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# AI-Powered Negotiations: Opportunities, Challenges, and the Future of Business Strategy

Hanjie Li

College of Professional Studies, Northeastern University, Boston, USA

li.hanji@northeastern.edu

**Abstract.** Business negotiations are integral to various aspects of enterprise operations, from recruitment and resource allocation to procurement and international business collaborations. Despite their critical importance, negotiations often remain cumbersome, complex, and time-consuming, with outcomes heavily influenced by the negotiator's skills and external factors, frequently failing to maximize benefits or achieve desired goals. The rapid advancement of artificial intelligence (AI) technologies, particularly large language models (LLMs) like ChatGPT, has seen AI increasingly integrated into daily tasks such as drafting emails and querying legal clauses. This paper investigates the potential of AI and negotiation agents to enhance efficiency and optimize outcomes in business negotiations. Utilizing case studies, the research explores how AI can assist or even replace human negotiators by automating data collection, analyzing historical negotiation patterns, predicting outcomes, and suggesting optimal strategies. The findings indicate that AI negotiation agents can surpass human performance in certain negotiation scenarios, providing consistent, data-driven insights and adapting strategies in real time based on counterpart responses. However, the research also highlights the limitations of AI in understanding human emotions, cultural nuances, and the ethical implications of AI decision-making. The conclusion emphasizes the promising role of AI in revolutionizing business negotiations while underscoring the necessity for human oversight to address emotional and ethical complexities. This study provides a foundation for further exploration into the integration of AI in negotiation processes, aiming to enhance both efficiency and effectiveness in achieving business objectives.

**Keywords:** Artificial Intelligence; Business Negotiations; AI Negotiation Agents; Efficiency; Ethical Implications.

## 1. Introduction

Every year, billions of dollars are lost globally due to ineffective business negotiations. Negotiations are ubiquitous in every aspect of business operations, from job recruitment, resource allocation, procurement and cross-border business cooperation. However, the process is not only cumbersome and complex, but also extremely time-consuming and labor-intensive, with many negotiations ultimately failing to maximize benefits or achieve desired goals. Nowadays, with the rapid development of artificial intelligence technology, large-scale language models like ChatGPT have already made their presence felt in areas such as email drafting and legal clause searching. So, can AI assist or even replace humans in business negotiations, bringing revolutionary efficiency gains and optimization of outcomes? This paper will delve into this exciting prospect through a case study.

## 2. How AI and Negotiation Agents Work

Artificial Intelligence (AI), in the view of most scholars, is a machine that can mimic human thinking and logic and respond accordingly to specific situations 1]. Through vision technology, language processing, robotics, expert systems and machine learning, AI is able to learn about humans, "see" images, "speak" sentences and even walk.

In business negotiations, expert systems and machine learning are the branches of technology that most influence the process and outcome of negotiations. Expert systems represent knowledge-intensive programs. These programs mimic the behavior of human experts by analyzing the problem-

solving strategies and methods of human experts in a given domain and combining them with heuristic-based judgment rules to generate a set of recommendations that match the situation at hand [2]. However, expert systems do not really think and act like humans and their accuracy is more dependent on the passage of time [1].

Deep learning, on the other hand, is an approach based on data representation and learning processes, which are learning methods that mimic the neural structure of the human brain [2]. Deep learning can make classification or prediction easier by learning multiple levels of data and acquiring different henceforth abstractions [3].

Natural Language Processing is also an important branch of technology being applied in negotiation, which enables artificial intelligence to decode, process and understand human language, intentions and the emotions contained behind it and generate responses in real time.

In addition to this, various mathematical modeling techniques are often used to project number-based negotiations, including kernel density models, Bayesian learning, variations of the frequency school model, and more [4].

