

Research on improving decision-making efficiency with ChatGPT

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Abstract—ChatGPT, a generative AI released in 2022, quickly gained global attention and reached 100 million users within two months of its release. Since then, its applications have expanded beyond a simple search engine to include customer support, content generation, translation, and educational support. In this study, we examined the possibility of using ChatGPT in decision-making scenarios to reduce the time required for decision-making. The results of a game-based experiment showed that a single person interacting with ChatGPT could produce decision-making results equivalent to an extensive discussion by multiple people. This suggests that there are advantages in terms of reduced decision-making time and workload.

Keywords—Generative AI, ChatGPT, Gaming, Decision-making, Lead Time Reduction

I. INTRODUCTION

This chatbot is a generative AI developed by Sam Altman and colleagues at OpenAI and released in November 2022. It is characterized by its ability to converse with users in natural language using a large-scale language model. Its applications are diverse, including customer support, content generation, translation, and educational support. Recently, applications in the medical, financial, and legal fields are also being considered. In conventional decision-making, when there are conflicts of interest or contradictions, discussions involving multiple parties are required, which often take an enormous amount of time and effort. In addition, it often requires a variety of knowledge and information, including legal, scientific, technical, and accounting knowledge, and the optimal solution must be selected from among a variety of possibilities. In these situations, ChatGPT has the potential to significantly reduce decision-making lead time and effort.

II. PRIOR RESEARCH

Several studies have been conducted on the effectiveness of AI support in decision making; Mohammad Hossein Jarrahi (2018) focused on the complementarity between humans and AI, examining their respective strengths in organizational decision-making processes characterized by uncertainty, complexity, and randomness. They found that the strength of AI lies in its superior computational processing power and analytical

approach to augment human cognitive abilities when dealing with complexity, whereas the strength of humans lies in their ability to provide a holistic and intuitive approach to uncertainty and randomness. Anne D. Trunk, Hendrik Birkel, E. Hartmann (2020) pointed out that AI might not only help reduce inherent problems in the decision-making process but may amplify them. In contrast, Christoph Keding, Philip Meissner (2021) introduced a binet-based decision experiment targeting 150 senior executives, examining individual perceptions of AI-driven decision-making. Contrary to prior research on algorithm aversion, they found that adopting an AI-based advisory system positively impacted decision-making quality. The application of AI in the decision-making process remains a divisive topic. The complex decision-making process with conventional AI requires an enormous amount of manpower to process a large amount of information obtained as a result of AI searches and multi-person discussions for a variety of situations. In addition, while conventional AI only searches for relevant information and communicates it to decision makers, ChatGPT is unique in that it understands and responds to the intent of the questioner who needs to make a decision in a dialogic format. ChatGPT is unique in that it understands and responds to the intent of the questioner in a dialogic format. Moreover, it provides rich and well-organized information in an objective and easy-to-understand manner. Answers are sufficient but not wasteful because they are based on the way things should be, and because it is an interpersonal conversation, there is a sense of reality as if one is discussing with an in-person person. These characteristics make it easier for the questioner to accept the answers as opinions and to reach a consensus without unnecessary rejection. These features suggest that using ChatGPT in the decision-making process may reduce the time and manpower required for decision-making.

III. RESEARCH OBJECTIVE

Using ChatGPT in the decision-making process may reduce the necessary manpower. Hence, the research hypothesis is: "By utilizing ChatGPT, a decision-maker, even if alone, can make decisions equivalent to those made after discussions among multiple individuals."

IV. RESEARCH METHOD

We will test this hypothesis using a game. In this study, we compare the decision-making processes of participants and ChatGPT by changing the content of the episodes and the order of decision-making for a decision-making task of high difficulty. For this purpose, it is necessary for the research method to be flexible in setting highly difficult decision-making tasks and to allow participants to make decisions as if they were real events that happened to them, even if the tasks set are fictitious. In games as a research method, it is relatively easy to include complex situations in episodes and to incorporate devices to create a sense of realism. Therefore, while games are creative works, they are characterized by the fact that players' own experiences and feelings are reflected in the episodes and are undeniably treated as real-life problems of the participants. For these reasons, this study attempted to test the hypothesis using games as a means of observing the decision-making process. In the experiment, participants were divided into several groups and played a game.

The game participants were working graduate students: 14 (9 males and 5 females) for test 1, 12 (10 males and 2 females) for test 2.

