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Artificial Intelligence as a Business Negotiation Partner[1]

Abstract

RESEARCH OBJECTIVE: The objective of this paper is to explore whether and to what extent artificial intelligence can serve not only as a support tool but potentially as an autonomous business negotiation partner.

THE RESEARCH PROBLEM AND METHODS: The fundamental research problem is to determine the potential of artificial intelligence (AI) to replace human negotiators in the negotiation process. In order to carry out the research task so defined, the following research methods were used: descriptive analysis, with a prior review of literature sources; elements of comparative analysis; SWOT analysis; deduction and synthesis.

THE PROCESS OF ARGUMENTATION: In this study, the focus is on the issue of using the potential of AI in the negotiation process. The article discusses the essence of negotiations and their automation, presents the SWOT analysis for the use of artificial intelligence in the negotiation process, defines the Negotiation Algorithm Protocol System (NAPS), at the same time indicating possible applications and importance to business. It also attempts to define the Artificial Intelligence Negotiation Algorithm (AINA).

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RESEARCH RESULTS: The analysis shows that while artificial intelligence is not yet capable of independently conducting negotiations, it significantly supports preparatory and repetitive tasks, increasing the chances of success through negotiation algorithms. The study introduces the conceptual frameworks of NAPS and AINA, which clarify AI's role, potential, and limitations in negotiation processes. It also identifies key research gaps, stressing the need for empirical validation and the development of criteria for defining negotiation "equality" between humans and AI.

CONCLUSIONS, INNOVATIONS, AND RECOMMENDATIONS: The study concludes that AI cannot yet fully replace human negotiators; nevertheless, the authors propose valuable conceptual frameworks (NAPS and AINA) that clarify its potential and limitations. A key novelty lies in outlining future research on negotiation algorithms, emotional and non-verbal communication, and the integration of AI with big data and blockchain. Future work should empirically validate these frameworks and address the ethical, legal, and trust-related implications of delegating negotiation tasks to AI systems.

Keywords:
negotiation process, artificial intelligence, negotiation algorithm, AINA, NAPS

INTRODUCTION

Artificial intelligence (AI) is technology that enables computers and machines to simulate human intelligence and problem-solving abilities. The form of learning differs from natural intelligence (human intelligence). Natural intelligence is based on experiences, emotions and social interactions, whereas artificial intelligence learns from data analysis and algorithms. As a field of computer science, artificial intelligence comprises machine learning, including deep learning, based on the development of algorithms modelled on decision-making processes in the human brain which, through the use of neural networks, can 'learn' from available data and make increasingly accurate classifications or predictions (John et al., 2023; IBM, 2024). Emerging as the most disruptive technology of the 21st century, AI is very likely to affect the functioning of individuals, societies and the global economy, including companies of all sizes (Weber, 2022). Therefore, it is no longer surprising to anyone that efforts are made to use its potential in various areas, especially as the potential of AI application in business processes seems to be huge and, arguably, not yet fully discovered, although it is still being tested by enterprises.

Basically, any company can experiment with AI, intending to enhance communication with customers on digital channels, improve customer retention, develop offers and manage customer complaints. One area of AI use is the decision-making process based on the analysis of large historical data sets where AI can optimise the process of making the right and reliable decisions (Battisti et al., 2022; Bharadiya, 2023). It is becoming increasingly common to use the possibilities of artificial intelligence to optimise communication processes and thus to deploy its potential in negotiation processes. Negotiations are an integral part of doing business and current conditions result in their increased complexity, both in scope and degree. In negotiation processes, it is usually necessary to consider a wide variety of issues and to take into account the different goals and interests of the parties (whether shared or conflicting) as well as shaping and analysing many alternatives. Objective difficulties arise in the choice of negotiation strategies and techniques, accompanied by increased uncertainty about the course and outcome of negotiations. Therefore, negotiations require comprehensive and precise analysis and selection of effective planning tools, adequate to the needs of the company. It is worth asking the question how to use AI-based tools and platforms to improve the entire negotiation process.

The scientific objective of this article is to explore whether and to what extent artificial intelligence can serve not only as a support tool but potentially as an autonomous business negotiation partner. The study seeks to identify the areas in which AI already contributes measurable value to negotiation processes, to assess its limitations, and to outline future directions for the development of negotiation algorithms. The hypothesis to be verified is as follows: artificial intelligence may become an equal negotiation partner, assuming responsibility for the entire process; at present, however, AI is not at such a stage of development. At the current level of advancement, it can effectively support concrete actions at the various stages of the negotiation process.

