International Journal of Engineering Trends and Technology
ISSN: 2231–5381 / https://doi.org/10.14445/22315381/IJETT-V73I7P125

Volume 73 Issue 7, 318-327, July 2025

Review Article

Artificial Intelligence in Mediation: A Systematic Review and Strategic Management

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Received: 04 November 2024 Revised: 03 July 2025 Accepted: 10 July 2025 Published: 30 July 2025

Abstract - *Mediation is the process by which parties in disputes get an easy, cost-efficient, and time-efficient solution to their disputes without going through the lengthy court proceedings. A mediator who is a third party is appointed by the court so that they can find a solution to the problem after considering all the facts and situations of the dispute. The customary processes in which documentation is paper-based make resolving disputes slow. In the present scenario, countries are using technologies in the administration of courts. Subsequently, several countries have tried to integrate AI into the mediation process. Split-Up in Australia, Anheng and CityDo in China are notable initiatives that focus on the fast and cost-efficient Mediation of disputes. These facts inspired this study to examine the detailed aggregation of artificial intelligence in the mediation process and strategic management. According to the study, integrating AI in Mediation can make it convenient, efficient and superior. The study also identified the challenges with the implementation of AI in Mediation, such as concerns related to privacy, data gathering, etc., which future studies need to explore.*

Keywords - *Artificial Intelligence, Mediation, Online dispute resolution, Energy disputes, Dispute resolution.*

1. Introduction

In the last few decades, the nature of disputes has changed from business and property disputes to disputes that involve family relations, construction and many more [1]. Hence, in the past few years, many significant changes in advocates' approaches towards conflict handling have occurred. There came phenomenal efforts towards developing cost-efficient strategies and more efficient and easy ways to resolve disputes through Mediation and other Alternative Dispute Resolutions (ADR) [2]. Alternative Dispute Resolution consists of different types of procedures and approaches other than litigation to resolve conflicts, such as negotiation, conciliation, Arbitration and Mediation [3]. The Mediation is a voluntarily chosen dispute resolution process in which a 3rd party, who is neutral, i.e., a mediator, is invited by all the parties or the court to assist the disputants in identifying and resolving the issues and finding a resolution suitable to all parties [4]. Mediation consists of different models, such as facilitative, evaluative, and transformative [5]. These models of Mediation have shared and different listening goals in which the mediator or judge should have intensive listening ability. The facilitative Mediation needs high quality and rational listening, in evaluative mediations, the mediator expresses his listening behaviour by proposing a tangible conciliation recommendation in which different factors are assessed carefully from the legal point of view and in transformative mediation model, both parties can communicate their necessities so that they can come to a prudent decision with the help of mediator [6]. Psychology and sociology are the main areas in which Mediation has been developed [7]. Mediation makes the parties aware of the "social norms" applicable to their relationship. Hence, the difference between a judge and a mediator is that a judge orders the parties to follow the rules, and a mediator convinces the parties to do the same [8]. But now in the modern era of Industry 4.0, we have Online Dispute Resolution (ODR), a type of online settlement that does dispute resolution by alternative methods. ODR settles disputes fully or partially through the internet. Online Mediation provides a vast range of executory approaches in ODR through its fastest-growing branches, i.e., consumer and family law [9]. Artificial Intelligence (AI) is also considered a leading step in industrial

transformation, which enables machines to perform self-monitoring, interpretation, diagnosis, and analysis automatically [10]. The root driver of the industrial revolution is artificial intelligence, which plays a significant role in encouraging the consolidation of looming technologies, like Graphic Processing Unit (GPU), Internet of Things (IOT), cloud computing, etc., in this new generation of big data and Industry 4.0 [11]. In the 1950s, AI arose as a field of research, which demanded understanding the nature of the intelligence of human beings specifically and other living organisms [12]. AI is now being used to aid the legal system, too. It has also become helpful in making legal decisions [13]. The objectives of the study are as follows:

- To study the role of Artificial Intelligence in the Mediation of disputes.
- To study the role of artificial intelligence in resolving different forms of disputes, such as energy disputes, family disputes, construction disputes, etc.
- To find the limitations of using artificial intelligence in the mediation process.