Test 1: After dividing the participants into several groups, Episode 1, which includes conflicting solutions, is presented to each participant individually. Participants first make an individual decision and answer Yes/No to the outcome. Next, each group discusses and decides Yes/No as a group. The group is then presented with their opinions on Episode 1 as presented by ChatGPT. The group then discusses again and decides Yes/No. The initial group discussion time is 15 minutes, and the group discussion time after the presentation of ChatGPT's opinion is also 15 minutes. A similar procedure was followed in another episode 2. The contents of the episodes are shown in Table I.

Test 2: Similarly, another episode 3 is presented to the participants. Participants first make their individual judgments. Then, in the reverse order of Test 1, ChatGPT opinions are presented first, and each individual makes a decision without group discussion and expresses his/her opinion with Yes/No. Then, a group discussion is held, and the group makes a decision as a group and states its opinion with Yes/No. After reading ChatGPT's opinion, 15 minutes are allotted for individual decision-making, and the time allotted for the subsequent group discussion is 15 minutes as well. The contents of the episodes 3 are shown in Table II.

Table I.
Episodes of Test 1

Episode 1	Episode 2
<p>The Omicron strain is now available and is spreading to young people.</p> <p>You have been tasked with promoting vaccination in your community. The risk of infection is increasing, although the rate of serious illness among young people is low. On the other hand, there are whispers that vaccination may cause transient painful swelling, fatigue, and fever, as well as infertility and taste blindness, and there are concerns about liability issues in the event of health problems caused by vaccination.</p> <p>Ms. X, who is in her 20s, says she does not dare to be vaccinated because of the risk of side effects. Would you recommend that Ms. X be vaccinated?</p> <p>A. Recommend B. Do not recommend</p>	<p>You are a restaurant manager.</p> <p>The number of bankruptcies in the restaurant industry has skyrocketed during the pandemic, and you are facing great difficulties.</p> <p>Restaurants are still considered to be places with a high risk of infection, and this time, too, restaurants were required to take some kind of countermeasures. Under these circumstances, a proposal was presented to check vaccination and test negative records for employees and customers working in restaurants.</p> <p>Would you refuse entry to a restaurant to an employee or customer who does not have a vaccination/negative test record?</p> <p>A. Allow B. Refuse</p>

Table II.
Episodes of Test 2

Episode 3
<p>Mr. B of mask manufacturer Company A is responsible for shipping. Due to the recent outbreak of coronas, medical institutions nationwide are strapped for masks. Company A supplies 10,000 masks per day to medical institutions nationwide, but has an excess backorder that exceeds its production capacity. One day, during the outgoing inspection process, a mask was found to be slightly damaged visually, and when more inspections were conducted, the defect rate was estimated to be 0.5%. Under normal circumstances, the masks should have failed the inspection, but if they are not shipped, many healthcare workers will be at risk of infection. Mr. B, do you ship these masks?</p> <p>Yes, I will ship. No. Do not ship</p>

V. RESEARCH RESULTS

A. Comparison of changes in Yes/No ratios by decision-making process

In Test 1, there was a change in the group decision-making results compared to the individual decision-making results (Yes/No ratio). However, there was no change in the group discussion results after the subsequent presentation of ChatGPT opinions, which were the same as the decision-making results during the group discussion (see Figure 1). On the other hand, in Test 2, similarly, there was a change in the individual and individual decision-making results after ChatGPT's opinion presentation, but no change when compared to the results of the subsequent group discussion (see Figure 2).

In other words, individual decision-making results after viewing ChatGPT opinions were equivalent to the discussion results without viewing ChatGPT opinions.

