

The Significance of AI in Mitigating Risk-Based Disputes in Construction Contracts

أهمية استخدام الذكاء الاصطناعي في تقليل النزاعات المتعلقة بالمخاطر في
إطار عقود الإنشاءات

by

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Abstract

This study addresses the legal perspective concerning the effectiveness of utilizing Artificial Intelligence (AI) tools in remedying potential project risks that may affect project progress and the final product quality, with a specific focus on the legal framework of the contractual relationship between the Employer and the Contractors. The study also explores the legal aspects of implementing Artificial Intelligence (AI) in the Construction industry, specifically its use in identifying potential risks during the early stages of a project. Besides, the current study will adopt the doctrinal approach, whereby the author is going to apply a qualitative method to answer the research questions of this study. Therefore, the study will apply authoritative analysis for relevant primary and secondary sources. Accordingly, the study will examine the UAE's relevant legal texts, FIDIC Red Book rules and relevant case law. Furthermore, the light will be quickly shed on the impact of utilizing AI tools in dealing with conflicts either during the Contracting period or even when they became disputes through the integration of these tools within the framework of traditional Alternative Dispute Resolution (ADR) mechanisms. This study will conclude with some inferences and suggestions that can assist in mitigating potential project risks encountered while recruiting Artificial Intelligence (AI) technology in the context of construction contracts. The importance of this study lies in the fact that the previous studies that have discussed the legal framework of the liability of the contractor have not addressed it in the context of AI technology.

ملخص

تتناول هذه الدراسة المنظور القانوني فيما يتعلق بفاعلية استخدام أدوات الذكاء الاصطناعي في معالجة مخاطر المشروع المحتملة التي قد تؤثر على تقدم المشروع وجودة المنتج النهائي ، مع التركيز بشكل خاص على الإطار القانوني للعلاقة التعاقدية بين اصحاب العمل والمقاولون كما تستكشف الدراسة أيضاً الجوانب القانونية لتطبيق الذكاء الاصطناعي في صناعة البناء ، وتحديد استخداماته في تحديد المخاطر المحتملة خلال المراحل الأولى من المشروع. ستعتمد الدراسة الحالية المنهج الفقهي، حيث سيتبع المؤلف المنهج النوعي للإجابة على أسئلة البحث في هذه الدراسة. ولذلك، ستطبق الدراسة تحليلاً موثقاً للمصادر الأولية والثانوية ذات الصلة. وبناء على ذلك، ستتناول الدراسة النصوص القانونية بدولة الامارات العربية المتحدة بالإضافة لقواعد الكتاب الأحمر للفيديك والسوابق القضائية ذات الصلة. علاوة على ذلك، سيتم تسليط الضوء بشكل سريع على أثر استخدام أدوات الذكاء الاصطناعي في التعامل مع الخلافات سواء خلال فترة التعاقد، أو حتى عندما تتحول إلى نزاعات من خلال دمج هذه الأدوات في إطار الآليات التقليدية لتسوية النزاعات كما انهاستدرس امكانية أدوات الذكاء الاصطناعي في تقليل احتمالية حدوث هذه المخاطر و التأثير المحتمل اللاحق على دورة حياة المشروع والنتائج ، بالإضافة إلى الإطار القانوني للعلاقة التعاقدية بين الأطراف المعنية. سيتم اختتام هذه الدراسة ببعض الاستنتاجات والاقتراحات التي يمكن أن تساعد في التخفيف من مخاطر المشروع المحتملة التي قد تواجهها أثناء توظيف تكنولوجيا الذكاء الاصطناعي. تكمن أهمية هذه الدراسة في حقيقة أن الدراسات السابقة التي ناقشت الإطار القانوني لمسؤولية المقاول لم تتناولها في سياق تقنية الذكاء الاصطناعي من ناحية أخرى ، قد يوفر استخدام أدوات التكنولوجيا الحديثة فرصة واعدة للتخفيف من تواتر وشدة النزاعات التي تتم مواجهتها عادةً في مشاريع البناء.

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Table of Contents

Chapter 1: Introduction.....	1
1.1 Background	1
1.2 Framework of Dissertation	2
1.3 Aims and Objectives.	4
1.4 Significance of Research.....	5
1.5 Research Questions.	5
1.6 Research Methodology.	6
1.7 Structure of the Study	6
Chapter 2: The AI and the Construction Industry	7
2.1 What is AI?	7
2.2 The Growth and Use of Modern AI Techniques	7
2.3 The Use of AI in the Construction Industry.....	9
2.3.1 Architectural Design and Visualization	10
2.3.2 Materials Design and Optimization	11
2.3.3 Structural Design and Analysis.....	12
2.3.4 Construction Management, Scheduling and Controlling.....	13
2.3.5 Risk Management and Dispute Resolutions	14
Chapter 3: Risks in Construction Projects	17
3.1 What is the Risk?	17
3.2 Risks in Construction Projects and the Probability of Disputes	18

3.2.1 Preliminary and Concept Design	19
3.2.2 The Tender Stage	20
3.2.3 Detailed Design.....	21
3.2.4 Construction Works	21
3.3 Risk Management in Construction Projects.....	23
3.4 The Utilization of Construction Contracts as a Tool to Transfer Risks.....	24
3.5 AI as a Revolutionary Tool to Identify and Manage Risks	26
Chapter 4: Major Disputes Arising from Risks in Construction Projects.....	30
4.1 Contractual Risks' Disputes and their Impact on the Project's Deliverables	31
4.1.1 Sources of Contractual Risks and Their Impact on Disputes	31
4.1.2 Impact of Contractual Disputes on Project Deliverables	32
4.1.3 Mitigating Contractual Risks-Based Disputes Using AI	34
4.2 Real Cases Studies on How AI May Mitigate Risks Based Disputes in Construction Projects.....	44
4.2.1 Case Study No. 01.....	44
4.2.2 Case Study No. 02.....	49
Chapter 5: The Potential Privileges of Utilizing AI to the Dispute Resolution System.....	57
5.1 Using AI in the Legal System	57
5.1.1 Legal Research for the Legal Sector	58
5.1.2 Legal Practice Efficiency	59
5.1.3 Breakthrough in Legal Practice:	59

5.2 Utilizing AI in the Dispute Resolution System.....	59
5.3 AI to Re-shape the Rules of Contractual Liabilities in UAE Law	63
5.4 Adopting AI in the Legal System in UAE	64
5.4.1 Introducing the AI by the Government of UAE	64
5.4.2 AI in the UAE Legal System	67
5.5 AI in the Construction Law and Dispute Resolution System (CLDR) in UAE.....	69
Chapter 6: Conclusion and Recommendations	71
Bibliography	76

List of Table

Table 1: 6 Months Program Schedule	42
Table 2: Risk Register generated by Chat GPT-4	47
Table 3: Risk Register Generated by perplexity	51

Chapter 1: Introduction

1.1 Background

During the evolution of modern science fiction literature and movies, especially in the early decades of the 20th century, the idea of artificially intelligent robots became a prevalent theme. As the 1950s unfolded, a generation of philosophers and scientists became well-acquainted with the cultural concept of Artificial Intelligence.

Recognizing the significance of information as an essential tool to make decisions and solve problems, scientists sought to achieve a dual objective: not only to enable computers to imitate human abilities and accomplish tasks with similar quality but also to equip them with the capacity for planning, problem-solving, and, most importantly, the ability to learn on their own through their own intelligence.¹

In his inspiring paper published in 1950 under the name of "Computing Machinery and Intelligence", A. M. Turing was considered the originator of the modern logical framework concept of Artificial Intelligence. In his paper, the searcher explored the construction of intelligent machines and the methods to evaluate their intelligence by focusing on how the machines can think.²

Thereafter, researchers began focusing on the utilization of algorithms to address mathematical problems and geometric theorems. Nevertheless, the limited availability of data and computer memory during that era posed challenges in achieving machine intelligence.

During the following decades, and after the increasing growth of modern industries side by side with the advancement of the field of Computer Science, this idea transitioned

¹ Trevor Bench, "A history of AI and Law in 50 papers: 25 years of the international conference on AI and Law", [Springer Science + Business Media B.V. 2012].

² A. M. Turing (1950) Computing Machinery and Intelligence. Mind 49: 433-460.

from mere fiction to a plausible reality. The second wave emerged between 1980 and 1990, coinciding with the introduction of expert systems.

Notwithstanding the initial vision that the long-term objective of Artificial Intelligence was tackled to develop machines that possess consciousness, self-awareness, and sentience level of intelligent autonomy currently exclusive to human beings, another AI researcher Professor Mike Wooldridge could approach after 25 years of experience as an esteemed AI researcher with particular examination, that more caution is required about such exaggerated claims.³

1.2 Framework of Dissertation

In the context of construction projects, disputes between the Employer and Contractor often arise due to inadequate identification and planning of potential risks, which may occur either during the early stages of the project tender, such as inaccurate estimations of project duration, costs, or quantities, as well as poor design with low-quality drawings and specifications, and even during the most essential stage of construction works. These different kinds of risks can escalate into significant conflicts that may impede the project's progress.

Notwithstanding the different traditional mechanisms dealing with the aforementioned kinds of risks, such mechanisms used to be implemented by human effort, the matter which raises the likelihood of errors or mistakes.

One of the major advantages that might be achieved thanks to modern technology is the use of Artificial intelligence in the field of the Construction industry. At the outset,

³ "A Brief History of Artificial Intelligence: What It Is, Where We Are, and Where We Are Going" [Online] Harvard Book Store. Available at: https://www.harvard.com/book/a_brief_history_of_artificial_intelligence [Accessed 18 May 2023].

this technology was used to generate a precise design in a short time, with limited reliance on the human element.

