



Original scientific paper

Feasibility of using Artificial intelligence to minimise cost and time in Arbitration process in the Zambian construction industry

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ABSTRACT

The Zambian construction industry (ZCI) is characterised by lengthy and costly dispute resolution procedures, caused by manual and inefficient practices. This study investigated the potential of artificial intelligence (AI) application in minimising cost and time of arbitration in the ZCI. The methodology adopted for this study was mixed method, employing both qualitative and quantitative approaches. Quantitative data was collected using a self-administered structured questionnaire from 65 respondents sampled from contractors and arbitrators. Qualitative data was collected through interviews with 5 respondents drawn from the regulator-chartered institute of arbitrators and the Judiciary. Findings revealed that arbitration is the second most preferred dispute resolution procedure. Furthermore, there is a growing awareness of AI potential in dispute resolution. 80% of the respondents recognized its potential in addressing procedural inefficiencies, which lead to high costs and lengthy arbitration processes. Infrastructure limitations, ethical concerns particularly regarding data security and the loss of human judgment, pose significant challenges to AI adoption. To overcome these challenges, the study recommends that the Government and relevant stakeholders, develop an adoption framework for AI application in arbitration. The paper highlights areas in which policy interventions should be focused, in promoting digital integration in dispute resolution from developing country's perspective.

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1. Introduction

1.1 Background and Context

Construction is often described as a risky undertaking, and many instances is characterised by disputes among parties (Oswald et al., 2020). Disputes can have debilitating effects on projects, as they can be time-consuming, costly, and resource-intensive (Francis et al., 2022). Hemanth Sai Kalyan et al. (2022) opines that in developing countries, disputes on construction project arises mostly from payment issues, variations in scope, delays, and performance-related disagreements. Resolving disputes remains a significant challenge in Zambia's construction sector (Tembo et al., 2025). Banda and Beyers (2023) acknowledge that arbitration proceedings often face considerable delays, which in turn increases project costs and hinder timely completion. The expenses associated with arbitration, such as arbitrator fees, legal representation, and administrative costs, can be particularly burdensome

for smaller construction firms. Moreover, construction disputes frequently involve complex technical issues that require specialized expertise, which may not be readily available within the existing pool of arbitrators (Lee et al., 2021). While arbitrators are expected to maintain impartiality, there remains a risk of biasness in decision makings (Marrow et al., 2020). Illankoon et al. (2022) additionally noted that access to arbitration can be limited for some parties due to financial constraints or a lack of awareness of available options. Jagannathan and Delhi (2022) argues that these issues can lead to a less effective and unfair construction sector, and the existing structure may deter investment, raise project risk, and impede overall economic growth especially in developing countries. Compounding the situation is the fact that the current practices in dispute resolution approaches are still characterized by low adoption of technology. The figure below (Figure 1) demonstrates the stages involved in the arbitration process in Zambia

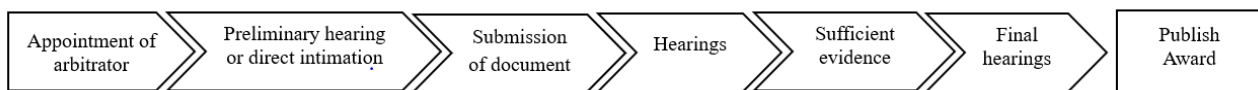


Figure 1. Arbitration process.

The trend is not the same in developed countries where the up-take of digital or emerging technologies is high and contributing to solving the challenges currently facing the construction industry. AI has emerged as a transformative tool in construction dispute resolution, offering solutions such as predictive analytics, automated contract analysis, and AI-driven mediation (Yıldırım, 2024).

In sub-Saharan countries, while the pandemic accelerated the use of digital tools like e-filing, virtual hearings, and online document management, it also underscored disparities in access to technology and the financial capacity of legal practitioners and institutions to adapt. In Zambia, for instance, contract enforcement methods and procedures are still onerous, expensive, and time-consuming. Again, despite the adoption of information communication technology in the legal systems, there are still issues with lack of technology infrastructure, which is a blatant sign that digitization has not been adequately implemented.