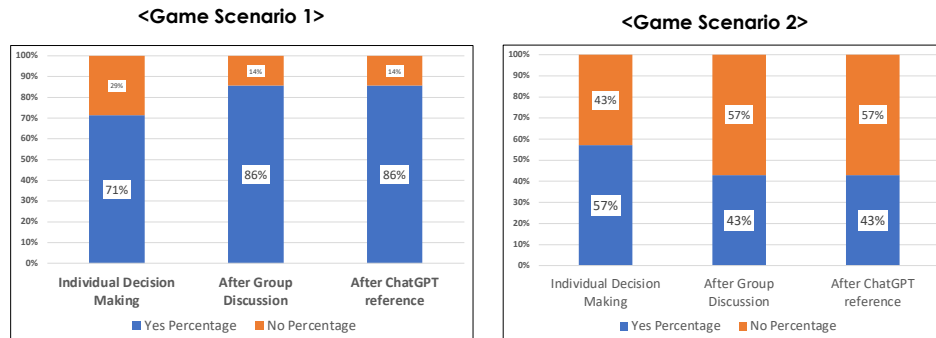


Fig .1. Change in Yes/No ratio in the decision-making process for Test 1

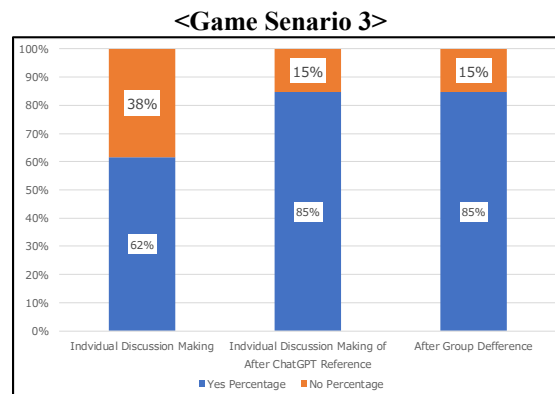


Fig .2. Change in Yes/No ratio in the decision-making process in Test 2

B. Linguistic Analysis of Decision-Making Processes Using ChatGPT

By comparing the results of applying co-occurrence analysis to the series of decision-making processes using ChatGPT conducted in Test 2, we will examine how ChatGPT affects the decision-making process. First, we conducted a co-occurrence analysis of ChatGPT's views, followed by a co-occurrence analysis of participants' reasons for decision-making in each process (decision-making based solely on ChatGPT's views and subsequent group discussions) conducted using ChatGPT's views for Episode 3. Finally, we analyzed the co-occurrence of reasons for decision-making in the group discussions. The results of these co-occurrence analyses are shown in Figure 3.a~c. The results were compared with the opinions of ChatGPT in Episode 3.

From the co-occurrence analysis results in Figure 3.a, b:

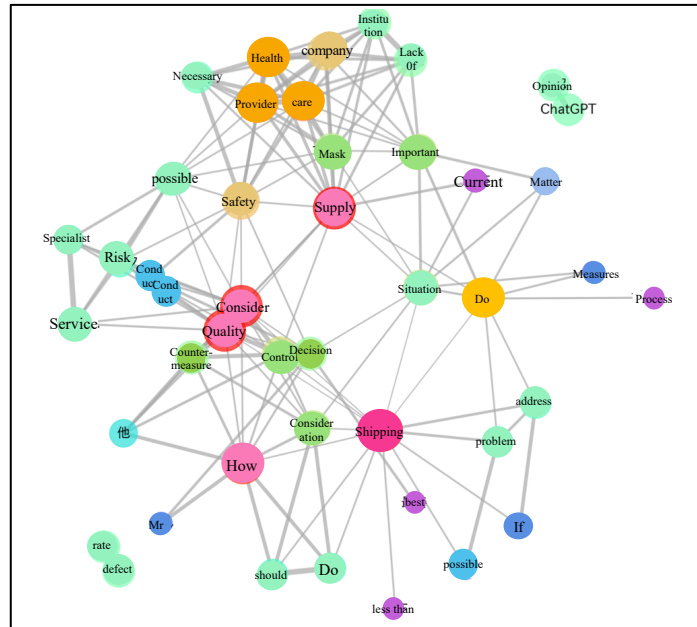
1. Shipment of masks, considering quality risk and prioritizing the safety of health care workers.
2. Communication with the counterparties before shipment.
3. Implementation of quality measures

These are common, indicating that the reasons for the decisions made by the individuals were derived from the views of ChatGPT.

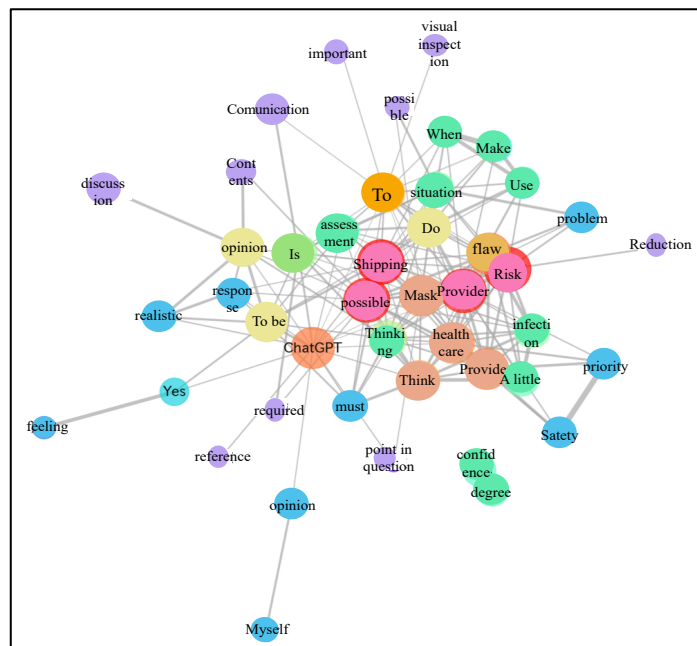
Figure 3.c. also shows that, from the group discussions