## 3. Application of Artificial Intelligence Negotiation in Business

### 3.1. Artificial Intelligence as a mentor

In business applications, AI can assist human negotiators in the negotiation preparation and execution phases, as well as in post-negotiation analysis. iDecisionGames, is a digital platform that enhances human performance during negotiation by simulating near-human images and voices during the preparation phase of a negotiation, allowing the assignment of roles and purposes, and simulating a real negotiation process [5]. A similar platform is Negotiation 360, which uses natural language processing technology to provide employees with more in-depth negotiation training and competency assessment, feedback and coaching to provide a more personalized version that meets the employee's needs after the data is precipitated [5].

AI applications can also provide real-time guidance to human negotiators during the negotiation execution phase. For example, Cogito, a technology platform that can provide advice and guidance to human negotiators in real time, was launched by MIT Labs and focuses on customer support and services to support negotiations involving price, features, or services [6]. When a human representative handles a user's issue, Cogito uses artificial intelligence technology to analyze the ongoing voice call, gain insight into the real-time speaking behavior and mental state of the other party, and provide real-time guidance including verbal coaching, behavioral coaching, and a post-processing summary of the comments for management. Studies have shown that human employees coached by Cogito show more empathy and self-confidence, as well as increased efficiency [6].

However, it is important to note that AI still has limitations in responding to the complexity of human emotions, such as the inability of AI to understand "saving face" or to coach human negotiators on how to build long-term relationships [7]. AI is also less effective at regulating emotions, for example, it is unable to guide human negotiators on when to use humor in order to regulate the atmosphere, and on how to make judgments about what to say and what to do [8].

### 3.2. Artificial intelligence as an agent

Not only that, AI can autonomously negotiate with suppliers and partners with set information and conditions, which is known as an AI agent. First, the AI agent automatically performs data collection and analysis, recognizes patterns in historical negotiation data, and then predicts the outcome and proposes the best solution [8]. This compensates for the uneven capabilities of human negotiators, and AI negotiators are also able to transcend the influence of human intuition and bias by convincing the other party to accept a deal that is not intuitive but is mutually beneficial [9]. This is because AI can identify trends and correlations, or hidden opportunities, hidden beneath the surface by analyzing

large amounts of data [10]. Second, AI agents choose specific strategies based on the type of negotiation scenario, and AI agents that use conversational techniques will also adjust their strategies based on the supplier or partner's response [11].

These advantages have also enabled AI agents to achieve a notable performance in real-world applications. Findings published in the Human-Machine Negotiation Experiment 2021 suggest that AI negotiating agents outperform human performance in business negotiations that are more focused on resource allocation [12]. In a more complex test of the International Automated Negotiating Agent Competition (ANAC), six different negotiation scenarios including automotive, smart grid, grocery store, political, party, and supermarket were used. The results indicated that AI-based negotiating agents performed better, obtaining the highest average individual utility and social welfare [12-14].

The same positive performance is also shown in Wal-Mart's pilot program in 2021. Wal-Mart is a huge multinational chain with more than 100,000 suppliers [7]. According to an article in the Journal of Purchasing, "Most of the time, it is difficult to focus on more than three to five negotiated terms [5]," which creates untapped opportunities and value for Walmart to work with many of its suppliers. After seeing the potential of AI agents, Walmart decided to conduct a small pilot test of an AI agent. The technology for this AI agent came from Pactum, an AI-based business based in Los Angeles. The business unlocked cash flow and untapped value for its clients with its AI-driven negotiation agents. pactum claims to increase its clients' profitability by roughly 4.2% and to free up working capital in excess of $1.5 million per month [5].

In the beginning, Walmart used the AI agent to automate procurement negotiations with only 89 suppliers. This was Pactum's first time working with Walmart, and Walmart's management did not have confidence in the AI agent and aimed to accomplish only the minimum. But as the AI agent deployment was completed, Wal executives were awed by the AI agent's performance. Sixty-four percent of suppliers were successful in reaching agreements with the AI agent, far exceeding the expected 20%, which saved Wal-Mart 1.5% in negotiation expenditures and extended payment terms by an additional 35 days [7].

