

Executive Summary

Objective: Examine how AI settings affect user trust and model trust dynamics.

Method: Three participants interacted with 18 AI chatbot conditions created by combining different styles, temperature levels, and top-p values. After each interaction, they completed a Trust in AI questionnaire.

Results: Trust varied across the AI models. AI 10 and AI 12 produced the highest trust scores, while AI 7 and AI 9 showed the lowest. Cognitive trust was generally higher than affective trust.

Interpretation: Trust is shaped by AI communication style and response settings and changes over time.

Conclusion: AI parameter settings influence trust in human-AI collaboration.

Practical Implication: These results can help guide the design of AI systems that foster stronger, more reliable user trust.

Background

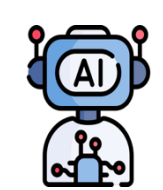
Human-AI Teaming:

- Human-AI teaming is becoming more common in work and learning environments.
- Trust plays a key role in whether people accept and rely on AI systems.
- AI communication style and response settings may shape user trust differently.

Why model trust:



Trust changes over time rather than remaining fixed.



Different AI behaviors can increase or reduce trust.



Modeling trust helps predict user response under different conditions.

Research Questions:

- How do AI communication style, temperature, and top-p influence users' trust in human-AI collaboration?
- How can trust patterns observed in user interactions be modeled through agent-based simulation?

Experimental Setup

Parameters:

- Style:** How the AI speaks.
- Temperature:** How creative vs. predictable it is.
- Top-p:** How many response options does AI considers.
- Higher temperature or top-p → more variable answers.
- Lower temperature or top-p → more consistent answers.
- Style does not mainly change randomness; it changes how the answer sounds.

AI Chatbot Development:

- Style = 2 (Task and Social).
- Temperature = 3 (0.2, 0.5, and 0.8).
- Top p = 3 (0.3, 0.7, and 1).
- 18 AI models were developed.

Participants. Three male participants took part in this pilot study.

Table 1: Configurations of 18 AI Models

task_id	style	temperature	top_p
1	task	0.2	0.3
2	task	0.2	0.7
3	task	0.2	1
4	task	0.5	0.3
5	task	0.5	0.7
6	task	0.5	1
7	task	0.8	0.3
8	task	0.8	0.7
9	task	0.8	1
10	social	0.2	0.3
11	social	0.2	0.7
12	social	0.2	1
13	social	0.5	0.3
14	social	0.5	0.7
15	social	0.5	1
16	social	0.8	0.3
17	social	0.8	0.7
18	social	0.8	1