1. Shipments are made after clearly communicating the possibility that defective products may be included due to an emergency situation.
2. Defective products are shipped as irregular processing.
3. Ship first, consider immediate countermeasures, and consider how to deal with defective products in the future.

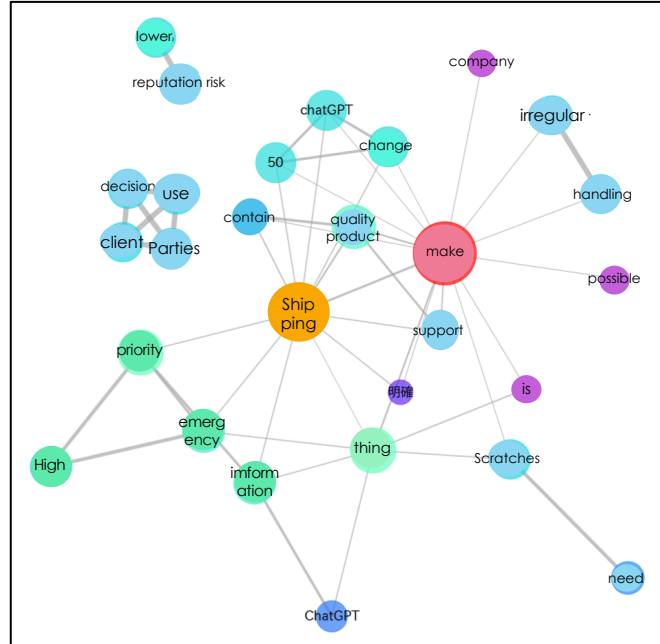
These are common and indicate that the reasons for the individual's decision were derived from the ChatGPT's views. The reasons for decisions made by group discussions also derive from the ChatGPT's views. Taken together, the reasons for decisions, both by individuals and by group discussions, are derived from ChatGPT's views.



a. Co-occurrence analysis results of the views expressed by ChatGPT



b. Co-occurrence analysis results of reasons for decision making by individual participants using ChatGPT views



c. Co-occurrence analysis results for reasons for decision-making in subsequent group discussions

Figure 3: Co-occurrence analysis of ChatGPT opinions and participants' reasons for their decisions in each decision process.

C. Investigation of the effectiveness of repeated discussions as a measure to reduce distrust of chatGPT

In the results of the above test, some members expressed negative opinions about the GPT. This is considered to be a low level of conviction with the GPT and may hinder its effectiveness in the process of implementing measures after they are formulated. Repeated discussions with the GPT as a practice to increase the level of conviction could be considered, and the effectiveness of this practice will be tested.

The following research hypotheses were developed
Hypothesis; Repeated discussions with GPTs will decrease negative views of GPTs.

The validation procedure was as follows.

Test3 was conducted using the following experimental procedure. The first subject is given episode 4. (See Table III) After a 20-minute discussion among participants, we repeated the discussion on GPT and measures within the same time period, and extracted negative opinions from the discussion. The test participants were 34 working graduate students. 34 working graduate students, 27 males and 7 females. Figure 4 shows the results of the co-occurrence analysis of the countermeasures proposed in the

participants' discussions and those proposed by chatGPT in its discussions with the participants. The repeated discussions with chatGPT after the discussions by the participants revealed that, in addition to the countermeasures proposed in the discussions by the participants, chatGPT proposed to discuss them in advance with the relevant departments. The following is the evaluation of chatGPT given by the participants during the discussions with chatGPT.

<Member's remarks>

- The method of examining countermeasures using ChatGPT is very interesting.
- I felt that it would provide a foothold for considering effective countermeasures while avoiding human disadvantages (discovery and group blind spots).