Furthermore, due to the recent huge jumps recognized in that field, the use of AI is no longer limited to design tasks but also has expanded to become an essential tool for dealing with the potential projects' risks. Such risks encompass a variety of factors, including but not limited to:

- Inaccurate estimations of project duration, budget, and quantities;
- Poor design quality and inadequate coordination between project sections, which can have significant impacts on project timelines, budgets, and quality;
- Selection of an inappropriate construction contract type, which may negatively impact the project scope and contractual relationship between parties;
- Inadequate safety plans and procedures, which may impact both the project budget and timeline;
- Poor coordination between contractual documents, which may lead to discrepancies during the project execution;
- Non-adequate identification of the Project's risks including the wrong implementation of the project's risk management plans.

Following that, the paper will focus on the role of AI tools in effective risk management, shedding light on how AI-driven risk identification, assessment, and mitigation can significantly reduce the occurrence of disputes. In addition, the potential of AI technologies to predict, analyze, and manage risks will be explored, along with their capacity to provide timely insights for early intervention and resolution.

Moreover, the paper will underscore the importance of incorporating AI-driven communication and collaboration tools in fostering a harmonious project environment. It will highlight how AI-supported platforms can facilitate transparent and effective

communication among all stakeholders, thus preempting misunderstandings and disagreements that might lead to disputes.

Lastly, the paper will delve into the legal and contractual aspects of AI in risk management, emphasizing the value of well-drafted contracts with AI-driven dispute resolution clauses. It will showcase how leveraging AI tools for contract analysis and interpretation can streamline dispute resolution processes, leading to more efficient and cost-effective outcomes.

In summary, this paper seeks to explore the nexus between risks and disputes within project environments and advocate for the overall strategic implementation of AI tools in risk management and dispute resolution. By harnessing the power of AI-driven risk identification and mitigation, project teams can proactively address challenges, foster collaborative relationships, and ultimately enhance project success while mitigating the likelihood of disputes.

1.3 Aims and Objectives.

The objectives of this study can be summarized as follows:

- To examine the effectiveness of utilizing Artificial Intelligence (AI) tools in remedying potential project risks that may impact the Contractual relationship between contracting parties of the Construction Contract.
- To explain how these risks can heighten the likelihood of disputes and explore the potential positive impact of minimizing these risks through the support of AI tools.
- To elucidate the various types of risks prevalent in construction projects, encompassing scheduling, financial, legal, technical, and external risks.
- To illuminate the way through which each type of risk can create a fertile ground for disputes to arise among project stakeholders, leading to conflicts,

disagreements, and project delays and to demonstrate how unaddressed risks can escalate into disputes, hampering project progress and escalating costs.

- To escalate the potential outcomes of applying Artificial Intelligence in conflict management, it is crucial to extend these benefits to the broader Dispute Resolution System. This approach entails significant implications for the integration of AI within the legal framework of the UAE, profoundly influencing both the Construction industry and the entire judicial process.

1.4 Significance of Research.

The utilization of modern technology tools presents a promising opportunity to mitigate the frequency and severity of disputes that are typically encountered in construction projects. This can result in significant benefits to project performance, including the achievement of high-quality final deliverables, adherence to budgetary and schedule constraints, and potential impacts on the provisions of contemporary construction contracts. Furthermore, the use of such tools may also have a positive effect on the overall dispute resolution system within the industry.

1.5 Research Questions.

This study will try to find the most appropriate answers to the following questions:

- To what extent the utilization of Artificial Intelligence (AI) tools is effective in remedying potential project risks that may impact the Contractual relationship between contracting parties of the Construction Contract?
- What are the various types of risks prevalent in construction projects?
- How can the emergence of risks during construction projects augment the propensity for disputes to arise among stakeholders, leading to conflicts, disagreements, and project delays?

- How could minimizing these risks be feasibly achieved through the integration of AI tools?
- What is the impact of utilizing AI within construction projects on the entire construction industry and dispute resolution system in the country?

1.6 Research Methodology.

The research will be doctrinal research; where previous literature, journal articles, books, reports and case law from the UAE and the world related to disputes arising from the potential risks that occurred in the projects' early stages. FIDIC Red Book will be examined as well, and then an empirical verification approach using professional opinions from Construction law Experts and Contract Professionals from the construction industry will be followed employing an interview questionnaire to analyze the new AI tools used in the construction field and the impact of using these tools on the projects' deliverables.

1.7 Structure of the Study

The research will consist of five chapters as follows:

1. Introduction and background about AI technology, and the quick growth of using such tools,
2. The General Use of AI in The Construction Industry,
3. Risks in The Construction Projects?
4. Major Disputes Resulted from Risks in Construction Projects,
5. The Potential Impacts of Utilizing AI on Disputes Resolution System,
6. Conclusion and recommendations, this chapter will conclude and summarize the search with recommendations to adopt AI as an essential tool in initiating and managing Construction Contracts.

Chapter 2: The AI and the Construction Industry

2.1 What is AI?

Artificial intelligence (AI) can be succinctly described as the capacity of a machine to replicate intelligent human behavior, utilizing human-inspired algorithms to tackle complex problems. Broadly, machine intelligence can be categorized into two types: hard computing and soft computing methods.⁴ On the other hand, the utilization of modern technology tools may present a promising opportunity to mitigate the frequency and severity of disputes that are typically encountered in construction projects. This can result in significant benefits to project performance, including the achievement of high-quality final deliverables, adherence to budgetary and schedule constraints, and potential promising impacts on the provisions of contemporary construction contracts. Furthermore, the use of such tools may also have a positive effect on the overall dispute resolution system within the industry.

In the same context, digitization is recognized as an essential catalyst for the transition towards social, economic, and environmental sustainability. The European Commission (2017) acknowledges that digitization exerts a positive influence on the economy (75%), quality of life (67%), and society (64%). Furthermore, digitization has transformed the characteristics of organizations, redefining their boundaries, work processes, and relationships across various levels.⁵

2.2 The Growth and Use of Modern AI Techniques

Remarkable scientific innovations achieved in the past decade have made the miraculous prospects of AI systems a tangible reality. Notable examples include the

⁴ Hadi Salehi1, Rigoberto Burgueño, Emerging artificial intelligence methods in structural engineering. P04.

⁵ Mohamed Shawki El Khadrawi "Artificial Intelligence and Electronic Litigation Towards A Better Future of Justice" [2023].

propagation of driverless cars and automated translation tools, both of which have seamlessly integrated into our daily lives, poised to revolutionize our world. On the other hand, in order to fulfil the purposes of AI and meet the high expectations surrounding it, an increasing number of companies are actively investing in diverse AI technologies, the process that requires huge time and cost resources.

As per a report by Accenture, the impact of AI is already being touched across various domains, bringing about significant transformations in all the industrial and scientific fields. This development holds massive influence to enhance labour efficiency by up to 40% with potential expectations to double annual economic growth rates by the year 2035.⁶ Currently, the field of AI has progressed to an extraordinary level, resulting in significant advancements in many fields like machine learning, deep learning, virtual assistants, and robotic process automation. These developments have enabled AI to play a vital role in various sectors, offering opportunities for smart data analytics resulting in enhancing the decision-making processes. Consistent with that, the profound capabilities of AI have made a noticeable impact on various modern industries, including business, automation, transportation, education, healthcare, industry, and notably, the construction field.⁷

In this search, light will be explicitly shed on the profound influence of AI on the construction industry, with a particular emphasis on the domain of risks under Construction Contracts. It delves into the revolutionary changes brought about by AI, facilitating smarter processes that enhance project delivery while minimizing disputes between the parties involved in the contract. By harnessing the power of AI, the

⁶ Purdy M, Daugherty P (2016) Why artificial intelligence is the future of growth, pp 3–27

⁷ Limao Zhang, Artificial Intelligence in Construction Engineering and Management. P02.

construction industry is experiencing a paradigm shift, enabling more efficient and effective collaboration, communication, and resolution of contractual matters.

2.3 The Use of AI in the Construction Industry

According to a survey from McKinsey Global Institute, the global construction industry is expected to make up more than 15% of the world's Gross Domestic Product (GDP) in 2026. In the meantime, construction projects create a wide range of job opportunities for 7% of the world's working population.⁸

In the construction industry - as this paper is centered around- AI is the mean anticipated to totally transform the way projects are planned, designed, contracted and executed. This can be functional through streamlining processes, enhancing productivity, improving safety measures, and providing valuable insights for better project management.

9

The conjunction between human-AI tools signifies an ongoing process of optimization to increase the possibility of better competence. The establishment of trust between humans and AI can be facilitated, leading to overgrown quality and reduced conflicts. On the other hand, AI technology distinguishes itself from lower levels of digitization by its unique prerequisites, particularly in terms of trust and collaboration with humans.¹⁰

The widespread integration of AI technologies in the construction sector is reshaping the industry and paving the way for more efficient, sustainable, and innovative

⁸ McKinsey & Company, The next normal in construction, P21.

⁹ Rashid Saeed Alnuaimi, "Artificial Intelligence in the Construction" P06. [<https://www.fenwickelliott.com/research-insight/newsletters/international-quarterly/ai-construction-law-partnership>].

¹⁰ Marte Helle Schia, The Introduction of AI in the Construction Industry and its Impact on Human Behavior, (2019). P115.

practices. Currently, the AI's application in the field of Construction Industry is not limited to the bellow main disciplines:

- Architectural and Concept Designs;
- Materials Design and selection;
- Structural Design Analysis;
- Construction Management, Scheduling and Controlling;
- Risk management and dispute resolutions.

2.3.1 Architectural Design and Visualization

Architectural design is a complex and intricate process that requires a harmonious blend of creativity, imagination, and artistic innovation. It encompasses various crucial components aimed at translating the purpose and spirit of a structure into a tangible design. These components include the concept design of the structure, driven by the underlying need or function it is intended to serve. Additionally, careful consideration is given to aesthetics, encompassing aspects such as colour, spaces and materials, which collectively contribute to the visual appeal of the design.