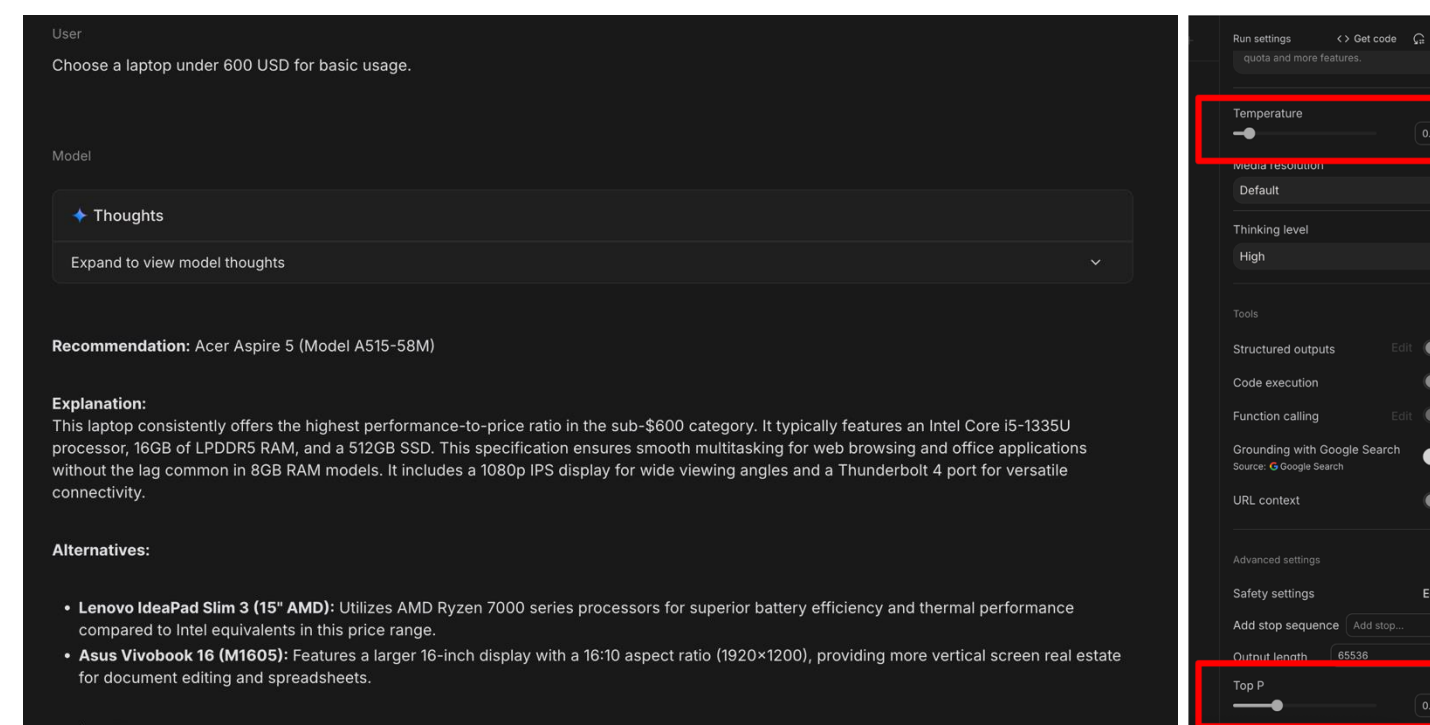


Figure 1: Various parameter settings affecting response variability.

Experimental Test Plan

Study Protocol:

- Recruit 3 male participants for the pilot study.
- Create 18 chatbot conditions using 2 styles, 3 temperature levels, and 3 top-p levels.
- Have each participant interact with the chatbot under each condition.
- Administer a 4-item Trust in AI questionnaire after each task.
- Record responses on a 7-point Likert scale and compute trust scores.
- Use the trust scores as inputs for the AnyLogic agent-based simulation.

Table 2: Trust in AI questionnaire items and 7-point response scale.

Item #	Questionnaire Item (Exact Wording)	Response Scale 1 to 7 (1 = Strongly Disagree, 7 = Strongly Agree)
1	The AI's answer for this task seems accurate and reliable.	
2	The AI seems knowledgeable and capable for this type of task.	
3	I feel I can predict how the AI will perform on tasks like this.	
4	I would feel comfortable depending on the AI's judgment for this task.	

Table 3: Sample data structure for participant responses and computed trust scores across parameter settings.

participant_id	task_id	style	temperature	top_p	item1	item2	item3	item4	trust_score
P1	1	task	0.2	0.3	4	6	6	4	66.7
P1	2	task	0.2	0.7	4	7	3	5	62.5
P1	3	task	0.2	1	6	4	4	4	58.3
P1	4	task	0.5	0.3	6	4	4	4	58.3
P1	5	task	0.5	0.7	6	6	5	5	75

Agent-Based Simulation in AnyLogic:

