

Application of ChatGPT in Design Thinking

Heiko Fischer¹, Martin Dres², and Sven Seidenstricker¹

¹Baden-Wuerttemberg Cooperative State University Mosbach, Bad Mergentheim, Germany

²ROTO DST, Bad Mergentheim, Germany

ABSTRACT

OpenAI's ChatGPT has gained increasing attention in both business and academia due to its generative capabilities. This article explores the application of ChatGPT in design thinking. The authors conducted a design thinking workshop, where participants employed ChatGPT throughout the entire design thinking process. While ChatGPT demonstrated strengths in generating ideas and aiding in problem analysis, it revealed limitations, particularly in empathic understanding and the reliability of market data. This article provides practical guidelines for ChatGPT's application in design thinking and highlights the importance of human involvement in design thinking and the need for careful consideration of ChatGPT's information.

Keywords: ChatGPT, AI, Design thinking, Business modeling, Creativity

INTRODUCTION

Open AI's ChatGPT is one of the most recent advancements of artificial intelligence and has gained enormous attention in business and academia (Chu, 2023; Ray, 2023). The chatbot is based on generative AI and can generate new information based on already collected information. It can imitate human-generated outcomes, and therefore it can be applied in various sectors such as academic research, learning, teaching as well as marketing and customer service (Gill and Kaur, 2023; Dwivedi *et al.*, 2023). However, to leverage ChatGPT's capabilities successfully, businesses must consider its potential limitations. For instance, the output can be erroneous and vague when it comes to domain-specific knowledge (Raj *et al.*, 2023), and its empathic capabilities lag behind humans' capabilities to interpret emotions and respond appropriately (Schaaff *et al.*, 2023).

However, being empathic is crucial to developing novel and creative solutions for people, as it is the aim of design thinking. Both human-centered and emotional insights into people are central to the success of the results of the design thinking process (Armstrong, 2016). Since, at the same time, these insights are potential limitations of ChatGPT, we decided to combine design thinking with ChatGPT and formulated the following research question: What is ChatGPT's performance in the design thinking process?

To answer this research question, we organized a design thinking workshop and asked the participants to use ChatGPT in the entire design thinking

process, which consists of the phases of empathize, define, ideate, prototype, and test (d.school, 2018). All relevant problem-solving tasks were executed by the chatbot. The participants' only task was to fix ChatGPT's output on post-its and arrange them as it is done when humans do design thinking. This article contributes to the literature as follows: First, we provide novel insights into the application of ChatGPT as one of the most consumer-used AI technologies. We show how ChatGPT can be used in combination with this well-known creativity technique and share our experience from our workshop. Second, we link the capability of ChatGPT with the requirements of design thinking and provide sample tasks for the chatbot that can be used in academia and practice. Third, we provide insights into the strengths and limitations of ChatGPT in creative problem-solving.

The article is structured as follows: First, we give a brief overview of design thinking. Second, we present our research findings from the workshop for each design thinking phase. Third, our article closes with a short discussion and conclusion.

DESIGN THINKING

Design thinking is used to solve problems and has its origins in the design of products, processes, and environments. Recently, the implementation in organizations has gained increasing attention (Elsbach and Stigliani, 2018), and research has started to analyze how artificial intelligence can be used in design thinking (Cautela *et al.*, 2019; Verganti *et al.*, 2020). Design thinking is seen as an approach that fosters innovation and competitive advantage in businesses and can be used in a variety of business contexts. The approach recognizes that design is of utmost importance to develop competitive solutions (Seidel and Fixson, 2013).

Design thinking is a multi-dimensional approach and consists of three points of view: The mindset defines the most relevant principles to design thinking, such as human-centered design, convergent and divergent thinking, prototyping, and failure culture. The toolbox offers methods that are aligned with this mindset, and the process guides the design thinkers to the human-centered solution and thus ensures a targeted approach (Brenner *et al.*, 2016). The design thinking process from d.school is presented in Figure 1 and served as a fundament for the application of ChatGPT in design thinking. Each phase is described in more detail in the next chapter.

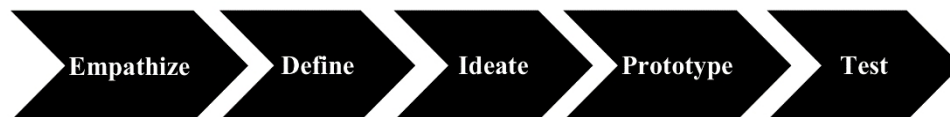


Figure 1: Design thinking process of d.school (adapted from d.school (2018)).