Recently, thanks to deep learning algorithms, Artificial Intelligence (AI) has emerged as a powerful tool in the field of architectural design and visualization. By harnessing the vast amounts of data from millions of previous designs, AI algorithms can generate innovative and high-level designs. Through AI-assisted architectural design and visualization tools, tasks such as the generation of 2D and 3D architectural designs became more effective even for non-experienced users. The use of AI tools in Architectural designs has altered the classification of architectural styles and building types, in addition to enhancing the overall design efficiency.¹¹

¹¹ Shanaka Kristombu Baduge, Artificial intelligence and smart vision for building and construction, P07.

2.3.2 Materials Design and Optimization

After the completion of the architectural design phase, the selection of suitable construction materials becomes a crucial step in the construction process. Recognizing the significant impact that construction materials have on various aspects of a structure, such as the structure performance, strength, energy efficiency, emissions, aesthetics, and thermal comfort, it becomes evident that utilizing a smart database filled with millions of learned lessons and scenarios could revolutionize the material selection process.¹²

By adopting AI technologies, architects and engineers can tap into this vast database to propose the most appropriate materials that align with the specific requirements of the structure. This data-driven approach allows for informed decisions regarding material selection, taking into account various factors and considerations. AI techniques can analyze and assess the performance characteristics of different materials, their compatibility with the design specifications, and their potential benefits in terms of construction efficiency and long-term sustainability.

Furthermore, AI can contribute to the development of high-performing materials and composites. By applying advanced algorithms and simulations, AI can optimize material properties, enhance performance, and generate innovative solutions that meet the desired criteria.¹³

This integration of AI in material development opens up new possibilities for creating materials with superior qualities, such as increased strength, improved energy efficiency, reduced environmental impact, and enhanced aesthetic appeal.

¹² Rosłon, J. 'Materials and Technology Selection for Construction Projects Supported with the Use of Artificial Intelligence' [2022], 15, 1282. <https://doi.org/10.3390/ma15041282>.

¹³ A. N. Kaulage, P. K. Tomar, R. Pant, L. Debnath, R. K. Ibrahim and M. B. Alazzam, "Revolutionizing Material Selection in Construction 4.0: A Comparative Analysis of Artificial Intelligence Technologies," in 3rd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), pp. 2707-2712 (2023).

Overall, the utilization of AI in the selection and development of construction materials offers tremendous potential to revolutionize the construction industry. It empowers professionals to make up-to-date decisions, improve project deliverables, and contribute to the creation of sustainable and resilient structures.

2.3.3 Structural Design and Analysis

Once the construction materials have been selected, AI tools can assist in many aspects related to structural design such as load analysis process, seismological design, buckling and fatigue analysis, and loading capacity prediction. Sometimes, the failure level prediction of existing structures and detecting the cracks or dangerous locations can be implemented by the same tools.

In the field of structural engineering, various branches of artificial intelligence (AI) have been found applicable, including machine deep learning (MDL), pattern recognition (PR), neural networks, fuzzy logic, evolutionary computation, expert systems, probability theory, swarm optimization, metaheuristic optimization, and decision trees.¹⁴ Over the past decade, many published researches have demonstrated an increasing use of modern AI methods in structural engineering.

While some AI methods, such as evolutionary computation, fuzzy logic, and expert systems, have not shown significant changes in their application, neural networks have garnered considerable attention from researchers, with a steady number of new studies being conducted on their usage. In the same context, there has been a substantial rise in the number of studies featuring the use of ML and PR techniques. Notably, deep learning

¹⁴Lior Rokach 'Data Mining with Decision Trees: Theory and Applications (2nd Edition)' (2015). p298.

architectures, such as convolutional neural networks (CNNs), have gained remarkable attention among the research community in recent years.¹⁵

Besides AI methods, other numerical simulation models are commonly employed to implement structural design analysis through codes of practice, using complex algorithms. By providing a larger number of design potentials, AI can provide insights into design optimization, leading to smarter and more efficient building designs, and granting the chance to make structural designs that would otherwise be impossible to achieve.¹⁶

2.3.4 Construction Management, Scheduling and Controlling

Before the commencement of the physical construction stage, the project concept is used to put forward by clients. Subsequently, a thorough feasibility analysis is conducted to clarify the project's objectives. To get this precise goal achieved, comprehensive plans are developed for project initiation, covering resources, schedules, budgets, and the specified quality standards. Such detailed plans have the potential to mitigate costs, shorten timelines, and streamline processes, ensuring a more efficient and rational execution of the project in the least possible duration.

Based on the above, it can be deduced that the key elements of the construction management process face challenges of complex uncertainty, including the duration required to complete the work, budgetary requirements, and the expected quality of the scope of work. However, the application of AI techniques and tools, equipped with self-learning algorithms and extensive databases, has the potential to significantly reduce these uncertainties to the minimum by providing highly accurate anticipated data.

The advent of Building Information Modeling (BIM) and Wireless Sensor Networks (WSN) has enabled the collection of vast amounts of data from construction

¹⁵ Roslon, J. 'Materials and Technology Selection for Construction Projects Supported with the Use of Artificial Intelligence' [2022], 15, 1282. <https://doi.org/10.3390/ma15041282>.

¹⁶ Hadi Salehi, 'Emerging artificial intelligence methods in structural engineering' [2021], P06.

worksites on a daily basis. This influx of data, akin to "big data," holds immense potential breakthroughs for the construction industry, not only in terms of final product outcomes but also in enhancing the overall efficiency of the entire process, ultimately leading to improved project performance.¹⁷

Artificial Intelligence (AI) has emerged as a powerful tool to harness the potential of this rich data by training suitable models and fulfilling its promises in various areas, including prediction, optimization, and decision-making. AI's ability to leverage these diverse data sources presents an opportunity to achieve high-level cost, time, and resource management, thereby paving the way for a more effective and modernized construction industry. Consequently, AI's integration in construction holds the potential to revolutionize the way projects are planned and executed, leading to more innovative and efficient project delivery.¹⁸

2.3.5 Risk Management and Dispute Resolutions

Identifying risks and appropriately managing them during the contracting process in construction projects has proved to be a crucial and decisive factor for achieving project success. Without a well-defined and thorough risk identification and management process, sound decision-making becomes challenging, and the project's overall outcome may be compromised.

Properly allocating risks ensures that each party involved understands their responsibilities and potential liabilities, which is essential for maintaining transparency and fostering a collaborative environment throughout the project's lifecycle. Adequate risk allocation not only mitigates potential disputes but also enables the parties to proactively

¹⁷ Limao Zhang, 'Artificial Intelligence in Construction Engineering and Management' (2021) p.09.

¹⁸ Ibid, P09.

address challenges and uncertainties, ultimately leading to a more efficient and successful construction project.¹⁹

AI indeed possesses the capability to recognize, monitor, evaluate, and predict potential risks in various aspects of construction projects, such as time, cost, design issues, potential variations, safety, quality and efficiency problems across different work areas. Through advanced techniques like probabilistic models, fuzzy theory, machine learning, and neural networks, AI empowers computers to efficiently explore and process significantly more risk-related information than humans could ever manage to analyze and learn from the vast amounts of data and identified risks collected from previous construction projects. As a result, the identification of these risks through AI provides valuable assistive and predictive insights on critical issues. Project managers can efficiently prioritize potential risks and focus on taking more effective preventive actions rather than corrective actions for risk mitigation.

Via the revolutionary assistance of AI tools, project managers can effectively address and manage risks which increases the projects' probability to stay on schedule and within budget. AI's early troubleshooting capabilities allow for the prevention of undesirable failures and accidents in the complex project management process, thereby enhancing overall project success.²⁰

Furthermore, some advanced AI techniques provide the opportunity to delegate unsafe activities to robots, minimizing the number of humans working in hazardous environments. Adopting AI-driven risk management practices in construction projects not only prioritizes the safety and well-being of the workforce but also optimizes project productivity and efficiency. The proactive nature of AI-based risk management

¹⁹ K.C Lam, Modelling risk allocation decision in construction contracts – ScienceDirect. P.01.

²⁰ Chang L, Zhang L, Fu C, Chen YW (2021) Transparent digital twin for output control using belief rule base. IEEE Trans Cybern 1–15.

significantly leads to a more effective decision-making process reducing the likelihood of unexpected accidents, as such ensuring smoother project execution and minimizing the potential for disputes. This proactive approach to risk management fosters a collaborative and transparent environment among all stakeholders, enhancing communication and cooperation throughout the project lifecycle.

Chapter 3: Risks in Construction Projects

3.1 What is the Risk?

As per the Project Management's Body of Knowledge "PMBOK", the risk is described as "*an uncertain event or condition, that if it occurs, has a positive or negative effect on a project's objective*".²¹

The fundamental essence of this definition lies in recognizing that uncertainty can influence the intended objectives of the project in both favourable and unfavourable ways. Uncertainty encompasses diverse elements, with risks specifically referring to ambiguities that, if actualized, will affect the project's results.

In similar terms, risks are uncertainties that present potential threats or opportunities to the project's success upon realization. Presently, it is crucial to address a significant query concerning the necessity of risk in construction projects, and whether projects can be devoid of any form of risk throughout their life cycle.

Based on exhaustive examinations within the domain of project management, it has been established that risk constitutes an intrinsic component that is likely to be encountered in virtually all construction projects. Extensive studies in the field of project management have consistently shown that risks are an essential and inevitable part of the construction industry. Throughout the project's life cycle, various types of risks can emerge, such as uncertainties in scope identification, cost estimation, schedule delays, unforeseen site conditions, weather-related issues, regulatory changes, material shortages, and even labour disruptions.²²

The complexity and unique nature of construction projects, coupled with the involvement of multiple stakeholders, make them susceptible to a wide range of risks.

²¹ PMI, Project Management Body of Knowledge (PMBOK- Seventh Edition) 2021, p122.