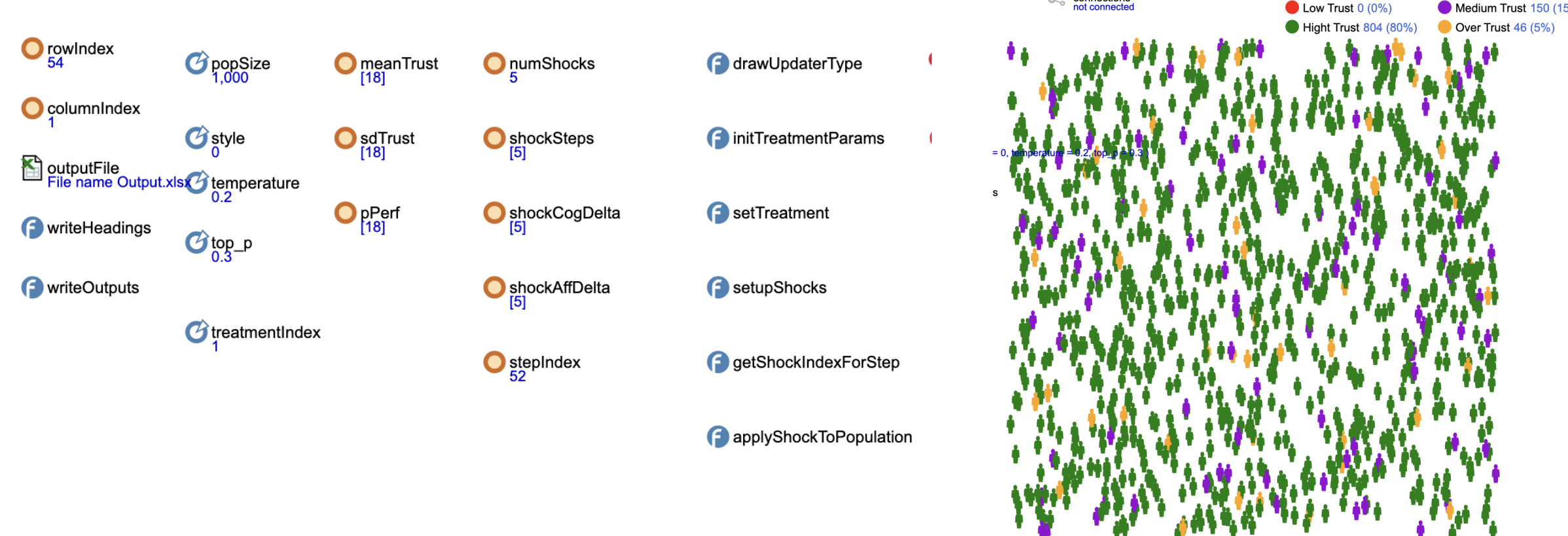


Figure 2: AnyLogic agent-based simulation showing the distribution of trust states in the population, with most agents in the high-trust category.

Experimental Results

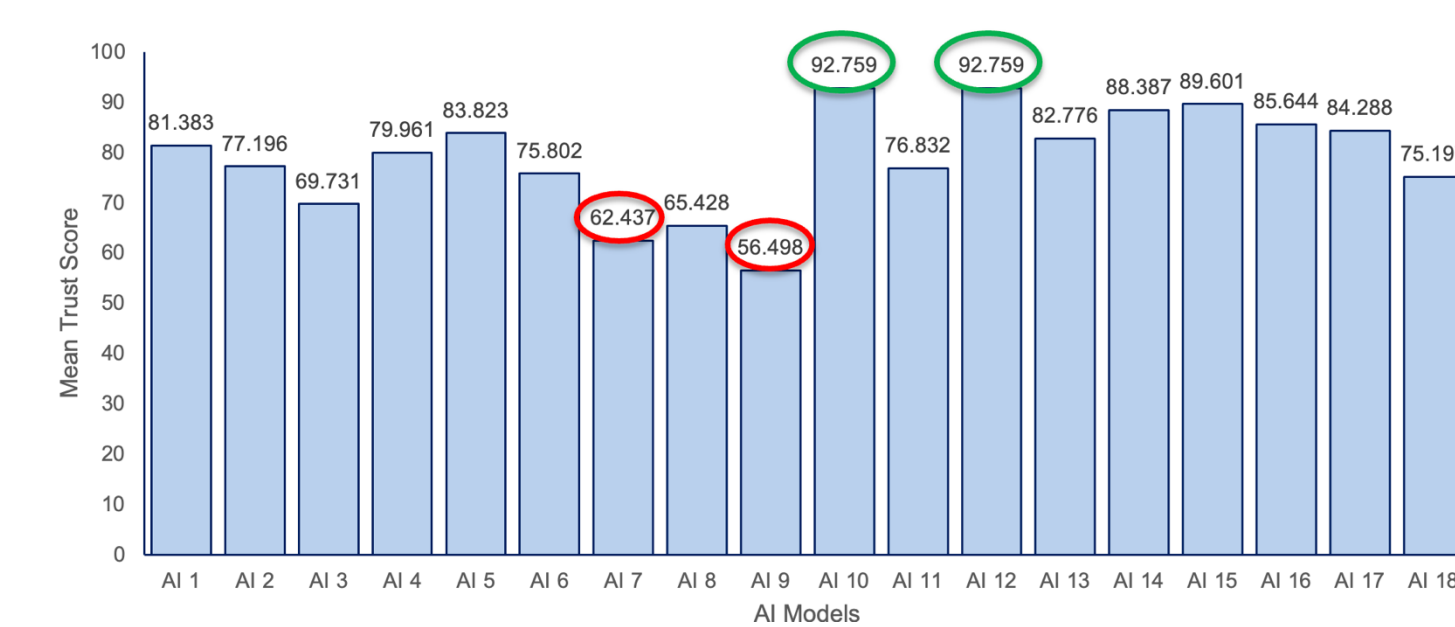


Figure 3: Mean trust scores across the 18 AI models. AI 10 and AI 12 had the highest trust (92.759), while AI 9 had the lowest (56.498), indicating that parameter settings affected user trust.