PRACTICAL GUIDELINES FOR CHATGPT'S APPLICATION

To generate our research insights, we conducted a design thinking workshop with students of our study program "business administration and

engineering” in May 2023. Prior to the workshop, we gave them basic information on the design thinking technique and different process models. Then, they were divided into two teams working on a different topic each. One team worked on a technically oriented problem description; the other team worked on a socially oriented problem description. The students received an introduction to each of the points of view on design thinking (mindset, method, process) and a detailed overview of each process phase before applying the chatbot. The students were asked to solely use ChatGPT (version 3.5) for solving the design thinking tasks. After each phase, they demonstrated their results in front of the class and evaluated their experience with the respective design thinking phase. The insights presented here are based on the students’ evaluation, the authors’ observations during the design thinking workshop, and own experiences.

Emphasize

Within the emphasize phase, the participants tried to get deep insights into the problem. First, they acquired information on current market demands, recent problems connected to the topic, and their current solutions via the chatbot. Moreover, they asked the chatbot about suppliers of current problem solutions and legal issues. ChatGPT provided a large set of information on these questions. The results were very precise. However, we are not sure whether the numbers (e.g., market volume, affected people) are reliable since the chatbot uses different input data when repeating the question. Moreover, the chatbot rejects the reference of its information and provides outdated or even wrong references. Accordingly, when acquiring such data via the chatbot, it is crucial to ensure that the chatbot uses real data and reasons based on it and is not just making assumptions.

Second, to get deeper insights into users, we asked the participants to design questionnaires, personas, and customer journeys. The chatbot provides a well-organized questionnaire with reasonable interview questions. It can adjust and improve the questionnaire based on the participants’ and potential users’ demands. It provides detailed characteristics of personas (personal profile, empathy map) and can respond to the questionnaire based on a certain persona’s point of view. It is possible to dig deeper and ask further questions based on certain answers. Moreover, it provides a detailed customer journey and describes how a certain persona solves the problem, which are his/her pain points, what are his/her emotions, and compares the customer journey of certain personas.

However, the interviews unfold several limitations of ChatGPT’s capabilities. While technical insights are very detailed, emotional insights are relatively superficial and generic. When asking deeper, the chatbot repeats its answers or adjusts them slightly without giving additional value. Moreover, when asking specific questions on a particular topic, the answers are relatively superficial, without any additional value. Depending on the interview topic, the chatbot generates stereotypic answers that are not insightful. Please have a look at Table 1 for sample requests.

Table 1. Selected assignments for ChatGPT in the emphasize phase.

Subject	Sample request
Basic information	Please share your assumptions, opinions, ideas, stories, and associations about [topic] in bullet points. Provide me with each point [number] bullet points
Potential Users	From all the information and answers you have received so far, determine which potential users or affected persons there are. Assign to each user or affected person his or her wishes and complaints.
Current problem solution(s)	Based on all previous information and answers, create a customer journey that shows how [user] currently solves the following design challenge “[insert design challenge]”. Assign the following to each step of the customer journey: a) Activity that the respective step involves, b) Touchpoints of the respective step, c) Problems and emotions that occur in the respective step.
Insights into Personas	Give me [number] personas based on the typical user “[insert user]” of the design challenge “[insert design challenge]”. Describe this persona with the following information: Name, age, origin, what is important to the persona, what are the persona’s needs, what bothers the persona, how does the persona currently solve the design challenge, what does the persona do during the day, what are the persona’s goals? Based on “[persona]”, create an empathy map for this persona with the following information: What does the persona hear, what does the persona think and feel, what does the persona see, what does the persona say and do, what are her gains, what are her pains?
Interview personas	Based on all the information and answers you’ve given so far about persona “[persona]”, imagine you are this persona and answer the following question: “[Question]”

Define

The aim of the define phase was to formulate a meaningful design challenge based on user insights. Therefore, we asked the chatbot to analyze the given information of the emphasize phase and summarize it. The chatbot easily formulated a design challenge. Table 2 provides a sample request for the define phase.

However, within this phase, the participants realized that there is less identification of the human with the design challenge. Compared with doing design thinking analog, the human does not dive deeply into the problem and sense the users’ needs. The chatbot acquires market information, conducts the interviews, creates personas, and summarizes the information. That makes it difficult to comprehend some answers, deeply dive into the problem, and evaluate the design challenge given by the chatbot. Moreover, there is only text but no gestures, mime, emotion, or voice tone that gives hints for further interviewing a certain persona and understanding its pains and gains. We

realized that it is more difficult to find out the real problem of the persona due to the lack of personal meetings compared to normal design thinking.