1.2 Research Gap and Objectives

Studies in developing countries have looked at the use of information communication technology (ICT) in dispute resolution (Schmitz, 2018; Ikubanni and Saheed, 2022; Olanrewaju et al., 2025; Cupido, 2025), and not necessarily the use of AI in dispute resolution. Therefore, leveraging on the benefits recorded in developed countries (Zeleznirow, 2021; Alessa, 2022; Salem et al., 2024; Abedi et al., 2025; Tantawy et al., 2025) this study sought to close the gap by exploring the feasibility of using AI in minimising cost and time of arbitration process, identifying the key barriers to its adoption from a developing county's perspective using Zambia as a case study.

1.3 Artificial Intelligence in Arbitration

The integration of artificial intelligence (AI) in construction arbitration represents an emerging frontier in dispute resolution, combining technological innovation with traditional legal frameworks. AI applications in construction dispute resolution have been categorized into three primary groups: settlement-oriented systems, method selection-oriented systems, and dispute evaluation-oriented systems (Gulyamov and Bakhramova, 2022). Furthermore, Bakst et al. (2022) add that these systems utilize various AI technologies, including machine learning, natural language processing (NLP), and neural networks, to enhance dispute resolution processes.

AI technologies demonstrate significant potential in construction dispute management through multiple applications (Yıldırım, 2024). This is because digital technologies, particularly AI, distributed ledger technologies, and building information modeling, have emerged as the most dominant solutions for managing construction contractual disputes, as illustrated in the work of Sadri et al. (2023) and further supported by (Francis et al., 2026). Machine learning techniques have shown

particular promise, through studies which have demonstrated that Support Vector Machine algorithms can achieve an accuracy of 71.65% in predicting construction dispute outcomes (Ayhan et al., 2021). Taken together, these studies reveal not only the technological benefits of AI applications, but also highlight a clear opportunity for their contextual adaptation in environments like Zambia, where costly and time-consuming dispute resolution processes can benefit particularly from predictive and data-driven tools.

Table 1 below illustrates how various AI technologies are applied within the legal domain of international arbitration. It details that Natural Language Processing (NLP) systems analyze contracts to understand specific terms and obligations, while Robotic Process Automation (RPA) tools automate tasks like sorting and filing contracts into directories. Furthermore, Machine Learning (ML) models are utilized to predict case outcomes based on historical data, while Generative AI (GenAI) can draft arbitration judgments by synthesizing previous decisions into contextually relevant outputs.

Table 1. Reported performance of AI arbitration systems.

AI Technique	Application Area	Reported Accuracy / Performance	Source
Support Vector Machines (SVM)	Predicting outcomes of construction disputes	71.65%	Ayhan et al. (2021)
Convolutional Neural Networks (CNN – Deep Learning)	Classifying construction contract disputes (text mining)	65.99%	Oftebro & Rabben (2022)
Natural Language Processing (NLP)	Detecting missing clauses in construction contracts	93% (multi-label classification); 83% (similarity matching)	Hassan et al. (2021)
Differing Site Conditions Analysis System (DSCAS – Expert System)	Claims and contract management in construction disputes	Demonstrated proof-of-concept (no formal accuracy %)	Efe (2025)

Going by the information displayed in table 1, NLP-based methods currently demonstrate the highest performance, suggesting that text-heavy arbitration processes in Zambia could benefit most from such approaches. However, predictive techniques such as SVMs highlight the potential for outcome forecasting, albeit with limitations in accuracy.

There are a number of studies that suggest that the application of AI extends to document analysis and case management. One such reference point is the work done by Oftebro and Rabben (2022) which reported that Deep learning-based text mining approaches have been successfully applied to classify construction contract disputes, with text convolution neural networks achieving performance metrics of 65.99%. Additionally, NLP-based methods for detecting missing clauses in construction contracts have demonstrated 93% accuracy in multi-label classification and 83% accuracy in similarity matching.

2. Materials and Methods

2.1 Study Design and Setting

The methodological approach adopted for this study was a mixed method, employing both quantitative and qualitative approaches. Quantitative data was collected using a structured questionnaire containing closed ended questions, whereas, qualitative data was collected through interviews. A total of 65 respondents participated in the quantitative survey. These included; respondents drawn from National Council Construction list of registered contractors in grades one (1) to four (4), registered arbitrators in Zambia as well as the regulator. For the qualitative part interviews were conducted with respondents who have participated in dispute resolution processes before, in the Zambian construction industry. Quantitative data was analysed using descriptive statistics while qualitative data was analysed using thematic analysis.