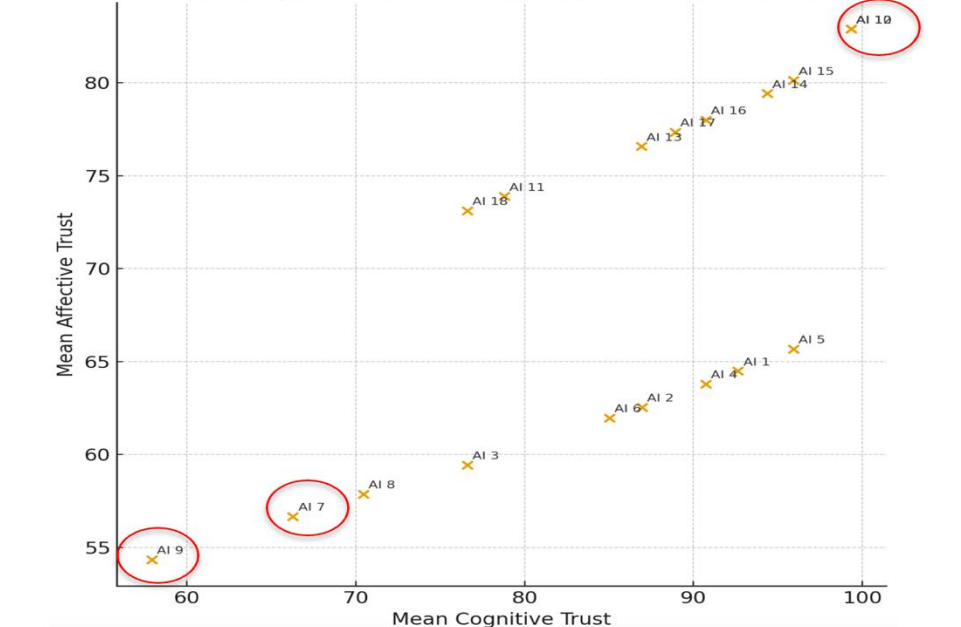


Figure 4: Positive relationship between cognitive and affective trust across AI models. AI 10 shows the highest trust, while AI 7 and AI 9 show the lowest.

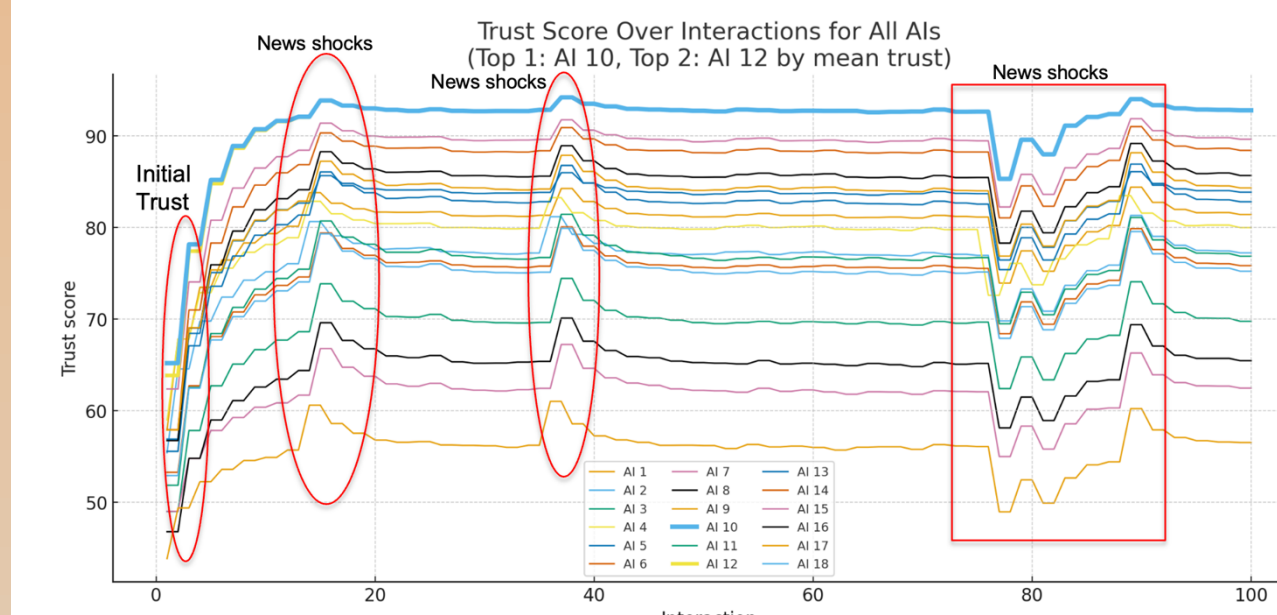


Figure 5: Trust scores across interactions for all AI models. Trust rises after the initial phase and responds to news shocks.