Recently, the body of studies on the application of AI in business activities has been growing, but the use of artificial intelligence in the negotiation process has not yet been comprehensively addressed. By formulating this objective, the article intends to fill a research gap and initiate a scientific discussion on the role of AI in negotiations. The presented considerations are an introduction to further research carried out by the authors as part of the Artificial Intelligence

Negotiation Algorithm (AINA) and Negotiation Algorithm Protocol System (NAPS) projects. In their next steps, the authors intend to create and subsequently verify the effectiveness of various negotiation algorithms in different situational and cultural contexts and to analyse the ability of AI to independently generate and adapt such algorithms. The presented conclusions primarily have substantive merits of a cognitive nature, thus adding value as a significant contribution and an attempt to fill the existing research gap.

The present article has a primarily theoretical and conceptual orientation. It does not aim to provide empirical data but rather to synthesise existing knowledge, propose an analytical framework, and initiate a scholarly discussion on the potential role of artificial intelligence in negotiation processes.

RESEARCH METHODS AND TOOLS

The present study is embedded in the domain of negotiation theory and International Economy and International Business, with particular emphasis on the application of artificial intelligence in global business contexts. The investigation assumes a cognitive and exploratory orientation, the primary objective of which is to conceptualise the potential of artificial intelligence as a negotiation partner and to delineate the scope of future empirical inquiries.

In order to achieve this aim, a multi-method qualitative research design was adopted. Specifically, the following methodological instruments were employed:

- Descriptive analysis, grounded in a systematic review of the relevant body of literature, facilitating the identification and clarification of key concepts, definitions, and theoretical perspectives.
- Comparative analysis, utilised to contrast the characteristics of traditional human negotiation processes with those supported or mediated by artificial intelligence, thereby highlighting convergences, divergences, and prospective complementarities.
- SWOT analysis, applied as an analytical framework for the structured assessment of strengths, weaknesses, opportunities, and threats inherent in the deployment of artificial intelligence within negotiation processes.

- Deductive reasoning and synthesis, enabling the integration of findings derived from the preceding analyses into a coherent conceptual framework and the formulation of theoretically grounded conclusions.

The adopted research design allows for the systematic juxtaposition of classical negotiation paradigms with emergent AI-driven approaches, thereby offering a theoretically informed foundation for the development of the Negotiation Algorithm Protocols System (NAPS) and the conceptualisation of the Artificial Intelligence Negotiation Algorithm (AINA).

THE MAIN PART

The Substance and Course of the Negotiation Process

Negotiation is a key element in both business and everyday life. Its diverse nature causes ambiguity in the definition approach in the literature. In general, negotiation is the main way of getting what we want from others (Fisher & Ury, 2011, p. 21) or a manifestation of human behaviour that focuses on the exchange of views, leading to a change in the relations between negotiators (Nierenberg, 1987, p. 8). Narrowly understood, it is a process of interaction in which at least two parties, who see the need for a common commitment to achieve a goal, but who initially differ in expectations, attempt to overcome their differences by argument and persuasion and to find a mutually satisfactory solution (Fowler, 1996, p. 12); alternatively, as treated by Nęcki (2000, p. 17), it comprises sequences of mutual operations through which the parties seek to achieve the most favourable resolution of a partial conflict of interest. At the same time, negotiation can be seen as a process of collective decision-making, deliberate and conscious social action, and a type of relationship based on difference, exchange and reciprocity (Albaret & Dieckhoff, 2020, p. 9). In relation to business activities, it can be defined as a communication and decision-making process involving two or more parties and aiming at an agreement between the participants in economic transactions that is satisfactory to each partner when there is a situation of divergence of interests between the parties in at least one area. It is also a process