²² Pawel Szymanski, Risk management in construction projects, P174.

Moreover, the dynamic and constantly evolving nature of construction environments further contributes to the potential for risk occurrences.²³

Therefore, project managers and stakeholders must recognize and address risks proactively. By implementing effective risk management strategies, project stakeholders can anticipate, mitigate, and respond to potential risks to minimize their impact on project outcomes and ensure successful project delivery.²⁴

Considering that risks are recognized as one of the major contributors to disputes within the realm of construction projects, this situation can logically accentuate the inverse correlation between effective risk management and the frequency of disputes that may arise during the project's life cycle. While the reduction of disputes is found to be achieved through proactive risk management, it's acknowledged that adequate risk management stands as one of the most efficacious means of dispute resolution.²⁵

3.2 Risks in Construction Projects and the Probability of Disputes

As previously indicated as per the modern Project Management applications, risks are considered as inherent components of the recent Construction projects. As such, numerous potential risks with probable consequences of potential amounts of disputes may be confronted during all the project stages. These risks may extend beyond the following main 5 groups:

1. The Preliminary and concept design, including the data collection stage and the project's fitting of purpose.

²³ Nerija Banaitiene and Audrius Banaitis, Risk Management Current Issues and Challenges, 2012.P430.

²⁴ Serpell, A., Ferrada, X., Howard, R., & Rubio, L. 'Risk management in construction projects' (2014). (pp. 1–5). Dubrovnik, Croatia.

²⁵ Norelyza Hussein, 'Sustainability Management Strategies and Impact in Developing Countries', Chapter 05, p50.

2. The Tender stage includes the appointment of the Contractor and drafting of the project Contract and other contractual documents.
3. The Detailed design.
4. The Construction works.
5. Financing the investment.²⁶

3.2.1 Preliminary and Concept Design

Several risks can arise concerning the project's design, commencing from the initial idea or concept phase, and encompassing issues such as inaccuracies in collected data. These risks may be attributed to various types of uncertainties, including but not limited to:

- Risk of poorly recognizing the concept and the general purpose of the Project:
Failure to comprehensively understand and define the project's concept and overarching objectives can result in design discrepancies that may potentially lead to various variations during the execution process increasing the probability of arising disputes.
- Risk of poor Data Collection: Inadequate or inaccurate collection of essential project data, such as topographical surveys, geotechnical investigations, and climate conditions, can result in faulty design assumptions impacting negatively the progress of the construction works with recriminations of the responsibility between the project parties. This default may open the door for many conflicts within the project's environment.
- Risk of over/under-estimating the costs/ time of the project: Incorrectly estimating the costs and time required for the project can lead to financial challenges, schedule delays, and potential disputes between project stakeholders.

²⁶ Pawel Szymanski, 'Risk management in construction projects' 2017, P176.

3.2.2 The Tender Stage

Tender is the stage that precedes the start of the project's construction works.

This stage may be exposed to the following risks;

- Risk of Tender Cancellation: The tendering process may face the risk of cancellation due to unforeseen circumstances, changes in project requirements, or other external factors.
- Risk of Excessive Marketing Costs: Bidders may incur excessive costs for marketing and lobbying efforts to secure the project, which can impact their overall financial performance.
- Risk of Low-Quality Quotes: Some bidders may submit low-quality quotes with an insufficient amount of information, which could compromise the project's quality and profitability.
- Employer's Uncertainty: The Employer may have uncertainties regarding the project's scope, duration, and milestones, which could lead to delays or changes during the execution phase.²⁷
- Risk of Corruption: There is a possibility of corruption in the tendering process, which can lead to biased decisions and unfair advantages for certain bidders.
- Risk of Poorly Drafted Contract: If the project's contract is not well-drafted, it may lead to misunderstandings, disputes, and conflicts between the parties involved.

As a consequence of the aforementioned risks inherent in the tender stage, numerous disputes may arise between the Employer and the potential contractors, impacting the relationship between the Contract parties and significantly influencing the feasibility of commencing the construction works.

²⁷ Martin Brook, 'Estimating and Tendering for Construction Work' 2017.p26.

3.2.3 Detailed Design

The detailed design stage is of paramount importance as it forms the main component of the project. During this stage, several critical risks must be addressed and managed to ensure a successful outcome. Some of these risks include:

- Risk of Improper Design Team Selection: The selection of an inexperienced or inadequate design team may lead to subpar design solutions, inefficiencies in the project's execution in addition to potential changes during the project execution.
- Risk of Inaccurate Identifying the Project Scope: The non-accurate estimating of the project's scope during the detailed design phase may result in constraints exposing the project to many variations and changes during the execution process.
- Risk of inadequate Materials Selection: The bad selection of the Materials may lead to exceeding the assigned cost in addition to the risks of bad quality and the probability of higher maintenance efforts.
- Risk of Improper Technology Selection: Selecting inappropriate construction methods or technologies may result in design flaws or reduced structural integrity.

3.2.4 Construction Works

The Construction stage of a project is exposed to a high probability of encountering risks, conflicts, and delays. To ensure the successful and efficient execution of the project, it is essential to identify and address these risks diligently which are not limited to the following:

- Risk of non-accurate work scheduling, leading to inefficiencies in project execution.
- Risk related to the human factor and workplace security, considering the safety of project teams.

- Risk of poor work organization, affecting productivity and coordination among different tasks.²⁸
- Risk of timely supply of construction materials, causing delays in project milestones.
- Risk of lack of management by the Contractor, impacting project coordination and performance.
- Risk of equipment failure, leading to downtime and delays in construction activities.
- Risk of damaging underground services, potentially leading to costly disruptions and repairs.
- Risk of changes in laws or political regulations, affecting project requirements and approvals.
- Risk of employees' insolvency impacting the project's cash flow.²⁹
- Risk of poor management of material resources, supplies, and personnel, impacting productivity.
- Risk of construction materials' quality, affecting the durability and performance of structures.
- Risk of maintaining standards and meeting project specifications.
- Risk of insufficient control, leading to lapses in monitoring and project oversight.
- Risk of expanding the scope of work, requiring additional resources and time.
- Market risk, arising from market reactions to the project's progress and outcomes.³⁰
- Nature risk, resulting from environmental factors beyond human control.

²⁸ Bahamid RA and Doh SI, 'A review of risk management process in construction projects of developing countries' (2017) Volume 271 of Conference Proceedings IOP Conf. Ser.: Mater. Sci. Eng. 012042.

²⁹ Leslie Edwards, 'Practical Risk Management in The Construction Industry' [1995]. P75.

³⁰ Akintola S Akintoye, 'Risk analysis and management in Construction' (1997), p34.

- External risk, arising from the socio-economic environment and external influences.
- Risk of variations and changes, which can disrupt the project's continuity and increase the potentiality of disputes.³¹

Proactive risk management and effective collaboration among all project stakeholders are effective key to navigating through the challenges presented during the Construction stage. By recognizing and mitigating risks early, the project can proceed with greater confidence towards achieving its goals, and minimizing the probability of conflicts.³²

3.3 Risk Management in Construction Projects

As mentioned above, one of the fundamental tasks of the project management team is how to identify the potential risks during the project's life cycle. To ensure project success, it is imperative to proactively prevent their occurrence or at least be well-prepared with effective mitigating responses in case they materialize. This necessitates a robust risk management approach that addresses and manages risks in a comprehensive manner with the involvement of all the project staff.

Addressing a specific threat may necessitate employing multiple strategies as risk responses, as such risk response may be one of the following:

- Risk Acceptance,
- Risk Avoiding,
- Risk Mitigation,
- Risk Transfer.

³¹ Leslie Edwards, 'Practical Risk Management in The Construction Industry' [1995]. P56-59.

³² Nerija Banaitiene and Audrius Banaitis, 'Risk Management in Construction Projects', Chapter 19, P435.

The selection of the most appropriate strategy depends on the nature of the threat, its potential consequences, and the risk appetite of the project stakeholders. A comprehensive risk management approach involves evaluating various response options to ensure effective risk mitigation and enhance the project's overall resilience.

For instance, if the threat cannot be entirely avoided, efforts can be made to mitigate it to an acceptable level, making it feasible to either accept it while implementing measures to minimize its potential impact or transfer the risk to a third party.

In the modern construction industry, one of the most effective ways introduced to transfer risks is the Contracting process.

3.4 The Utilization of Construction Contracts as a Tool to Transfer Risks

Construction contracts serve as a vital risk response tool in construction projects. Contracts establish the roles, and responsibilities, in addition to sharing obligations of all parties involved, helping to manage and mitigate potential risks throughout the project lifecycle. By clearly defining its terms and conditions, a construction contract allocates risks among the parties, ensuring that each entity bears the risks it is best qualified to handle.³³

The key ways in which construction contracts act as risk response tools include:

- Scope of Work: The contract clearly defines the scope of work and deliverables, minimizing uncertainties that may lead to potential disputes over project requirements.
- Performance Standards: Contracts establish performance standards and quality expectations, ensuring that the completed work meets the required specifications and standards.

³³ Helena Haapio & George J. Siedel, 'A Short Guide to Contract Risk' 2013.

- **Timeframes and Milestones:** Construction contracts set specific timelines, milestones, and completion dates, providing a framework for managing schedule-related risks and avoiding delays.
- **Change Orders and Variations:** The contract provides procedures for handling changes in the project scope or specifications, minimizing the impact of unforeseen events on the project's progress.
- **Risk Allocation:** Construction contracts identify and allocate specific risks to the relevant parties, such as the Contractor, Employer, or even third party. This ensures that each party assumes responsibility for the risks amongst their control.
- **Payment Terms:** Payment terms and conditions are established in the contract, providing financial risk management by ensuring timely compensation for completed work.
- **Insurance and Liability:** The contract may specify insurance requirements and liability limits, helping to manage potential financial risks associated with accidents or damages.
- **Force Majeure and Termination Clauses:** Construction contracts may contain force majeure clauses to address unforeseeable events that could disrupt the project. Additionally, they outline the conditions under which the contract can be terminated if necessary.
- **Dispute Resolution:** Construction contracts often include dispute resolution mechanisms, such as mediation or arbitration, to address any disagreements or conflicts that may arise during the project.