Summary of the methodological approach as employed in this study is as shown in figure 2.

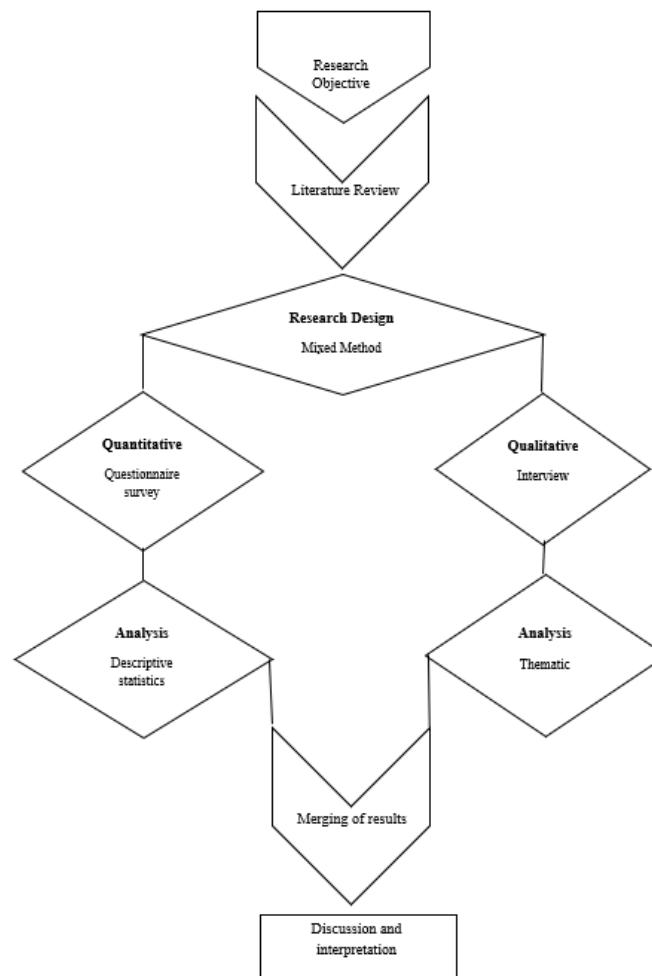


Figure 2. Methodological approach employed.

3. Results

3.1 Respondent profile

For quantitative data a total of 106 questionnaires were distributed out of which 65 were successful responses. The successful percentage response rate was 61%, according to Doloi (2013), an acceptable response rate of 30% is acceptable. Of the successful responses 43 were contractors whereas, 22 were arbitrators as shown in table 2.

Table 2: Questionnaire distribution and response rate.

Respondents	Distributed Questionnaires	Collected questionnaires	Response rate (%)
Contractors	63	43	68
Arbitrators	43	22	44
Total	106	65	61

The sample included 22 arbitrators, a representation across National council for construction registered contractors in grades one, two, three, and four. Further, in ensuring a broad range of viewpoints on the feasibility of AI in arbitration, Chartered institute of Arbitrators Zambia (CIArbZ) was also considered for the study. Among contractors, the majority were in possession of substantial experience, with 39% having worked for 6-10 years and 33% for 11-15 years. A similar trend is seen among arbitrators, where the largest group (36%) had 11 – 15 years of experience, and 28% had 16

plus years, indicating a highly experienced collection of respondents. Summary of respondents representation is as shown in figure 3.

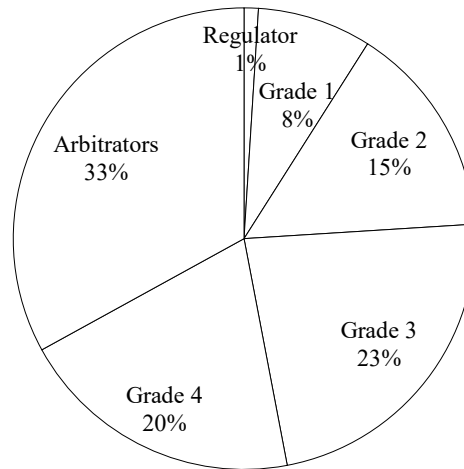


Figure 3. Respondents' representation.

