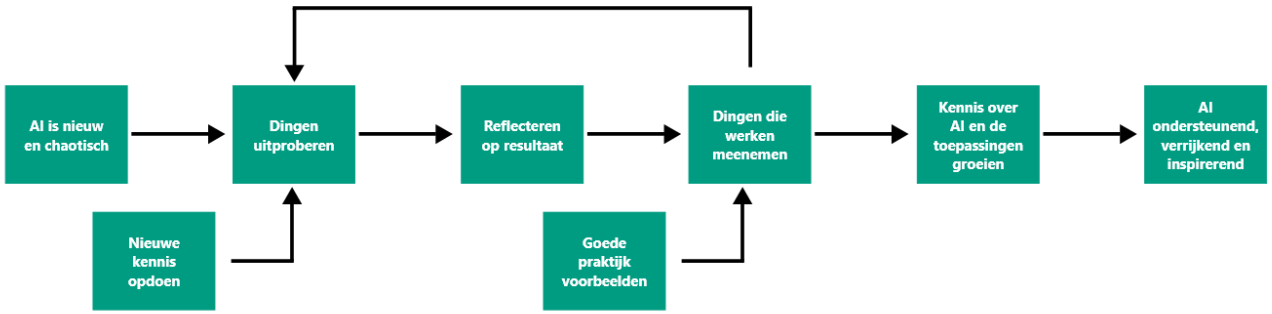
AI DESIGN TOOLBOX

Wat is AI? | Hoe werkt de toolbox? | AI design strategies | Adoptie van AI

Welkom bij de AI DESIGN TOOLBOX

AI is overal, maar hoe gebruik je het zinnig in jouw ontwerppraktijk? Deze toolbox is ontwikkeld om ontwerpers en ontwerpbureaus te helpen de overstap te maken van “chaos en verwarring” naar gericht en inspirerend gebruik van AI in het ontwerpproces.

Deze toolbox is onderdeel van het project AI in Ontwerp vanuit Saxion Lectoraat Industrial Design, waarin we onderzochten hoe AI op een betekenisvolle manier kan worden geïntegreerd in het werk van ontwerpers. Door interviews met AI-experts, ontwerpers en docenten hebben we in kaart gebracht wat AI wel (en vooral ook niet) voor je kan betekenen, en wat het vraagt van jouw werkwijze, tools en teamcultuur.



Prompttechnieken die het verschil kunnen maken:

Zero-shot prompting
Je stelt een vraag zonder enige context of voorbeeld.
→ Voorbeeld: "Wat zijn vijf ideeën voor een drinkfles voor ouderen?"
Simpel, snel. Werkt goed voor algemene vragen.

Few-shot prompting
Je geeft 1 of meer voorbeelden van het gewenste antwoordformaat of stijl.
→ Voorbeeld: "Een drinkfles met een rietje voor kinderen die weinig kracht hebben."

"Kun je nu nog 3 extra ideeën bedenken in dezelfde stijl?"
Helpt de AI om jouw denkwijze of toon over te nemen.

Chain-of-thought prompting
Je vraagt AI om tussenstappen of denkredeneringen te laten zien.
→ Voorbeeld: "Wat zijn de 3 belangrijkste aspecten voor een veilig kinderproduct? Leg je redenering bij elk aspect uit."

Dit stimuleert dieper nadenken en vaak betere output.

Prompt chaining
Je breekt je taak op in meerdere stappen/prompts. De output van de ene prompt gebruik je als input voor de volgende.
→ Voorbeeld: "Geef drie ideeën voor een product dat zintuigen prikkelt."
"Werk idee 1 uit in een korte beschrijving."
"Maak een prompt voor een AI-tool om hiervan een sfeerbeeld te genereren."

Zo hou je controle over het proces.

R-T-F
Rol - Definieer wie je wilt dat ChatGPT speel
Taak - Geef een specifiek opdracht
Formaat - Kies een outputstijl zoals een tabel of een lijst

T-A-G
Taak - Wat moet worden gedaan?
Actie - Welke stappen moeten er genomen worden?
Goal - Wat is het uiteindelijke doel?

C-A-R-E
Context - Beschrijf de situatie of uitdaging
Actie - Geef de stappen die genomen moeten worden
Resultaat - Omschrijf of toon het gewenste resultaat
Example - Voeg een voorbeeld toe

F-I-R-E
Focus - Wat is het belangrijkste doel?
Input - Welke middelen zijn nodig?
Resultaat - Wat wil je bereiken?
Evaluatie - Hoe kan je verbeteren?