The methodology for this review article involved an extensive review of 156 papers sourced from IEEE, Elsevier, MDPI, Springer, Wiley and others. These papers were carefully selected based on their credibility, relevance and alignment with the article's focus. After a thorough evaluation, 60 articles were selected and incorporated to ensure a comprehensive analysis of the topic. The selected papers provide robust insights, contributing significantly to the findings and discussions presented in the article.

2. Overview of AI in Mediation

While talking about technology, Industry 4.0 is regarded as an age of a new industry that is truly based on the connectivity platform used in it. Industry 4.0 is the latest and ongoing transformation in technology. There are four main transformations that occurred in the technology [14]. As described in Figure 1, in the 1st industrial revolution, steam and water were used in manufacturing processes. In the 2nd industrial Revolution, Electrical technology was used to increase production.

The 3rd industrial revolution, IT and electronics were used, but the main focus was to make production automatic. AI was used during the 4th industrial revolution to produce and do other work [15]. Artificial intellIgence (AI) is the root driver of industrial evolution and plays a significant role in encouraging the unification of looming technologies, like Internet of Things (IOT), cloud computing, big data analytics etc. in this big data and Industry 4.0's new generation [11].AI was introduced in 1950s for the first time [16].

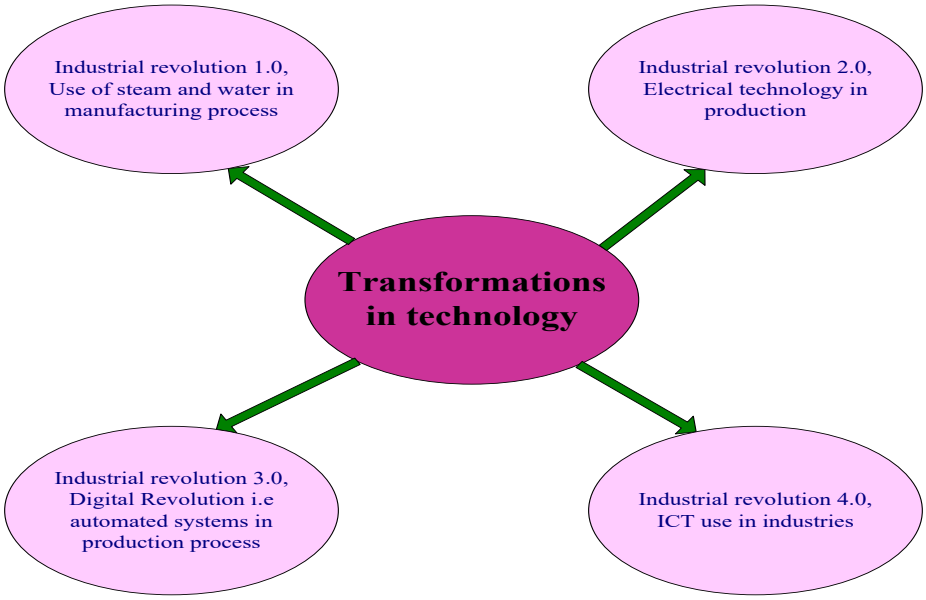

Fig. 1 Various developments in technology

AI is being used in Mediation nowadays. An example is 'Social Disputes Mediation and Resolution Centres' (SDMRCs), which are established at the village, town, and municipal levels. They use several ICTs, such as Anheng and CityDo, in dispute resolution in China. Different administrative agencies work together to identify and resolve a dispute. When information about disputes is identified by them, a 'precision intelligent control system' is applied for risk

warning and the prevention of collective activism [17]. Nowadays, courts are moving towards technologies in various legal processes. Automation and semi-automation of the legal domain is not a new one. Search databases like LexisNexis have been used from the early 90s [18].

Also, Mediation is used to resolve cases by the judiciary and the parties to settle down the cases without court proceedings, so that an easy and early resolution can be granted to the disputes between the parties. Mediation is defined as a process to settle the dispute between two parties; a third party intervenes to negotiate but does not impose any agreement [19]. Mediation is often used as an alternative tool by the courts in a legal process so that the parties in dispute can resolve problems between them on their own. A mediator is a person who is appointed by the court to act impartially between the parties so that the dispute can be resolved. Mediators have to routinely summarise or formulate the complaints and experience of the parties [20]. Three processes are used while doing Mediation, as shown in Figure 2: participation, representation, validation or reintegration. Participants play an active role while participating in the whole process of Mediation so that they can describe their perspective and what they feel about the whole dispute in the representation process.