3.2 Dispute resolutions in the Zambian Construction Industry

In assessing the common methods for dispute resolution in the ZCI, the findings revealed that adjudication was the most preferred method, chosen by 20 respondents. This suggested that contractors value adjudication as a relatively quick and cost-effective process and its enforceability in construction-related disputes. Arbitration came second, with 14 respondents selecting it as the preferred option as shown in figure 4, attributing its popularity to its formal structure and binding nature. It was noted however, that arbitration is becoming less favored compared to adjudication, possibly because of higher costs and longer timelines.

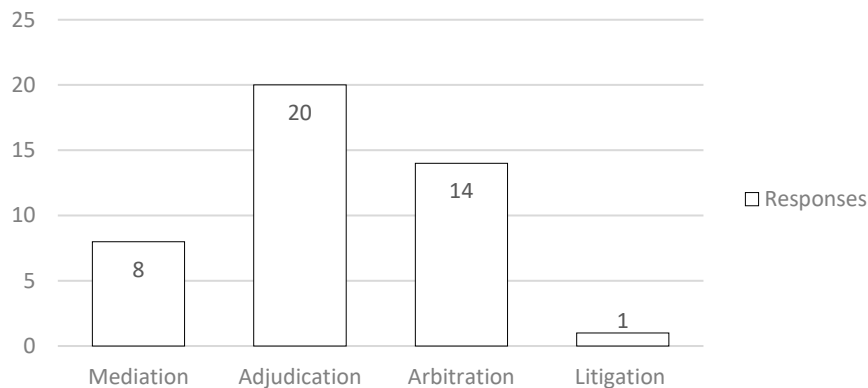


Figure 4. Contractor's preferred dispute resolution method.

Mediation came third, with 8 out of a total of 43 respondents opting for it. Its lower popularity compared to adjudication and arbitration reflected concerns surrounding its non-binding nature and reliance on parties' cooperation to reach a settlement. Litigation was ranked as the lowest, with only 1 respondent indicating preference for it. This underscores contractors' strong aversion to court-based processes, likely due to lengthy processes associated with court cases or the cost implication on the projects and parties involved.

3.3 Causes of Disputes

An assessment was carried out to establish the leading causes of disputes in the Zambian construction industry. The findings revealed that the leading causes of delays are payment related issues (Mean ≈ 4.23 ; RII ≈ 0.847), contract misinterpretation (Mean ≈ 3.79 ; RII ≈ 0.758), delays (Mean ≈ 3.33 ; RII ≈ 0.665), scope changes (Mean ≈ 2.77 ; RII ≈ 0.553), and design related issues (Mean ≈ 2.51 ; RII ≈ 0.502), in that order, as shown in table 3.

Table 3. Ranked causes of disputes.

Cause of Dispute	Mean	RII	Rank
Payment issues	4.23	0.847	1
Contract misinterpretation	3.79	0.758	2
Delays	3.33	0.665	3
Scope changes	2.77	0.553	4
Design issues	2.51	0.502	5

Further, in assessing the average time it takes for disputes to be resolved using arbitration in the ZCI, 57% of contractors indicated that their most recent cases took between 1 to 2 years to resolve. 28% indicated that their disputes were resolved in 6 to 12 months period. 12% indicated that it took them not more than 6 months, while 3% indicated having taken more than 3 years to resolve as shown in figure 5.

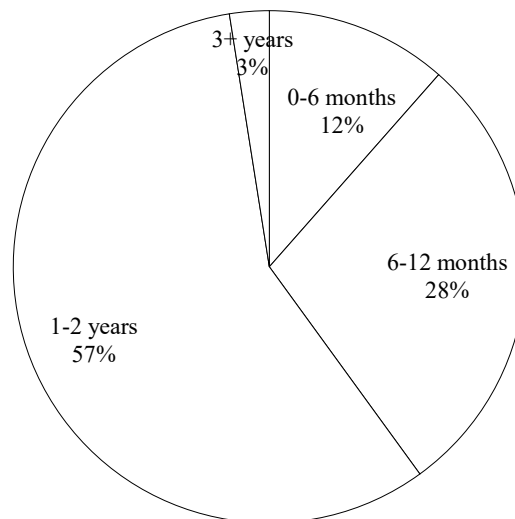


Figure 5. Arbitration resolution time-Arbitrators.