of cooperation rather than a struggle for domination (Prościak, 2024, p. 88). Despite the different approaches, the definitions of negotiation contain the following common elements: (1) the involvement of at least two parties who have both common and conflicting interests; (2) each party needs the participation of the other party to achieve its objective; (3) the actions of the parties concern the distribution or exchange of goods, resources and/or the resolution of problems concerning the parties involved; (4) the parties are convinced that negotiation is the best way to reach an agreement satisfactory to all (Roszkowska, 2011, p. 66). The negotiation process is undoubtedly complex and complicated, it has its dynamics and structure (Myśliwiec 2007, p. 12). Its course is modified by a combination of factors which are both intra-negotiation (the negotiation itself, including the negotiators, and direct spheres of influence) and extra-negotiation (law, politics, cultural customs) in nature (Kowalczyk, 2021, p. 17). The negotiation process comprises several phases which, in turn, consist of successive specific actions. The concept of negotiation as a process is not only about highlighting its holistic character, but also about drawing attention to its dynamic nature and to the sequence and repetition of specific actions. In the literature, there are various divisions of the negotiation process, most often distinguishing from two to six stages, depending on the assumptions adopted. For example, Kennedy (1982) identifies four basic phases: (1) how to prepare; (2) how to debate; (3) how to propose; and (4) bargaining. A similar division is proposed by Jankowski & Sankowski (1995): (1) preparation; (2) the starting phase; (3) the middle phase; (4) the final phase. According to Fowler (1996), the negotiation process can be divided into three stages: (1) preparation; (2) the actual negotiation process; (3) implementation of the agreement, whereas Casse (1992) presents six stages: (1) pre-negotiation; (2) the preliminary phase, (3) design; (4) decision-making; (5) implementation; (6) the final phase. Regardless of the division adopted, thorough preparation for conducting the whole process is the responsibility of every negotiator – failing to prepare is preparing to fail (Nęcki, 2000, p. 185). In addition, it is important to constantly improve the forms and methods of negotiation by searching for new tools to improve activities in particular phases, including going beyond traditional tools and models, e.g. through the use of the potential of artificial intelligence.

2. Automation of the Negotiation Process

Although the concept of deploying artificial intelligence in negotiations is not new, there has been considerable progress in its practical application in recent years. Artificial intelligence is used in business to implement automation processes (Qvist-Sørensen, 2020). Thus, the use of AI's potential in the negotiation process is primarily aimed at its automation, i.e. the application of advanced technology for the comprehensive implementation of the negotiation process with minimal human intervention. It can comprise anything from simple data analysis to complex algorithms capable of independently conducting entire negotiations. Table 1 shows the types of artificial intelligence deployed in negotiations.

Table 1. Types of artificial intelligence in negotiation

Type of AI	Role in the negotiation process
Machine learning – algorithms	An algorithm is a sequence of instructions presenting a step-by-step solution to a problem. Negotiation algorithms can automate most of the routine activities in all phases of negotiation, thus streamlining the entire process. They can be used, *inter alia*, to identify patterns and trends based on historical negotiation data, which improves the decision-making process (including in terms of strategy and tactics). Machine learning models are trained on large data sets. The more data a model has, the more accurately it can predict outcomes and propose optimal strategies for a given negotiation process.
Natural language processing – chatbots	Chatbot (chatterbot, ingubot, intellibot) – a type of software using artificial intelligence and attempting to simulate a very natural way of human communication (conversation). In negotiations, it facilitates communication, at the same time gathering the negotiation partner's requirements and expectations, analysing them in terms of personality and, depending on the outcome of such analysis, adjusting and selecting appropriate negotiation techniques, so that the conversation is more likely to lead to a positive effect (concluding a transaction or solving a problem).
Predictive analytics	Predictive analytics is a technique relying on statistics, data analysis, machine learning algorithms and artificial intelligence to forecast future results based on historical and current data. During negotiation, it can predict potential scenarios and suggest the best directions of action. It accelerates and increases the accuracy of analytical processes, limits the risk involved through prior identification, thus enabling negotiators to take action to reduce the occurrence of real threats to a positive outcome of the negotiation concerned.

Source: own elaboration.

The main advantage of automatic negotiation is that many actors can organise their behaviour in order to achieve mutually beneficial transactions, allowing for better use of resources and providing an advantage to society as a whole (Mohammad et al., 2020, p. 242). Table 2 presents the key AI tools and software solutions used in the negotiation area. Those tools draw on advanced technologies such as machine learning, natural language processing and predictive analytics to improve negotiation strategies and outcomes (Florkin, 2024).

Table 2. Key AI tools for negotiation

Tool	Description
IBM Watson	Data analysis and natural language processing for contract analysis and legal forecasting.
Kira Systems	Review of contracts and due diligence through the identification and analysis of clauses based on artificial intelligence.
ArbiLex	Predicting the outcomes of arbitration cases based on machine learning.
WyczyśćEdge3D	Assessment of the project risk and outcome in construction negotiations.
ZyloTech	Analysis of customer behaviour to personalise and optimise engagement strategies.

Source: own elaboration based on Florkin (2024).