Table 2. Selected assignment for ChatGPT in the define phase.

Subject	Sample request
Review design challenge	<p>Based on all the information and answers you've given so far about persona "[insert persona]", his/her customer journey, and the interview insights from persona "[insert persona]" [insert persona] please select the principal need of this persona and formulate a new design challenge.</p> <p><i>Note: We suggest agreeing on one principal need that you or the chatbot found via the interviews and customer journey. We suggest a combination of the insights of the chatbot and personal preferences.</i></p>

Ideation

Within the ideation phase, we asked the participants to apply several creativity techniques in ChatGPT based on the formulated design challenge (see Table 3 for sample requests). The chatbot was able to generate a high number of ideas that are very diverse. It can revise and extend its ideas on request and combine a certain idea with certain other ideas. It is possible to interact with the chatbot, and it revises and extends its ideas on its own or with minimal input (e.g., "I would like to improve [attribute]"). One can allocate the chatbot the job of idea generation without using specific creativity techniques as well as asking it to use certain creativity techniques. The chatbot can reason why a specific idea is meaningful, why it should be further elaborated, and what is the reason for a particular generated idea. It can combine different ideas to new ideas and justify why an idea is better than the previous idea. It can generate ideas based on the point of view of a certain person and argue why a certain person would solve the problem as stated.

In addition to these valuable results, we realized that the chatbot generates more ideas than a human would do at the same time. However, that is why it is difficult for humans to comprehend the interconnections between them and not lose the overview. However, the chatbot had similar problems. When asking the chatbot to revise or extend ideas several times, it can lose the reference to the given task (e.g., generates ideas that are not connected to the problem, repeats ideas). Moreover, the requested idea fact sheet was of middle quality. The chatbot described the idea in detail. However, the assessment of competition, similar problem solutions, evaluation of ideas (originality, feasibility), and market evaluation was not very clear.

Prototype and Test

Within the last stage, the participants should develop a prototype and test it. Since ChatGPT can solely produce text, the prototype capabilities are limited.

We asked the chatbot to prepare, e.g., storytelling, programming code to prepare a digital minimum viable product or business modeling (see Table 4 for a sample request). The chatbot could solve all tasks and improve the prototype according to the users' and participants' needs. However, regarding the business modeling, we realized again that the calculation of economic analysis was wrong. Either the chatbot does not calculate correctly, uses wrong information, or mixes up units. The chatbot changes answers to certain questions when asking them again. For instance, the calculation of market data changes from time to time inexplicable.

Table 3. Selected assignments for ChatGPT in the ideation phase.

Subject	Sample request
Idea generation	Based on the design challenge “[insert design challenge]”, perform the creativity method “[insert creativity method]” and present [number of ideas] ideas to solve this design challenge.
Idea profile	For the idea “[insert idea]”, create an idea profile with the following content: need that will be satisfied, solution description, benefit, and competitive situation. Additionally, assess the feasibility (very easy, easy, medium, difficult) and originality (very low, low, medium, high) based on the how wow now matrix.

Table 4. Selected assignment for ChatGPT in the prototype/test phase.

Subject	Sample request
Business Modeling	Create a value proposition canvas for the idea “[insert idea]” The following components should be considered: customer job_1, customer job_2, customer job _3, customer job _4, customer pain_1, customer pain _2, customer pain _3, customer pain _4, customer gain_1, customer gain _2, customer gain _3, customer gain _4, product or service_1, product or service_2, product or service_3, product or service_4, gain_creator_1, gain_creator_2, gain_creator_3, gain_creator_4, pain reliever_1, pain reliever 2, pain reliever_3, and pain reliever _4.

DISCUSSION AND CONCLUSION

Our article complements the scarce research on the application of ChatGPT in design thinking. We could show that ChatGPT can undertake several tasks in the design thinking process: It can provide the design thinkers with an overview of the problem, guides them to a meaningful design challenge, and helps them to solve the formulated design challenge. Through the application of ChatGPT, the design thinkers get a very fast overview of the problem and can evaluate it on given criteria. Primarily, we would like to highlight ChatGPT's capabilities of generating a huge amount of ideas and adjusting

them based on given information. It was simple to request a.csv output from the chatbot that can be easily handled and further analyzed by spreadsheet programs, too.

However, we experienced that the chatbot does solely augment human capabilities and is not capable of replacing human design thinkers and human-generated insights. When only using ChatGPT in design thinking, the creativity technique loses its human touch and thus its valuable focus on empathy. Especially when it comes to deep insights from observing users and interviewing them, ChatGPT's capabilities cannot meet the needs of design thinking. Therefore, ChatGPT's insights from the interviews should be considered cautiously and not replace an interview with real people. Moreover, we realized that the chatbot is not trustworthy regarding market data. Either the data is wrong, changes from time to time, or the correct reference is not available. For this reason, we suggest not relying on this data and making your own research and assumptions to get more meaningful results.