3.4 Perceived Benefits of using AI in arbitration

Four potential benefits of employing AI in dispute resolution were identified from literature after which contractors and arbitrators were asked to score in terms of their importance in dispute resolution. Scores from two groups were initially obtained separately, after which the differences in their perceived importance were compared using T-tests. 78.9% of the contractors indicated that AI can help in reducing the time taken to resolve disputes. This position was also affirmed by 34.2% of arbitrators who shared the same viewpoint. With regards to cost reduction, 69.7% of contractors indicated that AI can help to lower the cost of dispute resolution while only 43.2% of arbitrators had similar perspective. On consistency in awards 59.4% of contractors pointed out that AI leads to consistency in awards with only 21.4% of arbitrators sharing the viewpoint. Likewise, on enhanced document analysis 45.6% of contractors indicated that AI leads to enhanced document analysis, whereas, 54.3% arbitrators indicated the same views as shown in figure 6.

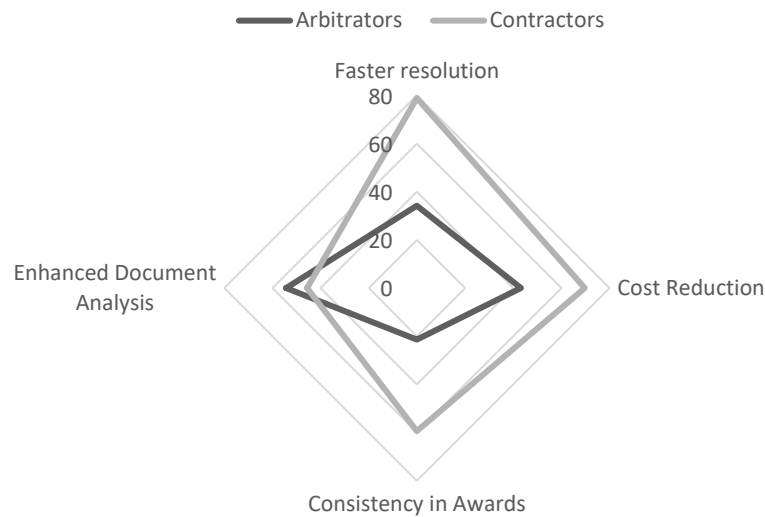


Figure 6. Radar graph of perceived benefits of AI in Arbitration.

In comparing the differences in perception of two different groups independent T-tests analysis was conducted. The results revealed significant differences in their perceptions as denoted by a p-value of 0.045, which is less than 0.05, as shown in table 4.

Table 4. Independent sample test.

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	T	df	Sig. (2-tailed)
Equal variances assumed	.008	.933	-2.518	6	.045
Equal variances not assumed			-2.518	5.996	.045

3.5 Perceived concerns

Here again four leading concerns to do with adoption of AI in arbitration were identified from literature based upon which contractors and arbitrators were asked to indicate their perception of the identified concerns. Likewise, scoring from two groups were recorded after which the differences in their perceptions were compared using T-tests. 86.3% of the contractors and 80.3% arbitrators indicated that they had concerns on data privacy risks. When it came to the aspect of local AI expertise, 84.1% of contractors indicated their concerns regarding lack of local AI expertise, equally so, 84.1% of arbitrators registered a similar perspective. Regarding the aspect of human judgement, 70.4% of contractors pointed out that AI can lead to loss of human judgement during arbitration. This point of view was also shared by 50.7% of arbitrators. . With respects to the risk of getting unreliable outcomes, 45.6% of contractors indicated that AI can lead to getting unreliable outcomes during arbitration, this position was shared by 30% of arbitrators as shown in figure 7.