This is due to the ability of AI negotiation to quickly update complex real-time information. For large corporations like Walmart, there are as many as 25 readily updated tradable terms, including rebates, warehousing terms, co-marketing subsidies, shipping methods, and more [5]. This may be overly complex for a human negotiator, but it is the easiest for an AI agent. The AI agent will use the most up-to-date information for each negotiation with the supplier, and the supplier can respond to it in the timeliest manner [5]. Moreover, Wal-Mart's managers can review and monitor the negotiation results in real time. On the other hand, suppliers also praise the agents, with 83 percent saying they are easy to use and can negotiate at their own pace [7]. Even more than three-quarters of suppliers preferred talking to an agent bot over a human [14]. This preference seems to be similar to people preferring to use self-service machines in supermarket checkouts. Overall, according to Pactum's calculations, Walmart generates between an additional 2.8% and 6.8% of the value of transactions after using an AI agent, and the increased negotiation efficiency results in a $200 to $500 billion opportunity for the organization [5]. Currently, this agent robot is used by Walmart in negotiations in markets such as the US, Chile and South Africa.

In addition to the cases above, AI and negotiation agents are also being used in other areas of business negotiation, such as DocuSign, which uses AI technology for contract review and risk assessment to help companies make better decisions in contract negotiations, Cogito, which provides real-time sentiment analysis and behavioral coaching to help customer service representatives deal with customer issues more effectively during negotiations and increase customer satisfaction, and Cogito, which focuses on automating the negotiation process. Cogito, and Pactum, which focuses on automating supply chain negotiations to help organizations reach better deal terms with suppliers. These technology companies help human employees in a variety of ways in the areas of hiring negotiations, contract negotiations, sales negotiations, customer service negotiations, and supply chain negotiations [3].

## 4. Potential Problems and Limitations

Although AI negotiation agents have demonstrated notable capabilities, there is still an unsurpassed question that cannot be crossed and that is, can AI agents really understand human intentions and emotions? In addition to rational judgment in negotiation, emotions, atmosphere, and body movements can also affect the outcome of the negotiation [9], which poses a considerable challenge for AI agents. The study says that scripted agents, a commonly applied technological solution to the anger emotions that arise in negotiations. There are barriers to its practical application, as scripted agents will choose only concession strategies when confronted with anger, always expressing either anger or happiness [6]. However, emotions are contingent and depend on the events that led to the expression [6]. In a real negotiation, anger is natural emotional feedback if a participant makes an unfair proposal, but it would seem unreasonable if the anger occurs after the other party's concession. In addition to this, AI agents have difficulty in understanding subtle human emotional changes, much less human extra-verbal [12], metaphors and innuendo, to name a few, are frequent methods of communication in negotiation. These methods are essential to humans and can sometimes even influence the success of a negotiation, but they are incomprehensible to AI agents. The good news is that generative AI agents, such as Merlin Assist, are working to solve this problem, and another solution is to invite humans to oversee these negotiations and tag and evaluate the AI agent's behavior as a way to help the AI agent better understand the human's intentions.

Not only that, but it also raises some potential ethical issues when AI is given full decision-making power in negotiations. For example, in order to maximize results, humans are more inclined to allow and instruct the AI to conceal and deceive about the truth, or to use emotional manipulation to gain more benefits [6]. Artificial intelligence may also use implicitly biased decision-making methods in order to maximize benefits. A case in point is in salary negotiations, where female interviewers receive lower salary proposals when negotiating with an AI agent compared to male interviewers [6]. At the same time, there is a lack of ethical rules, legal rules in the current society about being represented by an AI agent.

Data privacy and security may also pose a problem in the future, considering that the use of AI and negotiation agents in negotiation by enterprises will inevitably reveal and store a large amount of trade secrets and data, which will bring huge losses to the enterprises if this kind of information is leaked or stolen. ChatGPT in 2023 had a system error that led to the casual viewing of some users' chat logs [4].

On the other hand, the use of AI and negotiation agents will also further widen the problem of digital divide. The digital divide is the gap between those who have and those who do not have access to computers and the Internet. For marginalized people and businesses, this will undoubtedly widen the gap further.