In light of the precedence, it is worth noting that construction contracts play a critical role in risk management by providing a structured framework for addressing potential uncertainties and minimizing the impact of unforeseen events on project outcomes.

In regards to Contractors' evaluations, Artificial Intelligence (AI) facilitate evaluating subcontractors through an autonomously prioritizing risk score system. Consequently, construction managers are advised to avoid collaborating closely with groups that exhibit higher risk levels to effectively mitigate potential hazards.³⁴

3.5 AI as a Revolutionary Tool to Identify and Manage Risks

As per the latest studies, the international construction market is forecasted to grow to USD 15.5 trillion by 2030, and AI could potentially raise productivity from 0.8% to 1.4% annually³⁵. Most of this forecast growth is based on technological advancements in all phases of a construction lifecycle, i.e., planning, design, and construction stages.

The enhancement of risk detection and evaluation within the construction sector can be significantly advanced through the integration of the AI, which assists in predicting potential incidents and provides early alerts. The utilization of intelligent wearables facilitates the collection and analysis of valuable data, thereby fostering the formulation of AI algorithms tailored to address potential on-site challenges and enact novel strategies aimed at optimizing overall operational effectiveness.³⁶

Furthermore, the valuable insights derived from the huge process of data analytics can be effectively harnessed for informed strategic decision-making, thereby fortifying the ongoing efforts in risk management within the industry. In other meaning, the effective use of AI tools in project management contributes to the success of these projects which in the end lowers the probability of conflicts and failure in turn.

³⁴ Rashid Saeed Alnuaimi, "Artificial Intelligence in the Construction" P06. [<https://www.fenwickelliott.com/research-insight/newsletters/international-quarterly/ai-construction-law-partnership>].

³⁵ Pilkington B, 'The Use of AI in Construction' (2023) AZoBuild. <https://www.azobuild.com/article.aspx?ArticleID=8598>.

³⁶ 'The Next Normal in Construction' p. Available online: https://www.mckinsey.com/~media/mckinsey/industries/capital%20projects%20and%20infrastructure/our%20insights/the%20next%20normal%20in%20construction/executive-summary_the-next-normal-in-construction.pdf.

The escalating prominence of Artificial Intelligence is increasingly commanding attention due to its inherent capacity to yield heightened accuracy even within complex and uncertain contexts. This phenomenon has prompted numerous nations to embrace AI as a pivotal tool for the evaluation of risks associated with construction projects. The employment of AI methodologies transcends the introduction of novel tools; rather, it embodies an innovative and pioneering approach to the body of business operations.³⁷

For example, through the trial of utilizing the Long Short-Term Memory (LSTM) architecture, accurate forecasting of cost indexes has been achieved within the highway construction sector. This breakthrough led to a pivotal price trend with enormous impacts on such a sensitive sector. The purpose of this process was to effectively mitigate the potential cost risks³⁸.

In a parallel manner, an innovative AI-driven framework was implemented to ascertain the most suitable contractors for the project execution. This strategic selection process not only aimed at minimizing project management headaches and associated costs but also prioritized the timely project completion, thus enhancing overall efficiency³⁹.

According to a recent study encompassing the risk management community across diverse sectors, the degree of AI adoption among risk managers was found as follows:

- 33% of those managers perceive AI as a supportive innovation.
- 67% view it as an initial endeavor with transformative potential for reshaping business methodologies.
- 76% acknowledged the non-incorporation of AI within their risk management applications.

³⁷ By Ben Pilkington, 'The use of AI in construction [2023] AZO Build, <https://www.azobuild.com/article.aspx?ArticleID=8598>.

³⁸ "Predicting the Volatility of Highway Construction Cost Index Using Long Short-Term Memory" <https://ascelibrary.org/doi/10.1061/%28ASCE%29ME.1943-5479.0000784>.

³⁹ Shanaka Kristombu Baduge, Artificial intelligence and smart vision for building and construction, P14.

- Merely 15% reported active utilization of AI,
- whereas 9% expressed uncertainty.

Furthermore, concerning the timeframe within which risk managers envision AI's application within their roles:

- 13% of respondents foresee its definite integration within 12 months.
- 41% anticipate a span of 1 to 3 years.
- Meanwhile, 46% anticipate AI's adoption to materialize after 3 years.⁴⁰

On the other hand, many companies started to introduce artificial intelligence as a means to optimize workflows and elevate productivity⁴¹. This approach yields advantages such as preempting cost escalations, heightening on-site safety measures, augmenting the efficiency of project plan management, and fostering productivity amplification within work sites⁴². The integration of AI technologies has not only refined automated procedures but also conferred a distinct competitive edge.⁴³

Employing historical data alongside human inputs, machine learning algorithms have the capability to assess millions of potential approaches for project execution. They can consistently refine project schedules and proactively address risk factors. The AI-based technology excels in its capacity to analyze vast datasets, a domain where it surpasses human capabilities. Drawing from precedents in various industries, there exists a

⁴⁰ Adli Abbas Basaif, 'Technology Awareness of Artificial Intelligence (AI) Application for Risk Analysis In Construction Projects' (2020) 9 Malaysian Construction Research Journal 182, 248, https://www.academia.edu/download/77083074/MCRJ_20SI_20Vol_209_20No.1_202020.pdf#page=194.

⁴¹ Yigitcanlar, 'The sustainability of artificial intelligence: An urbanistic viewpoint from the lens of smart and sustainable cities. Sustainability 2020, 12, 8548.

⁴² Chien, C.F, 'Artificial intelligence in manufacturing and logistics systems Algorithms, applications, and case studies [2020], 58, 2730–2731.

⁴³ Regona, M.; Yigitcanlar, T.; Xia, B.; Li, R.Y.M. 'Opportunities and Adoption Challenges of AI in the Construction Industry [2022], 8, 45. <https://doi.org/10.3390/joitmc8010045>.

compelling rationale for the adoption of AI-based technology, driven by the prospects of cost reduction, enhanced risk management, and heightened productivity.⁴⁴

⁴⁴ Marte Helle Schia, *The Introduction of AI in the Construction Industry and its Impact on Human Behavior*, (2019). P44.

Chapter 4: Major Disputes Arising from Risks in Construction Projects

Generally, the dispute has been recognized as a conflict of claim or right which may arise between two parties or more. Contractually, the conflict is exposed to a disagreement between the Contract parties as demand on one side is met by contrary claims on the other.⁴⁵

While considering risks are inevitable within the context of construction projects, it becomes evident that they may play a pivotal role in the occurrence of consequent disputes among the project stakeholders.⁴⁶ Simultaneously, it may become essential to categorize major risk-based disputes in the construction industry into two distinct types based on their sources: External and Contractual.⁴⁷

External Risks can be defined as any risks that may occur beyond the control of any of the project parties. These risks may not be limited to the following:

- Natural events, such as adverse weather conditions,
- Economic interventions, like monetary crises, inflation, or even fluctuations in fuel prices,
- Unforeseen circumstances, such as the presence of underground services or unstable soil conditions,
- Alterations in legislation or changes in the country's legal framework,
- Events classified as force majeure, including earthquakes, tornadoes, or volcanic eruptions.
- Political disruptions like strikes or even civil war.⁴⁸

⁴⁵ Henry Campbell Black, 'Black's Law Dictionary – 6th Edition' (1968). p558.

⁴⁶ MOHAN M. KUMARASWAMY, "Conflicts, claims and disputes in construction" (1997). P11.

⁴⁷ Cheung, S.; Pang, K. 'Anatomy of construction disputes', (2013), 139, 15–23.

⁴⁸ FELIX HIDAYAT1 and BIEMO W. SOEMARD, 'THE DEVELOPMENT OF ANATOMY OF CONSTRUCTION DISPUTE' (2016).

Conversely, the other significant category of risk-based disputes pertains to contractual responsibilities among the parties involved in the project, potentially impacting the relationships among the project's stakeholders. These disputes are commonly referred to as contractual risk-based disputes.

4.1 Contractual Risks' Disputes and their Impact on the Project's Deliverables

The Contractual risks' disputes may be defined as any dispute that may arise due to deficiencies, inconsistencies, defects, or ambiguities within the contract. As per the Queen Mary Survey held in 2019 on Construction Disputes, it was concluded that issues with contract drafting and project management were found as the 2nd and 3rd most common causes of construction disputes⁴⁹.

These types of disputes typically emerge as a result of the improper selection of contract types, inadequately drafted contract provisions, non-fulfilment of the contractual provisions with laws, or misunderstandings regarding the applicable civil or construction laws. Such kinds of disputes can arise at various stages, starting with the planning and design phase passing to the execution stage, until the project closing out.

4.1.1 Sources of Contractual Risks and Their Impact on Disputes

Contractual risks can stem from a multitude of sources, and pinpointing their origins is essential for effective management. Here are some common sources of contractual risks in construction projects:

- **Inaccurate Contract Specifications:** One of the primary sources of contractual disputes is the presence of inaccurate or incomplete contract specifications. When

⁴⁹ Queen Mary, University of London, "International Arbitration Survey – Driving Efficiency in International Construction Disputes" [2019]. P08-49. <https://www.pinsentmasons.com/-/media/pdfs/en-gb/special-reports/international-arbitration-survey-november-2019.pdf>

project details are not clearly defined, it can lead to misunderstandings and conflicts down the line.