Artificial intelligence can be used in various business negotiation scenarios: (1) in sales negotiations (to analyse partners' data, adjust the offer, predict opponents' reactions or optimise pricing strategies); (2) in purchasing negotiations (to analyse and evaluate supplier performance, compare offers and forecast risks); or (3) in contract negotiations/renegotiations with external stakeholders (to analyse existing contracts, optimise contract terms, identify potential threats, recommend improvements).

Currently, artificial intelligence is not at a stage of development that would allow it to develop a negotiation system on its own – even if a sufficiently extensive negotiation algorithm protocol system should be completed. Recent empirical studies provide a more nuanced perspective on the comparison between artificial intelligence and human cognitive abilities. Research indicates that large language models (LLMs) can perform at levels comparable to children in selected cognitive domains. For instance, GPT-3.5 and GPT-4 achieved results similar to those of 6– to 10-year-olds in theory of mind (ToM) tasks, such as false belief

reasoning, while still lacking consistency and deeper comprehension (Kosinski, 2024; Strachan et al., 2024). In other contexts, LLMs have demonstrated performance comparable to or even surpassing human participants, such as when acting as interviewers of children in controlled studies (Sun et al., 2025) or predicting outcomes of neuroscience experiments more accurately than domain experts (Luo et al., 2025). At the same time, findings from developmental psychology highlight that young children often outperform AI systems in areas such as robust visual object recognition, underscoring qualitative differences between biological and computational cognition (Ayzenberg et al., 2025). These results suggest that while LLMs exhibit advanced problem-solving skills in structured tasks, their abilities cannot be linearly equated with human intelligence at a given age but rather reflect domain-specific competencies that vary considerably across contexts. Andler, Amblard, and Blangero (2024) point out that artificial intelligence lacks consciousness, emotions and other mental states that are crucial to fully imitating human intelligence (HI). The authors indicate two main approaches to AI. One is inspired by human thought (cognitive) processes, whereas the other focuses on solving problems without referring to HI. Initially, symbolic models (based on logical inference rules) were preferred, due to the limited computing power of computers. Currently, connectionist models (based on neural networks) dominate, which is related to technological advancement. Based on those studies, several key conclusions can be drawn regarding the possibility of using artificial intelligence in negotiation processes. Depending on the purpose of the negotiation, it is possible to attempt to simulate human thought (cognitive) processes or to concentrate on effective problem solving with no direct reference to human intelligence. In negotiations, both symbolic AI (based on rules and logic) and connectionist AI (based on neural networks) can be used. Symbolic models can be helpful in situations that require clear and understandable negotiation rules, whereas connectionist models can perform better in analysing complex patterns and predicting negotiation behaviour. The lack of consciousness and emotions in AI means that in negotiations there may be difficulties in reading the intentions and emotions of the other party. That may limit the ability of AI to fully understand and respond to human negotiation behaviour, suggesting the need to supplement AI with emotion analysis tools or for AI to work with human negotiators. Moreover, in negotiations, AI can be used on

the basis of functionalism, or focusing on the results of an action (e.g. achieving optimal negotiation results) rather than on the exact course of the decision-making process. It may be more important what AI achieves than its working in the same way as human intelligence. Martin von Allesch (2022) argues that assessing the effectiveness of artificial intelligence in negotiations should include generality and adaptability rather than just being narrowly focused on task performance. According to the researcher, current AI systems may be effective in performing specific tasks, but their ability to adapt in the context of dynamic negotiations is still limited. Therefore, there is a risk that today's AI systems may apply simplifications distorting the actual outcome of negotiation. Rhiannon Williams (2023) reported that AI had just passed a human test for creativity. Nevertheless, the author pointed to various limitations in the use of AI tools at the time: (a) AI can simulate human responses and strategies, but it is no match for human creativity and adaptability in negotiations; (b) in negotiations requiring innovative solutions, AI may be less effective, especially where the problem requires a new, unprecedented approach; (c) AI is based on previous data, which may limit its adaptability to new and unforeseen negotiation situations; (d) human beings should remain a key element in negotiations, especially in situations requiring empathy and a deep understanding of the context; (e) AI can be used as a support tool, providing analysis and suggestions, but it should not replace human negotiators.

According to the authors of this paper, artificial intelligence is not yet ready to become an equal partner in business negotiations. At the current level of development, AI has several imperfections. Negotiation algorithms cannot (yet) sufficiently analyse one of the important aspects, i.e. non-verbal messages and signals. Body language, providing information about the emotions and intentions of negotiators, can be a driver of gaining dominance at the negotiating table – based on non-verbal communication, one can read what the interlocutor really feels and thinks and, above all, whether they are telling the truth, which is often crucial to the outcome of the negotiations. Algorithms have no emotional intelligence; in order to be able to fully replace humans in the negotiation process, AI would need to have at least human skills to understand explicit or implicit intentions, reasons and motives of human intelligence, which it cannot do yet. In addition, there is a risk of AI's misunderstanding of the context

of negotiations, which may lead to misinterpretations of negotiation situations. Despite those shortcomings, AI can effectively support specific activities at different stages of the negotiation (Table 3).