## 5. Limitations of Using AI and Negotiating Agents

While the AI agents in the article seem to have demonstrated behaviors that excel even in the absence of supervision, there are moments when AI agents make decisions that are not commercially logical in order to close a deal. An example of this is when a Chevrolet dealership used a chatbot similar to ChatGPT to negotiate prices with customers, however the chatbot went as far as to offer the customer a price well below the market price, or a price well above the market price in order to close the deal, which caused confusion [13]. Thus, it seems that the negotiation process still needs to be supervised and scrutinized by humans.

The use of AI and negotiation agents can increase efficiency and optimize the outcome of negotiations, however the cost changes associated with this change need to be considered.

The cost of using AI for negotiation cannot be ignored. A mixed panel of experts in PSM and AI, meeting in the World Café, mentioned that trying to use AI that is highly applicable to the enterprise requires a significant investment. First of all, mature general-purpose business negotiation AI

applications have not yet been fully developed, and what is currently available on the market is generally an AI application or negotiation agent for a specific domain, which means that if an organization wants to use an AI model to assist or replace a human employee in negotiating a niche, the organization will either need to collaborate with an AI company to develop an AI application that is applicable to that business or industry, or an organization will need to develop an AI application on its own, or an organization will need to develop an AI application on its own. AI applications, or companies will need to do their own research and development. According to experts, designing and developing various types of AI models is not an easy task, and it requires high-level talent with knowledge of economics and game theory, as well as a significant investment of time and money, which is something that small and medium-sized businesses do not seem to have at this point in time, which will likely result in costs that will not be minimized in the end [13].

Second, for organizations that can provide support for development. Artificial intelligence models for business negotiations require large amounts of available data, and their results are highly dependent on the quality of the available data. However, in existing AI model development, there is little development experience serving business negotiations, which means that developers need to spend extra time in building the underlying technology for AI models, e.g., a model for supply chain negotiation requires the use of manual recording and labeling of suppliers' cost breakdowns [13].

On the other hand, organizations also need to train their employees when introducing AI or negotiators. As in the case of Walmart and Pactum mentioned in the article, there are still some suppliers in the pilot who reported a lack of experience with using negotiation assistants, encountered many problems with their use, etc. In an experiment using CHATGPT for negotiation it was also indicated that users with prior knowledge and experience in using generative AI to guide the negotiation had a better performance, and that users also need to learn how to give the generative AI the need to provide clearer instructions [1]. The time and cost outlay due to employee training is also something that organizations need to consider.

Finally, the use of AI or negotiating agents in business negotiations is a completely new change for the vast majority of organizations, which can create uncertainty not only for management, but also a test of trust for the employees who use it. Therefore, it will also be a challenge to build trust in AI and negotiation agents within the organization.

## 6. Future Research Directions

With the continuous progress of AI technology, the application prospect of AI negotiation agents is getting broader and broader. In the future, researchers and developers can explore deeply in the following key areas to further enhance the effectiveness and practical application value of AI negotiation agents.

First, the enhancement of emotion and context understanding is an important research direction. Although existing AI negotiation agents perform well in processing structured data and providing strategy recommendations, they still have significant deficiencies in understanding and responding to human emotions and contextual changes. Future research should aim to develop more sophisticated natural language processing and sentiment analysis techniques that will enable AI to better recognize and respond to subtle emotional changes and nonverbal cues in negotiations. This will help the AI to be more flexible in dealing with the complexities of actual negotiations, thereby increasing the satisfaction and practical effectiveness of negotiation outcomes.

Second, ethical and fairness issues also need attention. AI may use implicitly biased decision-making methods in negotiations, which has been shown in scenarios such as salary negotiations. Therefore, future research needs to focus on how to ensure that AI negotiation agents remain fair and transparent in their decision-making process and avoid discriminatory and unfair behavior. In addition, establishing a clear set of ethical and legal frameworks to regulate the use of AI in negotiation is also

an important direction for future development. This will ensure that AI does not violate social ethics and legal norms while achieving business goals.