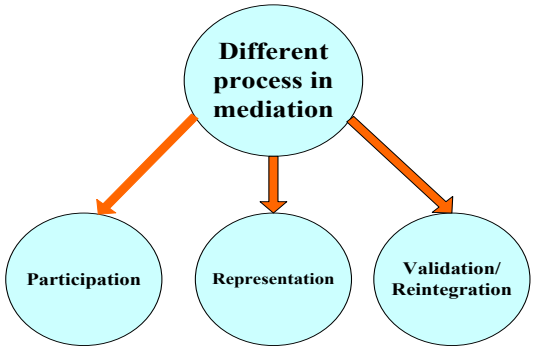

Fig. 2 Different processes in mediation

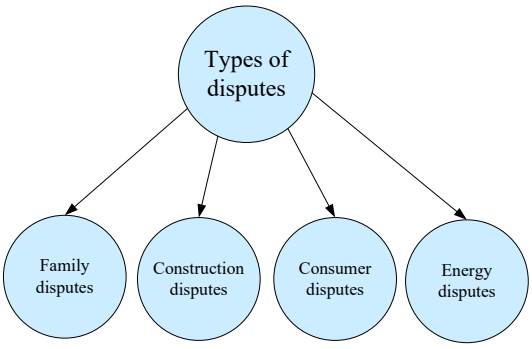

Fig. 3 Different types of disputes

Parties move towards solving the dispute in a respectful and cooperative way in the validation or reintegration process [21]. Also, emotions play an important role in the resolution of a dispute, but they are not understood and addressed properly very often. However, the mediators do not take them into account when processing the Mediation several times. Mediator must take the emotional aspect of him as well as of the parties into account with political, economic and physical aspects of the process [22]. Different kinds of disputes are shown in the Figure 3.

3. Artificial Intelligence in the Mediation of Family Disputes

Mediation in family disputes has evolved exclusively as an autonomous professional practice on the ground level, which is independent of all other professional interferences in divorce and separation, like therapy, counselling, social work, etc. Mediator motivates the negotiation process through the information exchange and learning towards settlement. The message passing between the parties is not to exploit or affect a party; rather, it is made to find the new dimension of the field in which negotiation can be made [23]. Mediation in divorce cases is defined as assisting parties to find a solution to the disputes, such that the parties to the dispute lead to their welfare as well as their children. It has been seen that Mediation has improved results compared to court hearings in the settlement of family disputes [24]. Mediation has grown rapidly in the last few decades because of the vast number of divorce cases and other family disputes, which cause an administrative burden on the courts [25].

The level of conflict is considered in divorce cases as they make a financial burden on the local government and both parties seeking the divorce. So, due to these concerns, many states have introduced Mediation as an alternative, which is beneficial to both the local government and the parties involved in the case. Mediation also helps courts reduce their burden of cases [26]. Also, with new technologies like Industry 4.0, the demand for Online Dispute Resolution (ODR) systems increased among the parties to settle their family disputes [27]. The unification of technology with dispute resolution has made beneficial efforts in both formal and informal legal proceedings. Negotiation support systems, i.e. NSS, are used to give computer-based assistance in situations where there is factual or value-based disagreement between the parties in disputes [28]. NSSs are designed to help the parties in dispute reach a satisfactory decision by providing them with information analysis, and communication protocol [29]. Asset driver was a new mediation tool in Australian family law and a negotiation support system used to support separating couples in executing trade-offs while distributing their property [30]. Split-Up is used as artificial intelligence to give advice on the distribution of property after separation between couples in Australia. However, while using these, the primary concern is to maintain privacy and confidentiality during the process. A risk-opposing approach

should be applied while developing these technologies. A secured multi-layer process with dual authentication should be included within these technologies so that the parties can verify the credentials of the program and the program can verify the identity of the parties [31]. AI of a lower level is being used in courts, Mediation, etc. However, AI of a strong level is used very rarely in the same way. If we think of replacing the human judges with robotic ones, then the decisions will not be in the hands of the human judges; that will be purely on the basis of algorithms used in the AI system programme, and the goal of running a completely fair trial will not be possible. It should not be achieved in all cases. Hence, a combination of AI and a human judge is successful, as AI gathers information, aids the judge by analysing the data, and gives them an expert opinion [32].