- **Non-compliance with Regulations:** Failure to adhere to local, state, or federal regulations can result in contractual disputes. Changes in laws or regulations during the project can also be another source of contention.
- **Change Orders:** Changes in project scope, requirements, or design during the construction phase can be a breeding ground for disputes. Contractors may argue over the scope of changes and the associated costs and delays.⁵⁰
- **Payment Issues:** Disagreements related to payment, including the ambiguity of the pertinent contractual clauses. In the same way, disputes over progress payments, retention amounts, or additional costs, are common in construction projects.
- **Project Delays:** Delays in project completion can trigger disputes, especially if responsibilities and penalties for delays are not clearly drafted in the contract.
- **Quality and Performance:** Quality-related issues or disputes over the level of the specified performance can lead to conflicts. These may involve disputes over materials, workmanship, or testing and acceptance criteria.⁵¹

4.1.2 Impact of Contractual Disputes on Project Deliverables

Contractual disputes can significantly affect the deliverables of construction contracts, varying from minor conflicts to potentially leading to full termination of the contract in their extremist cases. The impact of such disputes on the project's deliverables may not be limited to;

⁵⁰ MOHAN M. KUMARASWAMY, "Conflicts, claims and disputes in construction", [1996].

⁵¹ Sai On Cheung and Tak Wing Yiu, "Are Construction Disputes Inevitable?" IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT, VOL. 53, NO. 3, AUGUST 2006.

- **Time Delays:** Disputes often consume valuable time, leading to project delays. Delays can have a cascading effect, affecting not only the project's timeline but also its costs.
- **Cost Overruns:** Legal battles and disputes over payments can escalate project costs beyond the initially budgeted amount, leading to financial strain.
- **Quality Compromises:** In the heat of a dispute, parties may compromise on quality to expedite the resolution. This can result in subpar deliverables that fail to meet project standards.
- **Strained Relationships:** Prolonged disputes can strain relationships between project stakeholders, including contractors, owners, and subcontractors. This can hinder effective collaboration, which is essential for successful project delivery.
- **Reputation Damage:** A project marred by disputes can tarnish the reputation of the parties involved, potentially affecting future business opportunities.
- **Impacting the whole Construction Industry:** While the construction industry plays a significant role as a part of the overall economy of most countries, the consecutive disputes arising in the construction projects including the strategic ones, may negatively impact the feasibility of such projects. Such impacts can extend to the broader economy, particularly in countries that heavily depend on the construction and real estate sectors as pillars of their economic growth and stability.⁵²

⁵² Anusree Saseendran, S.M.ASCE1 ; Ben F. Bigelow, Ph.D.2 ; Zofia K. Rybkowski, Ph.D., A.M.ASCE3 ; and Dawn E. Jourdan, Ph.D, "Disputes in Construction: Evaluation of Contractual Effects of ConsensusDOCS" (2020).

4.1.3 Mitigating Contractual Risks-Based Disputes Using AI

Effectively mitigating contractual disputes using AI tools may become crucial for minimizing their impact on project deliverables. Here are some strategies to be considered through using AI with some practical applications:

- **Drafting Comprehensive Contracts:** Ensuring that project contracts are comprehensive Contract, with well-defined terms and conditions, clear scope of work, regular payment schedules, and dispute resolution mechanisms, may be one of the most effective strategies for mitigating the risks that potentially lead to disputes in Construction Contracts.⁵³

Artificial Intelligence tools are capable of assisting the project tendering team in selecting the most appropriate type of Contracts, taking into account the project's specific conditions, specifications, requirements, size, stakeholders, and deliverables.⁵⁴

Furthermore, Artificial Intelligence possesses the potential to significantly contribute to addressing one of the prevalent causes of contractual disputes which is drafting the contract's particular conditions. Leveraging their extensive, regularly updated databases, AI tools may support experienced Contract administrators to swiftly customize the Contract's general conditions in addition to effectively managing the level of risks their entities are willing to share with the other contracting party.⁵⁵

As a practical application of this principle, a directive was issued to one of the most sophisticated AI chatbots (Bard), to rephrase a segment of Sub-Clause 4.10 in the FIDIC

⁵³ Stacy Sinclair, Senior Associate, Fenwick Elliott, "AI & Construction law: an essential and inevitable partnership" [www.fenwickelliott.com/research-insight/newsletters/international-quarterly/ai-construction-law-partnership].

⁵⁴ Rashid Saeed Alnuaimi, "Artificial Intelligence in the Construction" [2022], P06.

⁵⁵ Mario R. Nicholas, "Can Artificial Intelligence Be Trusted to Draft a Legal Document?" <https://www.stoel.com/legal-insights/article/can-artificial-intelligence-be-trusted-to-draft-a>. 15. June.2023.

Red Book 1999. This task aimed at modifying the risk levels associated with this Sub-Clause.

According to construction contract specialists, Sub-Clause 4.10 “concerning the site data to be provided by the Employer during the tendering phase “is often recognized as one of the more debated provisions in the FIDIC Red Book that has been identified as a frequent source of conflict in a significant number of projects. The instruction was formulated as follows:

*“Would you rephrase the given between-brackets sub-clause for the purpose of decreasing the Employer's risks and increasing the Contractors'? (The Employer shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Employer's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Employer shall similarly make available to the Contractor all such data which come into the Employer's possession after the Base Date. The Contractor shall be responsible for interpreting all such data).*⁵⁶

The answer was given as follows:

Certainly. Here's a rephrased version that attempts to decrease the Employer's risks:

" The Employer shall endeavor to provide the Contractor with available data related to sub-surface and hydrological conditions at the Site, including environmental aspects, up to the Base Date and the Employer shall not be liable for any errors or omissions in the data. Any additional data that the Employer may receive after the Base Date will be shared at the Employer's discretion. It is solely the Contractor's responsibility to interpret, verify, and act upon all such data. -"

⁵⁶ Conditions Of Contract for Construction - FIDIC Red Book – 1996, P.15.

As per the AI bot, this revised clause places more responsibility on the Contractor for obtaining and interpreting the relevant data. This will decrease the Employer's risk of liability for any errors or omissions in the data. The employer is only making an effort (not guaranteeing) to provide the data and leaves it open to the Employer's discretion whether or not to share data received after the Base Date. It also emphasizes that the Contractor is responsible for all investigations related to the data.⁵⁷

- **Reviewing and Analyzing the Contract Provisions:** Another service that can be provided by AI in drafting a proper Contract clause, is confirming the full alignment with the Country's applicable law for the purpose of avoiding any kind of future Contract nullification⁵⁸.

As previously determined, poor drafting of project contracts is a primary contributor to conflicts in projects. This often involves provisions that are non-compliant with the laws of the project's host country, potentially precluding future disputes arising from such situations.

In the context of reviewing contract conditions to ensure their conformity with local laws, Artificial Intelligence (AI) can play a significant role. This involves inputting the contract provisions into AI tools, which are then tasked with examining whether each condition or clause complies with or contradicts the country's laws where the project is being constructed.

To illustrate this, a practical test was conducted using another leading AI chatbot tool, Perplexity⁵⁹. The test involved issuing an instruction to the chatbot to scan and

⁵⁷ Bard (2023). <https://bard.google.com/chat>.

⁵⁸ Krishnapriya Agarwal, "AI Contract Analysis: Saving Time and Increasing Efficiency", SPOT DRAFT (2023). Available at [<https://www.spotdraft.com/blog/ai-contract-analysis>].

⁵⁹ Perplexity. <https://www.perplexity.ai/>

analyze a specific sub-clause (SC-20.1) from the FIDIC 1999, assessing its alignment with the Civil Law of the United Arab Emirates.

The instruction provided was as follows:

“Kindly confirm if the given Contract Sub-Clause is aligned with or contradicts the UAE Civil Law. The referred Sub-Clause is stated as the following (If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim.

The response was given by the AI tool as the following:

“Article 390(1) of the UAE Civil Code allows parties to agree on a fixed number of damages in advance for a breach of contract, but Article 390(2) entitles the courts to reassess the amount fixed in the parties’ agreement to reflect the actual loss suffered.

Additionally, Article 893 of the UAE Civil Code entitles both the employer and the contractor to terminate the contract if any cause arises preventing the performance of the contract or the completion of the performance thereof.

Therefore, the Sub-Clause contradicts the provisions of the UAE Civil Law.”

The generated output that was attached with references, demonstrates a significant advancement in the process of analyzing the provisions of project contracts. Over time, and as much as more data are incorporated into the AI tool, analysis can be executed with a higher degree of accuracy and efficiency, significantly within the least amount of time.

- **Implementing and Managing Communications:** It is indisputable that communication plays a critical role in significantly influencing the frequency of disputes within a project environment. This encompasses not only the aspect of timely notifications but also extends to identifying the appropriate stakeholders to

be notified, as well as determining the most effective manner and timing for raising and escalating issues as they arise.⁶⁰

As an integral component of the integrated project management plan, AI is capable of aiding in the development and upkeep of high-standard communication plans for construction projects.

This effectiveness hinges upon the AI being sufficiently fed with information regarding the stakeholders involved in the project, including a detailed emphasis on the role of each stakeholder. In addition, it can help in addressing issues promptly to avoid any kind of misunderstandings that may evolve into future anticipated conflicts. Another practical example of a relevant simple instruction has been given to another leading AI chatbot (ChatGPT-4), to draft a communication plan for a construction project that shall include all the project's stakeholders. Notwithstanding the limited number of details given to the tools, the final result was as per the bellow:

“Communication Plan for Construction Project”

Objective: Ensure timely, accurate, and transparent communication amongst all stakeholders to maintain clarity, prevent misinterpretations, and drive project success.

Stakeholders Identification

- *Main contractor's staff,*
- *Subcontractors,*
- *Engineer(s),*
- *Project's Employer,*
- *Local regulatory bodies (Authorities),*
- *Suppliers,*
- *Residents or neighbors (if construction impacts the surrounding area),*
- *Financiers or investors (if applicable),*

⁶⁰ LIAQUAT HOSSAIN, “Communications and coordination in construction projects”, 2009.