Data privacy and security is another key research area. Data privacy and security issues become particularly important because AI negotiation agents need to handle large amounts of sensitive business information. Future research should aim to develop more secure data management and encryption techniques to ensure that companies' data is not compromised or misused when using AI for negotiation. In addition, research should focus on how to maximize the use of data to enhance the intelligence of negotiation agents while ensuring data security. Only in this way can organizations feel confident in applying AI negotiation agents to their actual business.

Meanwhile, cost and benefit analysis are also an important direction for future research. Although AI negotiation agents perform well in improving negotiation efficiency and optimizing results, their development and implementation costs are still important factors for enterprises to consider. Future research should focus on reducing the cost of AI applications, including the development of more versatile and easily customizable AI models, as well as streamlining the deployment and maintenance process of AI systems. In addition, empirical studies to evaluate the actual benefits of AI negotiation agents in different industries and application scenarios can help organizations make better decisions on whether to invest in the use of AI negotiation agents.

Finally, the optimization of human-computer collaboration mode is the key to improve the application effect of AI negotiation agents. Despite the advantages of AI in data processing and strategy suggestion, human negotiators still have irreplaceable advantages in emotional understanding and flexibility. Future research should be devoted to developing hybrid negotiation systems that enable AI and human negotiators to complement each other's strengths and jointly enhance negotiation outcomes. This includes research on how to realize real-time interactions during the negotiation process, and how to enhance human negotiators' trust and reliance on AI systems through training and feedback mechanisms.

Through in-depth research and technological innovation in these areas, the application prospects of AI negotiation agents will be broader, providing more intelligent and efficient solutions for enterprises in complex and changing business environments.

## 7. Conclusion

The convergence of artificial intelligence and negotiation agents in business negotiations has yielded promising developments for enhancing efficiency, optimizing outcomes, and propelling strategic advantage. As evidenced throughout this paper, AI has been demonstrated to facilitate and, in certain instances, surpass human performance in particular negotiation scenarios. Artificially intelligent negotiation agents have yielded substantial outcomes for organizations such as Walmart and a diverse array of industries through sophisticated data collection, pattern recognition, real-time strategic alignment, and decision-making processes. These technologies offer numerous advantages, including enhanced consistency, scalability, and data-driven insights that can uncover opportunities that may be overlooked by human negotiators due to bias or limitations in handling large amounts of data. Furthermore, AI can facilitate the implementation of complex negotiation tactics, potentially creating a more level playing field for both small businesses and large companies. As a negotiation mentor, AI can support human negotiators in the negotiation preparation, execution, and subsequent analysis phases, helping them make more informed decisions. At the same time, AI agents outperform humans in resource allocation and complex business negotiations, and are able to process large amounts of data, provide real-time advice and sentiment analysis, and improve the quality and effectiveness of negotiations.

Nevertheless, the potential limitations and challenges posed by AI in negotiations should not be overlooked. Artificial intelligence is currently unable to fully comprehend and respond to human emotions, cultural nuances, and non-verbal communication, which often results in gaps in complex,

relationship-driven negotiations. This deficiency indicates that there is a necessity for human supervision, particularly in domains that necessitate emotional intelligence, empathy, and ethical considerations. Furthermore, ethical concerns pertaining to biased decision-making, privacy risks, and transparency in AI-driven negotiations underscore the necessity for rigorous standards and regulations to guarantee the fair and responsible utilization of AI.

In the future, the optimal use of AI in negotiations will require a balance between human intuition and AI-driven precision. This hybrid approach, in which AI is responsible for data-intensive tasks and humans focus on relationship-building and ethical considerations, promises to optimize the potential of AI without compromising the intricate nuances of human interaction. As AI continues to evolve, further research is essential to address its current limitations, particularly in the areas of emotional intelligence and ethical decision-making, while also developing frameworks that enhance human-machine collaboration in negotiations. Such developments could lead to a transformation in business strategy, with AI negotiating agents enabling organizations to achieve more effective and fairer negotiation outcomes

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