4. Role of AI in Mediation of Construction Disputes

The construction projects nowadays have become more complex. Disputes in the construction process are inevitable due to the complex and lengthy process of designing and building. The disputes in construction arise out of the contractual matters, which include time-related, payment-related, and quality-related disputes [33]. A dispute is allied to a different justiciable issue that requires a resolution, which means that the disputes are manageable and require a third party to intervene in dispute resolution [34]. There are three construction disputes elements, i.e., contract provisions, triggering events and conflict as shown in Figure 4. In the last few years, construction companies and contractors have been using Mediation as an alternative dispute resolution to resolve their disputes, as this is a cheap and less time-consuming process. There are three dimensions of Mediation in construction: construction dispute sources, tactics used by the mediator, and outcomes of Mediation. The origin of construction disputes is a source from construction or human behaviour. The mediator tactics are generally related to the disputant's perception, mediation procedures and settlement. Mediator plays an important role in settlement [36].

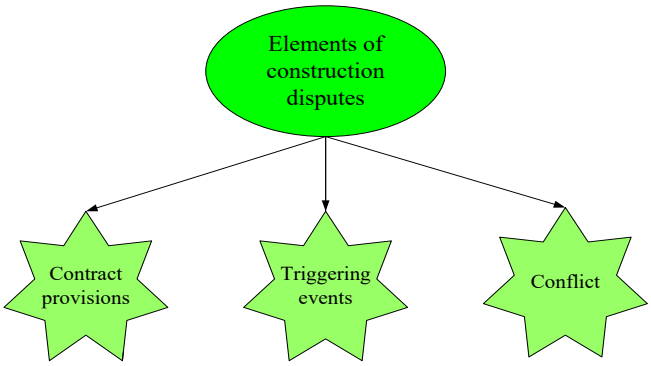

Fig. 4 Elements of construction disputes

The construction industry is also facing many difficulties, including disputes such as productivity challenges and many other challenges. AI has the ability to resolve these in the finest way [37]. The concept of expert systems, which is a part of AI, is also being proposed in different cases. Some expert systems, which have been recently developed, focus on specific fields of construction such as PLATFORM, PLATFORM III, MASON, PROPIC, DSCAS, SAFEQUAL, HOWSAFE, CPO-ES, etc. These expert systems help in the management of the construction [38]. Also, these expert systems are introduced in a legal context. The AI-based mediation system, i.e. DRExM, is introduced by A. Elziny and ors in their study, which predicts the most useful alternative dispute resolution of the construction dispute for the parties on the basis of the data collected from the project, the nature of the dispute, and its relation with other parties. The system is based on if-then rules [39]. Machine learning can help in Mediation by neutral and case data analysis and facilitating conversations by ensuring that each party gets an equal chance to be heard. The main difficulty that comes with AI as a mediator is that of sentiments and emotional prospect, which causes perceptive biases that lower the cordial settlement in construction disputes [40].

5. AI in Mediation of Consumer Disputes

With the advancement in technology, e-commerce has grown rapidly, and customers are preferring to buy things online. E-commerce refers to the system that enables customers and business owners to buy and sell goods respectively through online modes. Hence, there is a need for systems that are secure and reliable for these transactions. Consumer protection is a burning issue throughout the world in e-commerce [41]. With rapidly growing e-commerce, the transactions between businesses and consumers are also growing. A number of problems like defects in products, service deficiency and delivery of wrong or faulty products are also arising with the growth of e-commerce transactions. Disputes are time-consuming, costly and risky to businesses. Consumers need a quick and fair resolution system to deal with these disputes. The traditional resolution system to these disputes are time taking and costly [42] The methods and systems for resolving these disputes needs to grow as per the demand of the time, so that the disputes from B2C transactions can be resolved rapidly and cost efficiently. A. Palanissamy in his study, has described an Automated Dispute Resolution System (ADRS) in three stages as shown in Figure 5. At first stage i.e. negotiating phase, the first i.e. claimant provides the information about the dispute as an electronic complaint to the system and system as a mediator forwards all the information to the business owner about the dispute and tries to resolve it. The system conveys the reply from the second party to the first party and tries again to resolve the dispute. At this stage, the system will help the parties to resolve the matter without making it a legal matter, i.e., court settlement. However, if the first stage fails, then at the second stage, a complaint is filed with the competent authority and a mediator from the