In addition to this, our experiment elucidates that the more the chatbot is used, the more the human design thinkers have the role of organizing the knowledge. Several times, the chatbot lost the context and produced text that was not related to the task. Sometimes, it was hard to track whether the chatbot considered the given information in the chat. It is of high relevance to tell the chatbot exactly which information it should use to proceed in the design thinking process. Otherwise, there is a high risk of getting the wrong information.

Lastly, we would like to mention that we used ChatGPT's version 3.5 due to limited access to the newer version 4.0. Because of the fast and continuous development of the chatbot, our findings might not be applicable to newer versions without considering differences to version 3.5.

REFERENCES

- Armstrong, C. E. (2016), "Teaching Innovation Through Empathy", *Management Teaching Review*, Vol. 1 No. 3, pp. 164–169.
- Brenner, W., Uebernickel, F. and Abrell, T. (2016), "Design Thinking as Mindset, Process, and Toolbox", in Brenner, W. and Uebernickel, F. (Eds.), *Design Thinking for Innovation*, Springer International Publishing, Cham, pp. 3–21.
- Cautela, C., Mortati, M., Dell'Era, C. and Gastaldi, L. (2019), "The impact of Artificial Intelligence on Design Thinking practice: Insights from the Ecosystem of Startups", *Strategic Design Research Journal*, Vol. 12 No. 1.
- Chu, M.-N. (2023), "Assessing the Benefits of ChatGPT for Business: An Empirical Study on Organizational Performance", *IEEE Access*, Vol. 11, pp. 76427–76436.
- d.school (2018), *design thinking bootleg*.
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koochang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., Carter, L., Chowdhury, S., Crick, T., Cunningham, S. W., Davies, G. H., Davison, R. M., Dé, R., Dennehy, D., Duan, Y., Dubey, R., Dwivedi, R., Edwards, J. S., Flavián, C., Gauld, R., Grover, V., Hu, M.-C., Janssen, M., Jones, P., Junglas, I., Khorana, S., Kraus, S., Larsen, K. R., Latreille, P., Laumer, S., Malik, F. T., Mardani, A., Mariani, M., Mithas, S., Mogaji, E., Nord, J. H., O'Connor, S., Okumus, F., Pagani, M., Pandey, N., Papagiannidis, S., Pappas, I. O., Pathak, N.,

- Pries-Heje, J., Raman, R., Rana, N. P., Rehm, S.-V., Ribeiro-Navarrete, S., Richter, A., Rowe, F., Sarker, S., Stahl, B. C., Tiwari, M. K., van der Aalst, W., Venkatesh, V., Viglia, G., Wade, M., Walton, P., Wirtz, J. and Wright, R. (2023), "Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy", *International Journal of Information Management*, Vol. 71, p. 102642.
- Elsbach, K. D. and Stigliani, I. (2018), "Design Thinking and Organizational Culture: A Review and Framework for Future Research", *Journal of Management*, Vol. 44 No. 6, pp. 2274–2306.
- Gill, S. S. and Kaur, R. (2023), "ChatGPT: Vision and challenges", *Internet of Things and Cyber-Physical Systems*, Vol. 3, pp. 262–271.
- Raj, R., Singh, A., Kumar, V. and Verma, P. (2023), "Analyzing the potential benefits and use cases of ChatGPT as a tool for improving the efficiency and effectiveness of business operations", *Bench Council Transactions on Benchmarks, Standards and Evaluations*, Vol. 3 No. 3, p. 100140.
- Ray, P. P. (2023), "ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope", *Internet of Things and Cyber-Physical Systems*, Vol. 3, pp. 121–154.
- Schaaff, K., Reinig, C. and Schlippe, T. (2023), "Exploring ChatGPT's Empathic Abilities", *11th International Conference on Affective Computing and Intelligent Interaction (ACII)*.
- Seidel, V. P. and Fixson, S. K. (2013), "Adopting Design Thinking in Novice Multi-disciplinary Teams: The Application and Limits of Design Methods and Reflexive Practices", *Journal of Product Innovation Management*, Vol. 30, pp. 19–33.
- Verganti, R., Vendraminelli, L. and Iansiti, M. (2020), "Innovation and Design in the Age of Artificial Intelligence", *Journal of Product Innovation Management*, Vol. 37 No. 3, pp. 212–227.