Communication Methods & Tools

- *Meetings (regular and emergency),*
- *Emails,*
- *Project management software (e.g., Procore, Microsoft Project),*
- *Phone calls,*
- *Text messaging or dedicated communication apps (e.g., WhatsApp, Slack),*
- *Notice boards at construction site,*

Meeting Schedules

- *Daily stand-up meetings: For site supervisors and team leads to report on daily progress and challenges.*
- *Weekly team meetings: Detailed review of the past week, plans for the next week, and problem-solving.*
- *Monthly progress meetings: High-level review with all stakeholders to discuss progress, budgets, and any major issues.*
- *Emergency meetings: As needed, if significant problems arise.*

Communication Protocols

- *Urgent issues: Phone call immediately followed by an email for documentation.*
- *Regular updates: Through project management software or weekly emails.*
- *Decision making: Decisions affecting any stakeholder must involve them either through meetings or written communication.*

Information Sharing & Reporting

- *Daily reports from subcontractors to the main contractor's staff.*
- *Weekly progress report shared with all stakeholders.*
- *Monthly financial reports detailing budgeting, expenditure, and any variances.*
- *Ad-hoc reports for specific issues.*

Feedback Mechanisms

- *All stakeholders can provide feedback during the weekly and monthly meetings.*
- *Anonymous feedback/suggestion box at the construction site.*
- *Dedicated email for feedback.*

Conflict Resolution

- *Clearly define a hierarchical path for resolving disagreements.*
- *If conflicts cannot be resolved at a certain level, escalate to the next highest authority.*
- *External mediation (or as per the Contract) might be considered for major disputes.*

Documentation & Record Keeping

- *All communication (especially decisions) should be documented for accountability and clarity.*
- *Store documents in both hard copy (if needed) and digitally on a secure cloud platform.*

Training & Familiarization

- *Train all stakeholders on the communication tools being used.*
- *Regular refresher sessions to ensure everyone remains familiar with the communication protocols.*

Responsibilities

- *Assign a Communication Manager (usually from the main contractor's staff) responsible for overseeing and enforcing the communication plan.*
- *Subcontractors, Engineers, and other stakeholders should nominate their point-of-contact persons.*

Review & Improvements

- *Quarterly review of the communication plan to ensure its effectiveness.*
- *Adjust the plan based on feedback and the changing dynamics of the project.*

Key Considerations:

- *Ensure all stakeholders have access to the necessary communication tools.*
- *Prioritize transparency and clarity in all communication.*
- *Encourage open channels for feedback and suggestions.*

Furthermore, and as a part of the project risk and communication management plan, AI can be effectively programmed to issue alerts for various types of risks as they arise particularly external risks. For instance, concerning risks associated with weather conditions, AI tools can be programmed to interface with real-time weather update services. They can be set to issue alerts when specific thresholds are exceeded, such as wind speeds surpassing a certain limit, or the occurrence of heavy rains or floods.

This capability may act as a robust barrier against many potential disputes and offers a proactive approach to mitigating risks that could otherwise evolve into disputes.

- **Project Planning and Scheduling:** AI tools are equipped to aid in the development of a project's schedule with exceptional precision. This includes performing detailed estimations of the durations required for each activity, as well as accurately determining the sequences, links and resources among the various project tasks.⁶¹

To effectively utilize these tools, the specialist is required to input the project's critical information such as scope, timeframe, major contractual milestones, and any other relevant data necessary to develop the program.

Another applicable instance where a straightforward command was issued to the same AI chatbot involves creating an 8-month schedule program for the construction of a 2-floor, 750 m² villa with isolated footings and a fully concrete structure. The AI tool is tasked to deliver a detailed schedule in table format, encompassing planned start and

⁶¹ Jiaxiong Weng, "Putting Intellectual Robots to Work: Implementing Generative AI Tools in Project Management", (2023) P.16.

completion dates for each activity. The Work Breakdown Structures (WBS) should be distinctly outlined. The program must encompass all phases, including mobilization, engineering, procurement, construction, finishing, testing, authority approvals, and handover activities. The start date of the project was proposed to be 30th November 2023.

The generated 8-month schedule was as follows:

Table 1

6 Months Program Schedule

BS	Activity	Planned Start Date	Planned Completion Date
1	Mobilization	30-Nov-23	07-Dec-23
1.1	Setup Temporary Site Facilities	30-Nov-23	02-Dec-23
1.2	Establish Site Security & Safety Systems	03-Dec-23	05-Dec-23
1.3	Mobilize On-Site Team & Equipment	06-Dec-23	07-Dec-23
2	Engineering & Design	08-Dec-23	22-Dec-23
2.1	Finalize Architectural Designs	08-Dec-23	15-Dec-23
2.2	Structural & MEP Engineering	16-Dec-23	22-Dec-23
2.3	Obtain Necessary Permits & Approvals	23-Dec-23	27-Dec-23
3	Procurement	28-Dec-23	15-Jan-24
3.1	Procure Major Materials (Cement, Steel etc.)	28-Dec-23	05-Jan-24
3.2	Procure MEP Materials & Fixtures	06-Jan-24	10-Jan-24
3.3	Procure Interior & Exterior Finishing Items	11-Jan-24	15-Jan-24
4	Foundation & Substructure Works	16-Jan-24	31-Jan-24
4.1	Excavation for Foundations	16-Jan-24	20-Jan-24
4.2	Construct Isolated Footings	21-Jan-24	26-Jan-24

4.3	Foundation Slab Construction	27-Jan-24	31-Jan-24
5	Superstructure Works	01-Feb-24	12-Apr-24
5.1	Ground Floor Columns & Beams	01-Feb-24	10-Feb-24
BS	Activity	Planned Start Date	Planned Completion Date
5.2	Ground Floor Slab	11-Feb-24	20-Feb-24
5.3	First Floor Columns & Beams	21-Feb-24	02-Mar-24
5.4	First Floor Slab	03-Mar-24	12-Mar-24
5.5	Roof Slab & Parapet Walls	13-Mar-24	12-Apr-24
6	Finishing Works	13-Apr-24	10-Jun-24
6.1	Ground Floor Internal Plastering & Flooring	13-Apr-24	03-May-24
6.2	First Floor Internal Plastering & Flooring	04-May-24	24-May-24
6.3	Roof Floor Waterproofing & Finishing	25-May-24	31-May-24
6.4	External Block & Plastering	01-Jun-24	10-Jun-24
6.5	External Painting Works	11-June-24	17-June-24
7	MEP Installations & Testing	11-Jun-24	24-Jun-24
7.1	MEP Installations	11-Jun-24	17-Jun-24
7.2	Testing & Commissioning of MEP Systems	18-Jun-24	24-Jun-24
8	Authority Approvals & Certifications	25-Jun-24	29-Jun-24
8.1	Obtain Occupancy & Other Relevant Certs	25-Jun-24	29-Jun-24
9	Project Handover & Closure	30-Jun-24	30-Jun-24
9.1	Final Inspections & Snag List Completion	30-Jun-24	30-Jun-24

The considerable advancement realized by employing AI tools for schedule programming is highlighted by the fact that a high-standard program can be generated within a few minutes, as demonstrated by the program produced above.

This is a stark contrast to the time typically required for such a task, such as the contractual duration stated by FIDIC for the Contractor to submit the time schedule program. (28 days from the commencement notification)⁶².

In addition to the above, and as previously mentioned, the greater the volume of data provided to the AI tool, the more accurate and comprehensive the generated program can be. The next generations of AI tools are anticipated to possess the capability to integrate all principal project documents like the drawings, specifications and other tendering documents to facilitate the generation of a comprehensively coordinated contract, aligned meticulously with the project's time schedule. Such a process is projected to occur in a remarkably short duration while adhering to superior quality standards.

4.2 Real Cases Studies on How AI May Mitigate Risks Based Disputes in Construction Projects

4.2.1 Case Study No. 01

In case No. 134/2004, the judge of the Dubai Court of Cassation upheld the appealed judgment and obliged the defendant (Main Contractor) to pay the outstanding fees to the claimant (Sub-Contractor1) due to extra work instructed by the defendant.

4.2.1.1 Case Background. On 25th July 2001, a Sub-Contract agreement was issued between a Main-Contractor and Sub-Contractor to deliver and install the Aluminium and Glassworks for the Balance of Sheikha Sanaa Al Maktoum, in Dubai. The original Contract price was 190,000 AED. During the execution, the following additional changes have been agreed upon;

- The 1st Change with a value of 63,900 AED was agreed upon on the 8th of August 2001,
- The 2nd Change with a value of 34,200 AED was agreed on the 9th of October 2001,

⁶² FIDIC Red-Book (1999) – Sub Clause 8.3 (Programme), P26.

- The 3rd Change with a value of 66,486 AED was agreed upon on the 8th of November 2001,

Due to such changes, the total contract price became 362,586 AED, but the Main Contractor (Defendant) has admitted only the 1st change order, stating that there is no evidence that any other change orders have been officially issued by the Main-Contractor.

4.2.1.2 The Encountered Risk. The below risks may be counted as a reason behind the dispute.

- Poorly drafted provisions in the Sub-Contract agreement regarding the verbal Engineer's instructions.
- The poor communication plan in the project.

4.2.1.3 The Risk's Cause and Effect. The aforementioned risks might be encountered due to the lack of knowledge and experience of the Subcontractor's staff, either in drafting the Contract conditions or in managing the project.

The impact of such risks on the project deliverables may be summarized as follows.

- A disruption in the project progress,
- The negative impact on the relationship between the Contract parties,
- Wasting time and cost during the dispute resolution process.