government is appointed to resolve the matter by gathering all the dispute information regarding the dispute and giving proper advice to the parties to negotiate the matter. However, if the second stage fails then at third stage i.e. Arbitration come into force an arbitrator unknown to both the parties is appointed who listens both the parties through online mode and after checking facts, documents etc. about the dispute he gives his decision which is legally binding on both the parties as a civil court [43]. The application possibilities of AI are also developing rapidly in the resolution of this type of matter with digitalisation and Industry 4.0. Expert systems in different legal systems of different countries are growing, handling court work and mediation work, maintaining data for those systems, and helping consumers get fast and cost-efficient solutions to their disputes. For example, DRExM is an expert system for resolving construction-related disputes between consumers and business owners. Another example of an expert system is UMCourt, which is a multi-agent system that helps in Mediation and negotiation, which is purely case-based reasoning in Portuguese labour and customer law [44]. UMCourt uses autonomous tools to increase the meaningful information that is available to the parties in dispute in the process of ODR [45]. AI is facing legal and human rights issues, which are mostly concerned about the privacy of data collected, issues of data protection, legal personhood issues, cybersecurity loopholes, etc [46]. While expert systems are being used in a few legal systems, AI has not gained the trust of all legal systems.

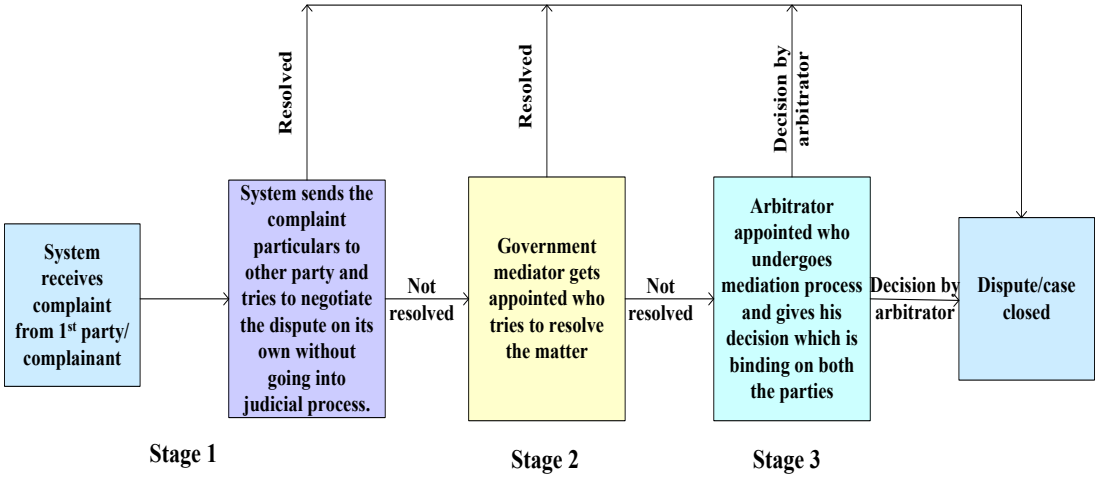

Fig. 5 Three stages of Automated Dispute Resolution System (ADRS)

6. Role of AI in Online Dispute Resolution (ODR)

Alternative Dispute Resolution (ADR) is being used by many law systems traditionally from decades as a speedy and cost-efficient way to resolve the disputes which lowers the burden on the courts and also helps the parties in disputes to get rid of time taking trial process of judicial system by the means of negotiation, Mediation etc.