Table 3. Possible applications of AI in the negotiation process

NEGOTIATION PHASE	AREA OF APPLICATION
PRELIMINARY – PRE-NEGOTIATION	analysis of information about the negotiation partner
	assessment of the negotiation conditions
	selection of members of the negotiating team
	analysis of (one's own and the partner's) interests, goals and alternatives
	estimation of the parties' bargaining strengths
	defining the area of negotiation
	choice of negotiation strategy and tactics
MIDDLE PHASE – ACTUAL NEGOTIATION	modification of the assumed negotiation techniques based on the negotiation style adopted by the partner
	analysis of specific areas of divergence
	identification of costs and losses resulting from possible breaking off of the talks
FINAL PHASE – POST-NEGOTIATION	substantive verification of the content of the agreement
	analysis of the achievement of the goal, the effectiveness of the strategy used, the parties' negotiating styles and techniques
	analysis of errors and correct actions
	analysis of the implementation of the negotiated arrangements

Source: own elaboration.

AI's potential to generate value is now particularly useful at the initial stage of the negotiation process – in the preparatory phase (Table 3). Thanks to the use of AI, the negotiator can quickly deal with the most laborious, 'mechanical' part of the preparatory phase, thus leaving more time to refine issues that require creative thinking, rational analysis, drawing conclusions and making decisions in fields such as selecting the goal, strategy or negotiation techniques. AI is an effective tool supporting repetitive activities – it allows to properly organise, read and draw practical conclusions in all those areas. It performs very well in tasks that have clear rules but complex processes. It can be programmed to respond to a set of assumptions and a set of data presented in the past, thus predicting value more accurately than humans. The forecast data can be used as a standard reference

for special functions in negotiations. Therefore, it is a natural way of combining artificial intelligence with negotiation, which can be used to automatically optimise human decisions during negotiations (Liu et al., 2020, p. 10). The role of artificial intelligence in modern negotiations is crucial due to the increasing complexity and amount of data involved. The following table provides a SWOT analysis for the use of artificial intelligence in negotiations (Table 4).

Table 4. SWOT analysis – artificial intelligence as a negotiation partner

STRENGTHS	WEAKNESSES
– effectiveness, efficiency and speed – broad and predictive data analysis in a short time; AI can process large amounts of data and negotiate much faster than humans, – cost reduction – AI's taking over part of the duties leads to time savings and optimisation of human and financial resources; – permanent availability – the ability to perform tasks without time limits, AI can operate 24/7, which is beneficial in international negotiations, where time zones can pose a challenge; – scalability – automated negotiation systems can handle multiple simultaneous negotiations, which is difficult for human negotiators to achieve; – communicativeness – instant feedback; AI automates routine communication, leaving time for more complex tasks; – insight – reliable analysis of the negotiation partner, the ability to identify the negotiation partner's behaviour pattern based on their reactions and method of communication; recommendations based on a thorough analysis of data, based on evidence (historical data); – objectivity – AI uses data and algorithms to provide unbiased recommendations. Moreover, it minimises the risk of falling into the trap of becoming overemotional in a negotiation; it eliminates prejudices and emotions that can influence human decisions, thereby helping to achieve more equitable (free from human prejudice) negotiation outcomes; – prediction – forecasting the results of talks based on the analysis of previous negotiation processes; – certainty – minimising the risk of human error in the form of oversight or non-identification of relevant information;	– lack of intuition and empathy – despite its advancement, AI still fails to fully understand human emotions and subtleties, which can lead to misinterpretations of negotiation intentions; – data dependence – the effectiveness of AI in negotiations depends on the quality and quantity of data on which it has been trained. Inaccurate, incorrect, incomplete or outdated data can lead to incorrect decisions. In the case of already existing errors in algorithms, AI systems may inadvertently perpetuate them; – ethical restrictions – there are concerns about the ethics and transparency of AI algorithms, especially in the context of privacy and data security; – adaptability – AI may have difficulty adapting to rapidly changing contexts or unexpected behaviours of the other party to the negotiation; – schematic approach – in relation to decision-making; misunderstanding of the negotiation context by AI can lead to misinterpretations of negotiation situations in terms of decisions taken; – failure by AI systems to take into account cultural differences at the negotiation stage may be a threat to the subsequent performance of the contract;