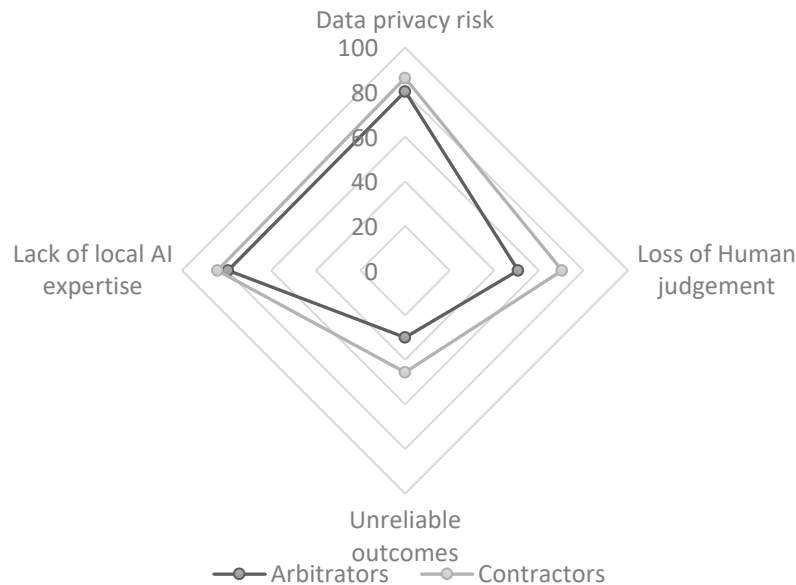


Figure 7. Concerns over the use of AI in arbitration.

Similarly, interviews findings revealed several concerns regarding the feasibility of adopting AI in arbitration, the concerns were to do with limited scope of oversight, technical complexity of the construction industry, ethical concerns and the need for a regulatory framework.

Limited scope of judicial oversight

Limited scope of judicial oversight in arbitral proceedings was brought up, with regulators noting that court intervention is generally confined to the enforcement or setting aside of arbitral awards. Positing that while this autonomy preserves the efficiency of arbitration, it also means that safeguards must be built within the arbitration process itself to ensure fairness.

Technical complexity

Another significant concern was the technical complexity inherent in construction-related disputes. Respondents highlighted the considerable challenges involved in reviewing and enforcing awards in such cases, particularly given the need for specialized technical and engineering knowledge. This complexity raises questions about whether AI systems, without proper domain-specific training, could effectively navigate such intricate subject matter.

Ethical concerns

Regarding ethical concerns, respondents expressed apprehension about potential bias embedded in algorithms, the opacity of AI reasoning processes, and the difficulty in assigning accountability when errors occur. These issues were seen as directly linked to the legitimacy and acceptance of AI-assisted or AI-led arbitral outcomes.

Implementation Framework

On the need for a framework, respondents indicated that a comprehensive regulatory framework tailored to AI use in arbitration. They emphasized that such a framework should establish clear standards for transparency, procedural fairness, and accountability. As one regulator put it;

“We need clear guidelines on how AI systems are developed and used in arbitration to ensure fairness and transparency.”

T-tests analysis

In comparing the differences in perception of two different groups independent T-tests analysis was conducted. The results revealed that there is no significant differences in their perceptions as denoted by a p-value of 0.613, which is more than 0.05, as shown in table 5.

Table 5. independent sample test.

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	T	df	Sig. (2-tailed)	
Equal variances assumed	1.775	.231	-.534	6	.613	
Equal variances not assumed			-.534	5.313	.615	

4. Discussion and Policy level implication

The analysis revealed that AI holds significant promise for enhancing arbitration. Respondents cited faster resolution times (70%) and cost savings (75%) as key benefits. These findings agree with literature on the potential of AI in quickening the dispute resolution time as well as lowering the cost for the parties involved in the resolution procedure (Hussein, 2025; Ahmad, 2024; Zeberga et al., 2024; Zhang et al., 2023). By automating administrative tasks, facilitating document analysis, and generating preliminary agreements, AI shortens the take for case resolution. Salcedo et al. (2025) shares the viewpoint by arguing that AI applications quicken the arbitration processes by reducing resolution times and minimizing errors associated with documentation management.