However, with the revolution in technology, the internet has had an effect on different areas of public life, including the legal sector. As the internet is evolving, new communication methods are also improving in many sectors of law, including modernization of out-of-court settlement of disputes, examples of which are stated by systems for ODR. One of the first such cases has come to the USA, where the settlement was made by means of e-mail from the online ombuds office. In another case, the online ombuds office offered Mediation for the auction portal eBay. In 1999, the SquareTrade portal was made, which was the first ODR for resolving consumer disputes in the USA [9]. ODR supports dispute resolution and decision-making processes. Three kinds of ODR are used to resolve disputes: process support ODR, solution support ODR, and dispute resolution automation. Automated ODR services resolve a dispute using an agent programmed to collect online information and represent interests while working as an AI. These three supports can be used to assist primary forms of ADR, i.e. negotiation, Mediation, Arbitration, etc. [47]. ODR is a tool and a process, but its development is in its infancy. The traditional ADR system is successful in dispute resolution as it uses human-to-human communication in the Mediation and negotiation of disputes between the parties. Hence, the primary problem that arises when implementing AI in ODR is human-machine translation. In the future, AI can be used as systems that have ODR support, which can be further classified into supportive AI systems and substitutive AI systems, as shown in Figure 6 [48].

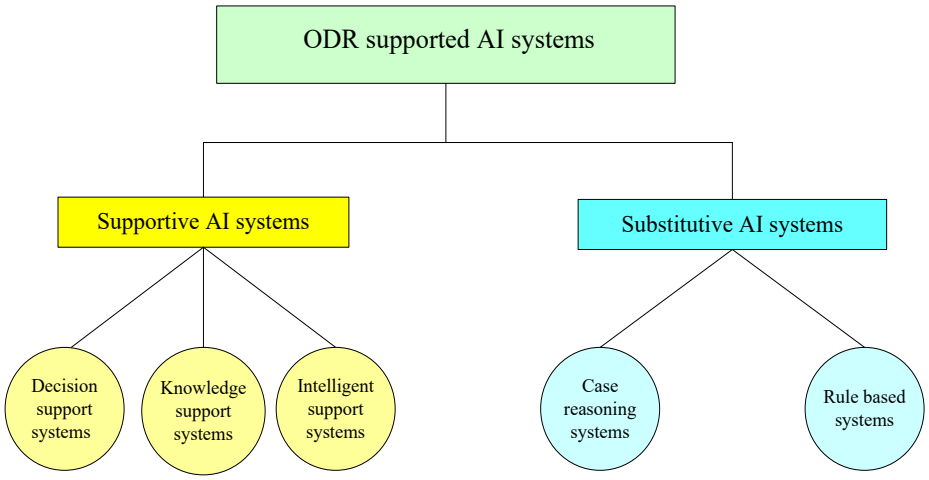

Fig. 6 defines the role of AI in ODR-supported AI systems

Governments and industries are trying to implement ODR, but while doing so, more research is required to use it confidently as an advantage to the parties while avoiding its disadvantages [49]. Technology and the online nature of ODR have created serious security issues. As they are also like some other programmed systems, the crucial information and data of the parties can be compromised by any third party. Hence, ODR providers must use more secure systems that provide information security, privacy and authentication. The government should implement strict laws regarding the same so that a transparent and secure ODR system can be implemented to maximize the effectiveness of ODR [50]. Doing this is significant because knowing current problems and resolving them leads to a strong legislative framework [51].

7. AI in Energy Dispute Resolution

The international trade regime has faced numerous challenges to renewable energy subsidies, yet fossil fuel subsidies remain unchallenged. This discrepancy is attributed to factors such as non-membership of major fossil fuel exporters, inadequate WTO subsidies rules, separate energy governance institutions, and the likelihood of reciprocal litigation, despite the ease of applying WTO subsidies rules [52]. Investors are increasingly using Investor-State Dispute Settlement (ISDS) clauses in investment treaties to claim compensation for state regulatory actions addressing environmental issues. This trend is controversial and calls for reform of the ISDS system, but it will take time to implement [53]. Energy disputes make up a fifth of international commercial disputes, with over 50% of cases accepted by the International Center for Settlement of Investment Disputes in 2020. The scientific community is exploring alternative mechanisms for resolving energy disputes, with Arbitration being particularly well-suited for disputes involving innovative technologies in the energy sector. Innovators are developing automated dispute resolution processes similar to smart contracts [54]. Renewable energy development is a priority for economic policies and plays a crucial role in mitigating climate change. However, trade tensions between countries, particularly in the solar energy sector, are high. The WTO disputes over solar energy involve leading producers and exporters, with the USA and China being the most active participants. The most complex disputes are pending due to global trade tensions and divergent interests. China has the highest comparative advantage in global solar panel trade, while the US and EU are losing distance to China [55].