OPPORTUNITIES	THREATS
– technological progress – the continued development of AI technology, including advanced machine learning algorithms and natural language processing, can significantly improve AI negotiation capabilities; moreover, the rapid development of AI in relation to human intelligence can lead to independent creation of negotiation mechanisms based on existing algorithms; – integration with other technologies – combining AI with big data, predictive analytics and blockchain technologies can create more advanced, secure and transparent negotiation systems; – globalisation and complex negotiations. – the growth of global markets and the complexity of international negotiations increase the demand for effective, scalable solutions that AI can deliver; – personalisation – the development of AI allows for a more personalised approach to negotiations, tailored to the individual needs and preferences of negotiators;	– cybersecurity – the automation of negotiations with AI exposes systems to potential hacking attacks and data security breaches; the risk of insufficient protection of sensitive information about negotiation partners from unauthorised access and breaches; – legal regulations – changing legislation on the use of AI may limit the possibilities of its implementation in negotiations; – trust and acceptance – people may be reluctant to trust AI in critical negotiations, fearing lack of control or understanding of decisions made by algorithms; – technological divide – differences in the availability and advancement of technology between different regions of the world can lead to uneven implementation and benefits of automating negotiations using artificial intelligence tools. – changing the negotiation model – reducing the need for 'traditional' negotiations will weaken the skills of humans as negotiators, which can lead to the breaking off or negative conclusion of the negotiation process in the event of a system failure;

Source: own elaboration.

Incorporating artificial intelligence into negotiation processes requires a strategic approach, whereas choosing the right AI negotiation tool involves a thorough understanding of business needs and careful consideration of various factors (Florkin, 2024). It is worth remembering, however, that the use of artificial intelligence in negotiations requires a balance between automation and preserving the human element of the art of talking at the negotiating table. According to Analytics Vidhya (2023), the future of negotiations is likely to involve collaboration between AI and humans and AI will be a tool to support rather than to replace human negotiators. AI can complement the human negotiation process by strengthening analysis and decision-making, but not substituting human creativity and empathy. In negotiations, AI will be effective in areas where large amounts of data can be analysed,

but it may have difficulties with subjective, emotional aspects. AI can process data faster, but the human mind remains more energy-efficient, which is important in long-term negotiation processes.

3. The Negotiation Algorithm and the Negotiation Algorithm Protocol System (NAPS)

The answer to the need to use AI-based tools and platforms to streamline the entire negotiation process is a negotiation algorithm. NAPS – it is the title of the project implemented by the authors of the article and aimed to create and test specific protocols of the Negotiation Algorithm Protocol System (NAPS). The authors intend to describe sets of rules, procedures and standards that must be followed during the negotiation process. Those protocols may include communication methods, sequences of operations or offer evaluation principles that are relevant to the proper conduct of negotiations. Each protocol will be responsible for different aspects of the negotiation process, forming a comprehensive system for managing and coordinating the entire negotiation process.

Each NAPS protocol might be constructed according to a structured schema. This schema might specify the input data (e.g. parties, objectives, BATNA, reservation points, constraints), define an ontology of issues (e.g. price, delivery, risk allocation), outline rules of concession-making, determine priorities and weights assigned to issues, and incorporate relevant constraints (legal, ethical, organisational). Such formalisation might provide the necessary foundation for subsequent automation and for feeding these protocols into AI-driven systems. The step before creating specific tools is the need to define the very concept of a negotiation algorithm. In general terms, an algorithm describes a step-by-step solution to a problem or achievement of a goal (Sysło, 2016, p. 2). In other words, an algorithm is a recipe, a set of commands, a description of a sequence of operations leading to resolving a specific problem. An algorithm can also be understood as a function that transforms input data into output data. However, any negotiation is an extraordinary process. Due to the complexity of human interaction, it is not entirely comparable to the formal language of mathematical and computer algorithms.