However, concerns were raised about data security by 60% of the respondents, these results confirm Habbal et al. (2024) and Guo et al. (2026) who posits that issues to do with data security and privacy are a hindrance in AI adoption. This concern in brought up in developing countries such as Zambia where cyber security infrastructure is inadequate. Likewise, on the danger of eroding human judgment, 55% of the respondents indicated that as a concern in adopting AI in construction related dispute resolution. As a way of addressing the concern to do with AI replacing arbitrators in dispute resolution, interview respondents pointed out that AI should not replace human judgement but rather aid in the resolution procedure, again the findings agree with Korteling et al. (2021) who argued that with all the benefits associated with improved efficiency and accessibility, AI should not replace human judgement. The results reflect the broader ethical debates around legality of adopting AI in dispute resolution.

Profoundly, half of the respondents indicated openness to piloting AI in arbitration, suggesting cautious optimism towards its application. These findings mirror Susskind's (2019) arguments about the tension between efficiency and ethical responsibility, and reinforce on the need for balancing technological innovation with procedural fairness in arbitration practice. Taken together, these findings highlighted both the maturity and the limitations of arbitration in Zambia. While it is widely practiced, inefficiencies and recurrent disputes persist. Overall, these results highlight Zambian arbitration's maturity as well as its shortcomings. Revealing that despite its widespread use in the Zambian construction industry, inefficiencies and frequent conflicts still exist.

This paper highlights the potential of AI application to minimizing arbitration process duration which consequently would lead to cost reduction. The cost reduction stems from the fact that arbitration costs are linked to the time spent by arbitrators and other parties involved in the process, Hence, any interventions to expedite the process translates into cost saving. It further highlights the key areas on which policy interventions should be focused in promoting digital integration in dispute resolution from developing country's perspective. Other scholars can build on the findings of this study and

conduct further research aimed at developing technology adaptive solutions in improving the resolution of dispute in the construction industry.

5. Conclusion

The collective evidence from the reviewed literature as well as findings from this study underscores the importance of integrating AI in dispute resolution in the construction industry. The research confirms that AI tools present opportunities to address challenges to do with costly and time inefficiencies associated with current manual methods of arbitration in Zambia. However, infrastructural limitations, lack of implementation guidelines and ethical considerations remain significant barriers that must be addressed. This paper, therefore, recommends the following:

- The state and relevant stakeholders should develop an adoption framework for digital technologies in dispute resolution. This would facilitate the incorporation of AI into mainstream arbitration.
- The regulatory bodies such as National Council for Construction (NCC), Chartered Institute of Arbitration Zambia branch, Lusaka International Arbitration Center among others, should develop and promote continuous professional development programmes aimed at up-skilling the arbitrators and construction stakeholders on how to use AI in dispute resolution.

Though interesting and valuable findings have emerged from this study, they are not without limitations. Firstly, this study was only conducted in Zambia, another study incorporating other developing countries is recommended. Secondly, despite adequately employing a mixed method approach, a similar study with more respondents and using structural equation modelling of key determinants for digital adoption in dispute resolution is recommended. Other areas for future research should focus on modeling the role of AI in dispute prevention in the construction industry.

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Conflicts of Interest

The authors report no conflicts of interest.

Data availability statement

The datasets presented in this article are not readily available because data used for this study are not publicly available for ethical reasons. However, it can be made available on request from the corresponding author. Requests to access the datasets should be directed to clechisumbe@gmail.com.

Institutional Review Board Statement

Ethical considerations were upheld in this research and respondents' consent was sought. None of the respondents was forced/coerced to participate in the survey. Respondents were informed about the study and its purpose, as well as the freedom of participation, and the option of withdrawing from their participation in the survey. Likewise, the anonymity and confidentiality of respondents were respected and upheld accord to the Declaration of Helsinki principles.

CRedit author statement:

Conceptualization, E.M., L.M. and S.C; Data curation, E.M. and L.M.; Formal analysis, E.M., L.M. and S.C.; Funding acquisition, L.M., E.M. and S.C; Investigation, E.M.; Methodology, E.M. and L.M.; Project administration, L.M; Resources, L.M. and E.M; Software, E.M. and S.C; Supervision, L.M; Validation, L.M. and S.C; Writing -original draft, E.M.; Writing -review & editing, E.M., L.M. and S.C.

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