- The fact that we are dealing with AI allows us to ask neutrally what we should have done as a company.
- The team was also able to suggest and discuss medium- to long-term issues that are difficult to notice from the on-site perspective, such as education and fostering a workplace culture.
- The answers from the chatGPT were similar to ours, and it provided an opportunity to think about the role that humans should play as AI develops in the future.
- With regard to creating a climate conducive to communication, as suggested in the participants' discussion, the chatGPT further proposes the following five measures.
 - (1) Improvement of communication channels;
 - (2) Promotion of teamwork (e.g., regular team meetings);
 - (3) Improvement of communication skills (training/training);
 - (4) Promotion of awareness-raising (educational activities to raise awareness of quality control); and
 - (5) Supervisor leadership (promotion of communication and awareness raising.) were mentioned.

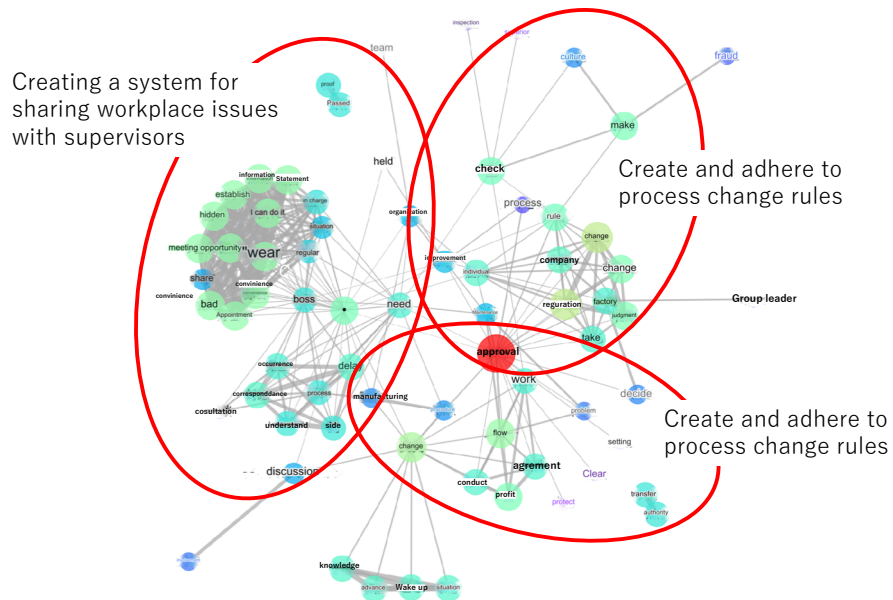
In response to the chatGPT measures, participants stated that the implementation of the above measures to create a corporate culture is expected to make the organization more effective in preventing fraud.

- The team's conclusion, based on the opinions of the chatGPT, is that long-term education and system building are necessary to prevent such fraud. In addition, although their opinions differed from those of the GPT, many of them were positive about the GPT's measures, such as incorporating the GPT's findings and developing better countermeasures. They also differed from the GPT in their opinions, but were positive about the GPT's measures.
- We did not find any negative opinions about GPT, and our distrust of GPT diminished as we discussed with them. Even when they differed from the opinions of the CHATGPT, they did not reject all of them, but rather constructively incorporated some of them, leading to better planning of countermeasures.

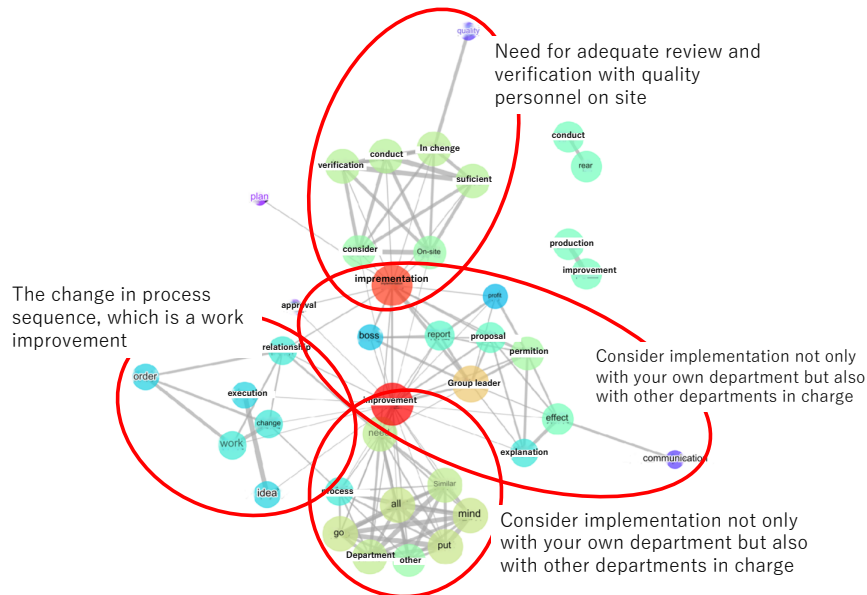
In conclusion, no negative evaluation of chatGPT was found in the above evaluations, suggesting that repeated discussions with chatGPT may mitigate the negative view of chatGPT.