Therefore, by transferring that classic definition of an algorithm to the field of negotiations, according to the authors of the article, a negotiation algorithm describes a step-by-step solution to a negotiation problem or achievement of the set goal in the negotiation process. In other words, a negotiation algorithm is a recipe, a set of commands, a description of a sequence of operations leading to resolving a specific negotiation problem. Such an algorithm can also be understood as a function that transforms negotiation input data into negotiation output data. A negotiation algorithm is a record of accumulated knowledge reflecting the collected and stored information (e.g. data on the terms and conditions, partner, subject-matter and area of negotiation; the hierarchy and ways of achieving negotiation goals; possible strategies and techniques; possible concessions; short– and long-term benefits and costs, whether acceptable or unacceptable), translating into step-by-step actions until the positive conclusion of the negotiation process (i.e. solving the problem concerned). Therefore, the creation of negotiation algorithms enables the transfer of knowledge to specific systems and the creation of intelligent actions therein, resulting in an effective recipe for efficient negotiations.

For a set of commands or instructions to be considered a negotiation algorithm, it must meet several key criteria:

1. Finiteness: a negotiation algorithm must always end after a finite number of steps have been completed. Any negotiation process that could potentially never end is not a negotiation algorithm.
2. Definiteness: each step of a negotiation algorithm must be clearly defined. The instructions must be clear and unambiguous, which means that each negotiation operation is precisely defined.
3. Input: a negotiation algorithm takes zero or more inputs before or during its operation. The data may include information about the parties to the negotiation, their objectives, priorities, limitations and any other relevant variables affecting the negotiation process.
4. Output: a negotiation algorithm generates one or more outputs that have a specific connection to the input data. The output must be clearly defined and linked to the objective of the negotiation.

5. Effectiveness: all operations performed by a negotiation algorithm must be sufficiently basic that they can be performed manually within a finite time period. Operations must be realistic and feasible.

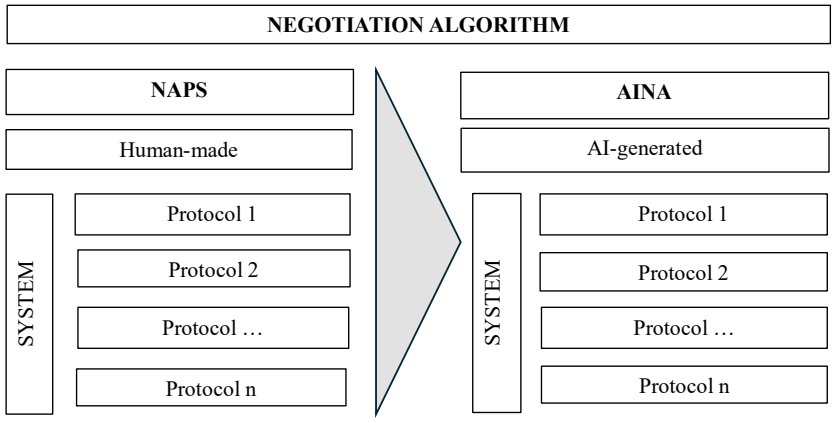
Adhering to those principles allows for the creation of negotiation algorithms that are precise, effective and reliable, enabling both humans and artificial intelligence systems to conduct effective negotiations.

4. Artificial Intelligence Negotiation Algorithm (AINA)

Bearing in mind the complexity of negotiation processes, their infinite variableness, multi-element nature, today the authors of the article see no possibility of defining the concept of an artificial intelligence algorithm that would describe the negotiation process in its entirety. Technically, it would be an overly complex block diagram, basically consisting of an unlimited number of subalgorithms. In the opinion of the authors, a negotiation algorithm of artificial intelligence, within the meaning of the classic definition of an algorithm, will not be described by a human. The idea is to supply artificial intelligence with negotiation algorithms. Therefore, the authors intend to create an extensive catalogue of NAPS negotiation algorithms that will describe different situations (with no certainty that a human will be able to predict them all), assuming that, at a more advanced stage of AI development, the system will be able to create a mechanism by itself – adapting to a specific situation or phase in the negotiation process.

To recapitulate, an artificial intelligence negotiation algorithm (AINA) will be a scheme, program or recipe for operation that a human will not be able to define, describe or even understand. AI will create such a scheme based on the NAPS supply. An AINA will be the ideal of the negotiation process automation, the target state (understood as a set of skills rather than as a specific model solution). The NAPS–AINA relationship is illustrated Figure 1.

Figure 1. Diagram NAPS v AINA



Source: own elaboration.

To assess the quality of AI-generated negotiation algorithms, an evaluation framework is required. This may include multi-agent simulations, agent tournaments, or controlled A/B tests with practitioners. Evaluation criteria could involve not only effectiveness and efficiency (time to agreement, rate of successful outcomes), but also the quality of solutions (Pareto efficiency), fairness, and compliance with predefined constraints. Moreover, to ensure responsible use, the development of AINA might incorporate a governance, risk and compliance layer. This includes traceability of decisions, explainability of AI reasoning, systematic bias auditing, as well as guarantees of security and data protection in handling sensitive negotiation information.