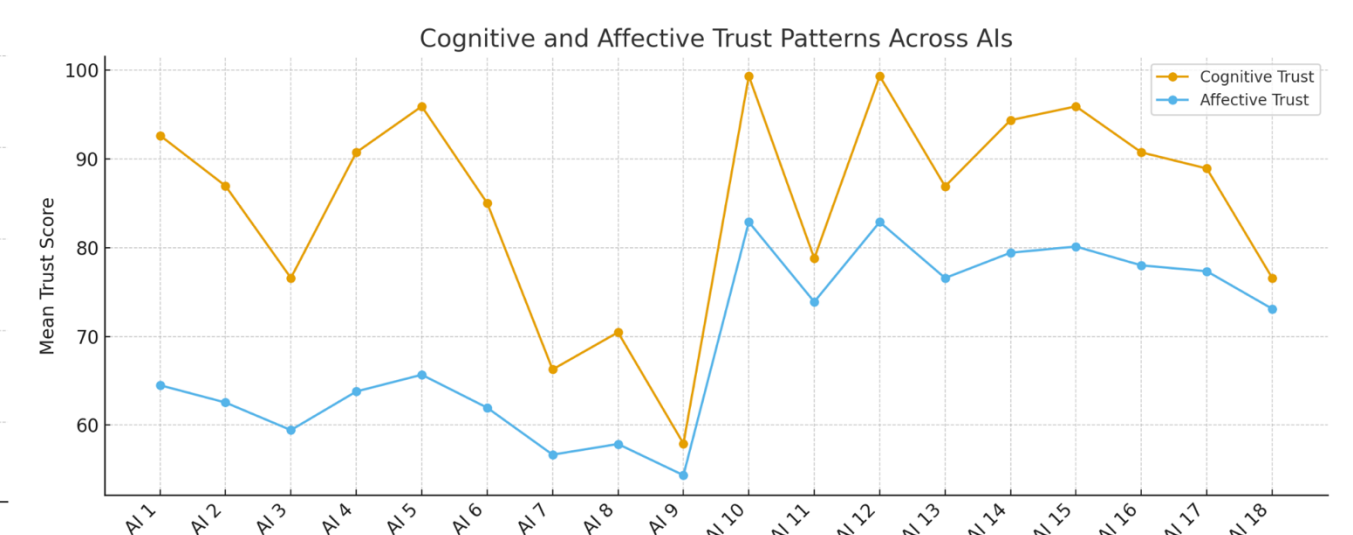


Figure 6: Cognitive trust is consistently higher than affective trust across all AI models, with the highest scores observed for AI 10 and AI 12.

Conclusions

- AI communication style, temperature, and top-p influenced user trust in human-AI collaboration.
- Trust differed across the 18 AI models, suggesting that parameter settings play an important role in shaping user perceptions.
- AI 10 and AI 12 had the highest mean trust scores, while AI 7 and AI 9 had the lowest.
- Cognitive trust remained higher than affective trust across all models, with a clear positive relationship between the two trust dimensions.
- Limitation:** This pilot study included only 3 male participants, limiting the generalizability of the findings.
- Future research:** Future studies should include larger and more diverse participant groups, additional task types, and broader AI parameter combinations to further validate the trust model and simulation results.

References

- Demir, M., McNeese, N. J., & Cooke, N. J. (2023). Defining human-AI teaming the human-centered way. *Frontiers in Psychology*, 14, 1–14.
- van der Heijde, C. M., et al. (2023). Human-AI teaming: Leveraging transactive memory and speaking up in healthcare teams. *Scientific Reports*, 13.
- Jarrah, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons*, 61(4), 577–586.
- Seeber, I., Bittner, E., Briggs, R. O., de Vreede, G.-J., Maier, R., Merz, A. B., Oeste-Reiß, S., Randrup, N., Söllner, M., & Stein, M. (2020). Machines as teammates: A research agenda on AI in team collaboration. *Information & Management*, 57(2), 103174.
- Bonabeau, E. (2002). Agent-based modeling: Methods and techniques for simulating human systems. *Proceedings of the National Academy of Sciences*, 99(Suppl 3), 7280–7287.
- Macal, C. M., & North, M. J. (2010). Agent-based modeling and simulation. *Journal of Simulation*, 4(3), 151–162.
- Tsvetkova, M., Mähönen, T. A., & Jäger, W. (2024). Generative agent-based modeling: An introduction and tutorial. *Systems Dynamics Review*, 40(1), e176