B-A-B
Before - Beschrijf huidige situatie
After - Schets gewenste situatie
Bridge - Omschrijf welke stappen nodig zijn

Information page on how to use the toolbox

Het stappenplan

De toolbox begeleidt je in 5 eenvoudige stappen:

Stap 1: Bepaal de functie die jouw AI tool moet hebben.
Wat wil je dat jouw AI-tool voor je doet? Kies uit een van de vijf functies, of bedenk er zelf een:

Assistant | **Creatieve partner** | **Kwaliteitsbewaker** | **Efficiëntiemiddel** | **Skill-extender**

Stap 2: Waar zit je in het ontwerpproces?
AI werkt anders in elke fase van het ontwerpproces. Wat je nodig hebt tijdens een brainstorm is heel anders dan tijdens het testen van een prototype. Daarom is het belangrijk om eerst te bepalen in welke fase je zit, dit helpt om realistische verwachtingen te hebben van wat AI op dat moment kan bijdragen. e gebruiken het Design Thinking-model als leidraad: zoals bovenaan de pagina staat afgebeeld. Door je fase helder te hebben, kun je gerichter nadenken over wat je precies van AI verwacht: inspiratie, structuur, versnelling, analyse, reflectie... of iets anders. Het voorkomt dat je AI 'zomaar inzet' zonder duidelijk doel, wat vaak leidt tot frustratie of oppervlakkige resultaten.

Stap 3: Wat wil je invoeren en ontvangen?
Bedenk met welke vorm van input en output je werkt. Denk aan: Tekst, Beeld, video, audio, mesh (3D) of data.

Stap 4: Wat moet de output opleveren?
Wil je een ruwe schets? Een sfeerbeeld? Een werkbaar concept? Een render? Formuleer je gewenste uitkomst.

Stap 5: Wat wil je investeren?
Niet elke AI-toepassing kost evenveel moeite. Sommige tools zijn plug-and-play en geven direct resultaat, terwijl andere juist vragen om verdieping, testen en bijsturen. Daarom is het goed om vooraf te bepalen hoeveel tijd en energie je wilt (of kunt) investeren.

Stel jezelf vragen als:
Wil je snel iets proberen, of ben je bereid om er een paar uur in te duiken?
Is het een gratis tool, of ben je bereid te betalen voor extra functies?
Ben je op zoek naar snelheid, verdieping of leermomenten?

Deze stap helpt je om je verwachtingen realistisch te houden. Het voorkomt dat je na 10 minuten afhaakt omdat "het niet meteen werkt", terwijl de tool misschien wél waardevol was met iets meer inzet. Maar het voorkomt ook dat je té veel tijd steekt in iets dat eigenlijk een kleine, snelle taak had moeten zijn.

Wat krijg je terug?
Op basis van je keuzes krijg je een advies voor een AI Design Strategie: een suggestie hoe je AI op dat moment zou kunnen inzetten, inclusief tips en voorbeelden. Deze strategie is bewust generiek gehouden, zodat hij lang bruikbaar blijft, ongeacht hoe snel AI-tools zich ontwikkelen.

Community page to share success stories (1/2)

In deze community draait het niet om perfecte eindresultaten of gelikte eindplaatjes. We willen het **echte verhaal** horen: waar liep je tegenaan toen je AI gebruikte in je ontwerpwerk? Wat werkte verrassend goed, wat juist helemaal niet? Geen LinkedIn-showcase, maar een plek waar we leren van elkaars proces. Deel je aanpak, je twijfels, je leermomenten, juist als het niet vlekkeloos was. Doe inspiratie op, leer van fouten en laat zien hoe jij het hebt aangepakt.

We vragen je om je proces en ervaring open te delen, zodat anderen daarvan kunnen leren. Het gaat niet om hoe mooi het eindresultaat was, maar om wat jij geleerd hebt door AI in te zetten in een echte ontwerpcontext. Successen zijn welkom, maar fouten, worstelingen en verrassingen misschien nog wel meer.

Je kunt je verhaal insturen via het invulformulier (klik op "**Deel je Ai Design Strategie**" hieronder). In dat formulier volg je een vast format, zodat alle verhalen goed leesbaar en vergelijkbaar zijn. We stellen je bijvoorbeeld deze vragen:

Wat was je doel?
Welke AI-tool gebruikte je?
In welke design thinking-fase zat je?
Wat werkte goed – en wat werkte niet?
Welke stappen heb je gezet?
Hoeveel tijd kostte het?
En wat zou je anderen aanraden (of juist afraden)?

We helpen je stap-voor-stap door het formulier heen. Na het insturen controleren we je bijdrage kort, en daarna verschijnt hij hier op de pagina tussen de andere verhalen.

Samen bouwen aan een open AI-design cultuur!
Of je nu net begint met AI of al een tool-veteraan bent, jouw ervaring telt.
Door te delen, maken we deze toolbox waardevoller voor iedereen.

Met **AI Design Strategie** bedoelen we de manier waarop je AI bewust en in combinatie met je eigen vaardigheden inzet binnen je ontwerpworkflow. Je bepaalt niet alleen wanneer je AI gebruikt, maar ook hoe – bijvoorbeeld door AI een beeld te laten genereren dat je daarna zelf verder uitwerkt. Tijdens ons onderzoek zagen we dat AI nooit op zichzelf staat: het is altijd een samenwerking tussen tool en ontwerper.

Deel je Ai Design Strategie

Community page to share success stories (2/2)

Midjourney voor visualisatie

Op basis van korte prompts moodboard schetsen maken.
In eigen stijl. Het kost wel wat itteraties.....

De power of Vizcom!

Snelle ideegeneratie door Vizcom. Van één simpele schets veel variaties en binnen paar seconden direct mooie renders in plaats van een maand lang ideegeneratie.....

Brainstormen met ChatGPT

AI chatbot to support designers