RESEARCH RESULTS

The development of negotiating skills in both humans and AI systems will contribute to more effective and harmonious relationships, leading to mutual benefits. As AI becomes more advanced, understanding and adapting to those 'new negotiation partners' will be crucial to succeeding in future business interactions. In the future, artificial intelligence may become an equal negotiation partner, assuming responsibility for the entire process; at present, however, AI is not at

such a stage of development. Today, AI is an effective tool supporting repetitive activities – it allows to properly organise, read and draw practical conclusions, particularly in the preliminary phase, i.e. the preparation of negotiations. Ultimately, the AI negotiator (AI negotiation robot) will assume responsibility for carrying out the process from start to finish. At the current level of development of artificial intelligence, the chances of success in negotiations are increased by the use of negotiation algorithms. The research conducted is the foundation for further identification and development of advanced negotiation algorithms, especially in terms of considering how fast AI will develop in relation to human intelligence and the situation where AI will independently create negotiation mechanisms based on the supply of algorithms. Although the study does not present empirical data, its results consist in theoretical insights derived from the literature review, comparative analysis, and SWOT evaluation. These findings include the conceptualisation of the Negotiation Algorithm Protocols System (NAPS) and the Artificial Intelligence Negotiation Algorithm (AINA), as well as the identification of specific research gaps requiring empirical validation.

The claim that artificial intelligence may in the future become an 'equal partner' in negotiations is formulated here in general terms, as no universally accepted formal criteria for negotiation equality currently exist. At present, the notion should be understood as an exploratory hypothesis, highlighting the potential trajectory of AI development rather than a measurable reality. Establishing clear criteria for 'equality' – such as decision-making autonomy, adaptability, or the ability to recognise and respond to human intentions – remains a task for future research.

CONCLUSIONS

The primary research objective of this article was to explore the possibility of employing artificial intelligence as a business negotiation partner. This aim has been achieved through a conceptual analysis that combined a literature-based review with original theoretical propositions. The investigation confirmed the hypothesis that, at the present stage of development, artificial intelligence cannot yet

assume full responsibility for conducting negotiations on par with human negotiators. Nevertheless, AI already provides measurable value as a support instrument, particularly in the preparatory phase of negotiations, where it enhances information processing, scenario forecasting, and the organisation of repetitive activities.

The main theoretical contributions of the study may be summarised as follows:

- the identification of specific areas within the negotiation process where AI tools may be effectively applied (preparation, analytical support, evaluation of agreements);
- the development of a SWOT analysis illustrating both the potential and the limitations of AI in negotiation processes;
- the conceptualisation of the Negotiation Algorithm Protocols System (NAPS) and its relationship with the Artificial Intelligence Negotiation Algorithm (AINA), constituting an original framework for structuring and advancing research in this field.

By providing these results, the article contributes to filling an evident research gap. At the same time, it should be emphasised that the study is primarily theoretical and review-based in nature. Its claims regarding the future "equality" of AI in negotiations are intentionally formulated in general terms, as no formalised criteria for assessing such equality currently exist. Establishing these criteria – whether in terms of autonomy, adaptability, or the capacity to interpret human intentions – remains a task for future inquiry.

The implications of this research are twofold. From a theoretical perspective, the study demonstrates that negotiation algorithms can be meaningfully integrated into negotiation science, offering a structured conceptual lens for analysing the interaction between human and machine negotiators. From a practical perspective, it suggests that AI should presently be deployed in a complementary role, supporting human negotiators rather than attempting to replace them.

Future research should focus on empirically verifying the proposed conceptual frameworks. In particular, subsequent studies may investigate:

1. the effectiveness of specific negotiation algorithms across diverse situational and cultural contexts;
2. the capacity of AI systems to autonomously generate and adapt negotiation mechanisms;

3. the role of emotional and non-verbal communication in human–AI negotiation dynamics;
4. the implications of integrating AI-based negotiation with big data, blockchain, and predictive analytics;
5. the ethical, legal, and trust-related challenges of delegating negotiation tasks to AI systems.

In conclusion, the study should be regarded as a theoretical and conceptual contribution. It clarifies both the potential and the limitations of AI in negotiations, proposes original analytical frameworks (NAPS and AINA), and lays the groundwork for future empirical research that may establish formal criteria for assessing the extent to which artificial intelligence can become an autonomous partner in negotiation processes.

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