Digital technology has significantly impacted society, particularly in digital trade, which promotes sustainable business growth and employment. However, it also raises regulatory issues like disputes and the complexity of smart contracts and blockchain technology. The global digital trade sales have increased significantly over the past decade, leading to the emergence of digital trade dispute resolution mechanisms. These mechanisms focus on institutional reform, new strategies, and competitive businesses, using digital technology like online trials, digital evidence, and blockchain to resolve disputes and enhance trust. Balancing interests in jurisdiction remains a challenge. Digital trade is crucial for sustainable development, but disputes arise. Combining technology and dispute resolution mechanisms can improve efficiency. Future research should explore blockchain, smart contracts, and quantum computing [56]. Online Dispute Resolution (ODR) has emerged as a solution to the growing number of disputes arising from electronic contracting. Despite some automated systems, the development of fully autonomous ODR systems is still far from being achieved. Human experts still play a significant role in ODR systems, resulting in reduced costs and time. However, the use of AI

techniques can significantly improve the current state of the art. A hybrid approach combining rule-based and case-based ODR systems will enable efficient intelligent behaviors, empowering users and improving the success rate of dispute resolution processes [57]. W. Dan et al. [58] successfully applied a deep learning mediation model to dispute resolution, demonstrating its effectiveness in text classification tasks. The Attention-based LSTM model maintains high recall and accuracy, identifying successful and failed mediation cases. Optimizing parameters like learning rate, batch size, hidden layer dimension, and discard rate improves performance. However, misclassification cases persist due to vague text and complex legal issues. Future work will optimise the model's structure, training, and feature extraction methods. This mediation model has significant theoretical and practical implications for dispute resolution.

8. Recommendations

Artificial Intelligence has achieved significant traction in the field of dispute resolution, particularly in Mediation. The integration of Artificial Intelligence technologies offers potential solutions to streamline the resolution process, reduce human bias, and provide more efficient and accessible dispute resolution methods. In the context of family disputes, energy disputes, construction disputes, and Online Dispute Resolution (ODR), AI can play a transformative role by enhancing decision-making, improving accessibility, and ensuring fair outcomes. The following recommendations focus on harnessing AI's potential in these areas to optimize the mediation process and achieve more effective results.

- Integration of AI for Predictive Analysis: AI can be leveraged to predict the likely outcomes of disputes based on historical data, helping parties involved in family, energy, or construction disputes assess their chances of success. This will allow for more informed decision-making before engaging in Mediation.
- AI-Powered Chatbots for Initial Consultation: Implementing AI-powered chatbots in the early stages of dispute resolution can help individuals gain immediate access to basic information and potential solutions. These chatbots can offer guidance on the mediation process, answer queries, and direct users to appropriate resources.
- Enhancing Neutrality and Reducing Bias: AI algorithms can help reduce human biases during mediation by offering neutral and objective insights and ensuring that mediators make decisions based on data-driven information rather than subjective judgment. This is particularly beneficial in sensitive areas like family disputes.
- Automated Document and Contract Review: AI tools can assist mediators by automatically reviewing legal documents, contracts, and communications between parties in disputes. In energy and construction disputes, this can speed up the process and ensure that all relevant information is considered.
- Data Security and Confidentiality in ODR: AI-driven platforms used in Online Dispute Resolution (ODR) must prioritise robust data security measures. Ensuring the confidentiality of personal and sensitive data is essential, especially in family disputes, where privacy concerns are significant.
- Continuous Learning and Adaptation: AI systems must be designed with continuous learning capabilities to adapt to new dispute scenarios and improve over time. This ensures that AI tools remain relevant and effective in resolving disputes across different sectors, including family law, energy, and construction.

9. Conclusion

AI helps collect, process and analyse data in the mediation process to find the most relevant solution for the dispute between the parties. It makes the mediation process time and cost-efficient, such that the solution for the disputes can be provided easily to the parties. However, the concern about privacy, confidentiality and integrity has to be taken into account while doing Mediation with the help of AI.

Also, there are fewer expert systems that have been developed that can help in the mediation process. The technology in Mediation is at its first stage; hence, more advanced technologies need to be invented that can deal with the concerns mentioned above while doing Mediation.

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