Table III.
Episodes of Test 3

A company Y, an automobile manufacturer, has a large backlog of orders due to the recent eco-car boom and wants to increase productivity as much as possible. He realized that since he already knows whether the product has "passed" or "failed" before inputting the results, he should change the order of the work and input the inspection results after sending the inspected products to the subsequent process if they have passed. At the time, Mr. C's process is about to be overflowing with cars waiting for inspection. Will Mr. C follow through with this new idea? Mr. X, the factory manager, has told the workers to go beyond the norm and implement any idea that can increase production by even one more unit! If we don't implement these improvements, we will have to spend one million yen a year. If we don't implement this improvement, we will lose one million yen a year, and our boss will be in a bad position.



a. Co-occurrence analysis of measures presented by participants in discussions



b、 Co-occurrence analysis results for reasons for decision-making in subsequent group discussions

Figure 4: Co-occurrence analysis of ChatGPG opinions and participants' reasons for their decisions in each decision process.

VI. CONCLUSIONS

Based on the results of Test1 and Test2, "By using ChatGPT, a single decision maker can make a decision that is equivalent to a decision based on discussion among multiple people." This research hypothesis was supported. Additionally, the results of test 3 are also support the research hypothesis that "Repeated discussions with GPTs will decrease negative views of GPTs."

VII. DISCUSSION

The experimental results of Tests 1 and 2 indicate that using ChatGPT for decision making can be as effective as a group discussion with multiple people, even with one person. This suggests the possibility of a significant increase in decision-making productivity. After the game, the following comments were observed from the participants:

- It was found that decisions were made by clarifying risks and taking countermeasures so that they can be shipped.
- It is easy to make a decision because there is a reason.
- The outcome of the decision did not change, but the certainty increased.

- ChatGPT's professional opinion was helpful.
- ChatGPT's impartial opinions were persuasive.
- In the team discussion, the team that initially said "no" changed to "yes" after reading back ChatGPT's opinion.
- If it differs from their own opinion, it is a clue to revise or change their judgment.

Experimental results show that the use of ChatGPT for decision making can be as effective as a group discussion with several people, even with one person. This suggests the possibility of a significant increase in decision-making productivity. Observations of participants' opinions after the game yielded the following comments:

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- In the team discussion, the team that initially said "no" changed to "yes" after reading back ChatGPT's opinion.
- If it differs from their own opinion, it is a clue to revise or change their judgment.

There were some positive comments about the use of ChatGPT, such as. On the other hand, some were skeptical or concerned about the use of ChatGPT, as follows

- "ChatGPT can use data to make accurate judgments, but only humans can make true "judgments."
- It only provides general information and does not influence decision-making.
- There is concern that ChatGPT reinforces one's own confirmation bias.

However, as shown in the results of Test 3, no such negative opinions were found in the other cases where discussions were repeated with ChatGPT. This result may be due to the fact that ChatGPT, unlike conventional AI, not only displays search results, but also provides expert-like advanced knowledge that captures the context of the episode, making it useful for decision making and persuasive in its unbiased opinions.

While the practical significance of this study is that it demonstrated that decision-making costs can be significantly reduced, its academic significance is that the ChatGPT was recognized as a multifaceted, objective, and balanced view that eliminated opportunistic biases and had a significant impact on decision-making. The second academic significance is that ChatGPT was shown to be persuasive and effective through repeated discussions just as among humans.

VIII. LIMITATIONS AND FUTURE DIRECTIONS OF THIS STUDY

Limitations of this study include concerns that the quality and content of more complex episodes might yield different results and the small number of subjects. Future research should examine how the content of the ChatGPT questions, the words, the words themselves, and their context, or linguistic structure, affect the ChatGPT responses and people's views of those responses, and how they affect people's decision-making outcomes and sense of conviction. These are important research topics, both practically and academically, and are the subject of future research.

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