4.2.1.4 The Anticipated Role of Using AI in Avoid the Dispute Under Study.

As per a study established by the National Economic Development Office in the UK, it was demonstrated that 49% of the construction projects' delays in the UK are due to a lack of performance by the projects' subcontractors.⁶³

This is why in such projects which are suffering lack of experience of its staff in managing risks, AI tools with their giant databases, can be utilized during the early stages

⁶³ NEDC for Building (1983) Faster Building for Industry. National Economic Development Office. HMSO,

of risks' identifications including the preparation of the Project Risk management plan, with impressive outcomes.

AI may replace a full team in identifying and planning for risks:

To get this practically applied in our case study, upon requesting one of the most common AI chat pots (which is Chat GPT-4) to provide us with a comprehensive Risk Register for such Contract, the request was as per the following:

- *Can you give a detailed risk register identifying the risks relevant to a sub-contract agreement between a Main Contractor and Subcontractor in a Construction Project? The register to include the proactive mitigation and preventive actions required? Make it in a table format, with a focus on the Contractual Risks).*
- The Given Risk Register by the AI was as bellow;

Table 2*Risk Register generated by Chat GPT-4*

isk ID	Risk	Description	Impact	Mitigation Actions	Preventive Actions
RC-01	Inadequate Scope Definition	Unclear or incomplete definition of the subcontractor's scope of work in the agreement, leading to misunderstandings and disputes.	- Delayed project progress - Increased project costs - Quality issues - Potential disputes between Main Contractor and Subcontractor	- Develop a comprehensive scope of work document with clear deliverables and specifications. - Engage in detailed discussions with Subcontractor to ensure alignment on scope. - Include scope changes management procedures in the agreement. - Regularly review and update the scope to reflect project changes.	- Conduct a thorough project scoping and requirements analysis before drafting the subcontract agreement. - Involve subject matter experts in defining technical details. - Ensure clarity in roles and responsibilities within the scope. - Conduct a peer review of the scope documentation.
RC-02	Unclear Payment Terms	Ambiguity or lack of clarity in payment terms, including milestones and invoicing procedures, leading to payment disputes.	- Disrupted cash flow for Subcontractor - Project delays - Potential disputes over payment between Main Contractor and Subcontractor	- Clearly define payment terms, milestones, and invoicing procedures in the subcontract agreement. - Specify penalties for late payments or non-compliance with payment terms. - Establish a transparent payment approval process. - Regularly communicate on payment status.	- Develop a standard payment schedule template that aligns with industry norms. - Conduct financial risk assessments before entering into the agreement. - Ensure that payment terms are communicated and discussed in detail with the Subcontractor during negotiations. - Establish a payment dispute resolution mechanism.
RC-03	Inadequate Insurance Coverage	The subcontractor's insurance coverage does not align with project requirements, potentially exposing both parties to financial risks in case of accidents or damage.	- Financial liability in case of accidents or damage - Legal disputes over insurance coverage	- Clearly specify insurance requirements in the subcontract agreement. - Verify and request certificates of insurance from the Subcontractor. - Ensure insurance policies are up-to-date and cover project-related risks. - Establish a process for insurance claims.	- Conduct an insurance audit to assess the adequacy of the Subcontractor's existing coverage. - Collaborate with the Subcontractor to identify and address gaps in insurance coverage. - Seek legal counsel to review and confirm the insurance clauses in the agreement. - Regularly review and update insurance requirements to adapt to project changes.
RC-04	Incomplete Change Order Process	Insufficient provisions for managing changes in scope, specifications, or requirements, leading to disputes, additional costs, and project delays.	- Project delays - Cost overruns - Scope-related disputes - Communication breakdown between parties	- Develop a formal change order process with defined procedures, approvals, and documentation requirements. - Specify how changes will impact cost, schedule, and quality. - Establish a communication protocol for change requests. - Maintain a change order log.	- Conduct regular training on the change order process for project stakeholders. - Create templates and standardized forms for initiating, documenting, and approving change orders. - Define roles and responsibilities for change management. - Proactively communicate the importance of change management to all parties.
RC-06	Non-Compliance with Regulatory Requirements	Failure to adhere to local laws, regulations, permits, and environmental requirements can lead to legal and regulatory issues.	- Legal penalties and fines - Project delays - Regulatory disputes - Reputation damage	- Conduct a comprehensive legal and regulatory compliance review before entering into the agreement. - Specify responsibilities for obtaining permits and approvals. - Monitor and document compliance with environmental regulations. - Establish a legal contingency plan.	- Appoint a dedicated compliance officer or consultant to oversee and report on ongoing compliance efforts. - Conduct regular compliance audits to identify and rectify potential issues. - Collaborate with local authorities and experts to ensure project compliance. - Establish a compliance training program for project teams.
RC-07	Ambiguous Dispute Resolution Mechanisms	Lack of clearly defined dispute resolution mechanisms in the subcontract agreement may hinder conflict resolution and potentially lead to legal disputes.	- Prolonged disputes - Legal action - Project disruption - Strained working relationships	- Include a detailed dispute resolution clause specifying mediation, arbitration, or litigation processes. - Define a timeline for dispute resolution. - Establish a neutral third-party mediator or arbitrator. - Document and maintain a record of disputes and resolutions.	- Engage legal counsel to ensure that dispute resolution clauses align with applicable laws and regulations. - Regularly review and update the dispute resolution mechanisms based on lessons learned from previous projects. - Conduct dispute resolution training for project teams. - Foster a culture of open communication and collaborative problem-solving.
RC-08	Inadequate Termination Clauses	Unclear or incomplete termination clauses in the subcontract agreement may complicate the process of ending the agreement if necessary, potentially leading to disputes.	- Difficulties in terminating the Subcontractor's engagement - Potential disputes over termination - Project delays if replacement is needed	- Specify termination conditions and procedures for both parties in the agreement. - Include notice periods and dispute resolution mechanisms in termination clauses. - Develop a contingency plan for replacing the Subcontractor if needed. - Maintain open communication channels with the Subcontractor.	- Conduct a risk assessment to identify potential scenarios requiring termination. - Collaborate with the Subcontractor to define and align on termination conditions. - Engage legal counsel to review and validate termination clauses. - Periodically review and update termination clauses to reflect changing project needs.

- As per the generated risk register, the AI tool has incorporated the risk that caused the dispute in the current case study, giving the mitigation and preventive actions needed.
- As per RC-04 in the generated risk register, the focus was on the proper procedure of the change orders' with giving intention to the documentation and communication of any given variations, besides the significance of specifying the time and cost impacts for each change.
- When we requested the same from the Google AI tool (Bard), it gave similar results with semi-identical recommendations.
- The more detailed to be given to the AI tool about the project's scope like location, design, weather conditions, political conditions, the economic circumstances in addition to the Contract provisions, the more accurate outputs might be obtained.
- In the case of using more than one AI tool, the chance of obtaining more perfect output is increased.
- AI tools have the capacity to continually enhance their performance as they accumulate vast amounts of data and encounter diverse scenarios in real time.
- Even for the same situation, using the same inputs may lead AI tools to give more reliable, accurate and updated generated outputs over time.
- In the same way, for more specialized AI software or applications such as Proprofs Project, n tasks and resolver, the result should be more comprehensive and intensive.⁶⁴

As per the court decision in the case under study, it was found after referring to the expert's report that the executed work is considered an extra to what was originally agreed between the parties. In addition, even though the executed change was implied in the absence of an evident instruction, the extra work was deemed to be a binding variation to

⁶⁴ ProProfs Project, '14 Best Risk Management Software 2023' [2023]
<https://www.proprofsproject.com/blog/best-risk-management-software/>

the Contract's original scope, since the Engineer's consent can be demonstrated by the logical context of the events.⁶⁵

4.2.2 Case Study No. 02

In case No.151/2014 dated 11/11/2014, the decision of the Abu Dhabi Court of Cassation concluded that the Sub-Contractor payment under the back-to-back provision could not be withheld after the termination of the Construction Contract between the Main Contractor and the Employer.

4.2.2.1 Case Background. On 27th August 2009, a 70,000,000 AED Contract was issued between an Employer and a Main- Contractor to construct a tower, in Abu Dhabi. On 27 December 2009, the Main Contractor signed a Sub-Contract agreement with a Sub-Contractor to execute the work. In this Contract, the payment clause included a condition to pay the Sub-Contractor once the Main-Contractor gets paid by the project's Employer (back-to-back condition). Due to some circumstances related to the Employer, the construction work has been suspended, and as such hold the payment to the Main-Contractor. Consequently, the main contractor did not pay the Subcontractor the due instalments as per the payment schedule. Due to the abovementioned circumstances, a dispute has arisen between the Subcontract parties.

4.2.2.2 The Encountered Risk. The below risks may be counted as a reason behind the dispute.

- Poorly drafted provisions in the Sub-Contract agreement regarding the payment provisions.

⁶⁵ Dubai Court of Cassation, 134/2004, dated 31 October 2004.

4.2.2.3 The Risk's Cause and Effect. The aforementioned risks might be encountered due to the lack of knowledge and experience of the Subcontractor's staff, in drafting the Contract conditions of the project. The impact of these risks on the project deliverables may be summarized as follows.

- The negative impact on the relationship between the Contract parties,
- Wasting for time and cost during the dispute resolution process,
- Impacting the reputation of the dispute parties in the market.

4.2.2.4 The Anticipated Role of Using AI in Avoid the Dispute Under Study.

As mentioned before, in such Subcontracting agreements, the project's stakeholders, especially the staff of the Subcontractor encounter some difficulties in drafting/reviewing the adequate provisions of their Contracts with the main contractors. To avoid such risk, AI tools with their giant databases, can be utilized during the early stages of the Contract preparation.

AI may replace a full team in identifying and planning for risks, with a great chance to give early alarms and directions regarding the critical Contract provisions, besides giving the ideal procedures to deal with.

To get this particularly applied in our case study, upon requesting **perplexity** AI chat pot to provide us with a comprehensive Risk Register for such a Contract, the request and the result were as follows:

“Can you give a detailed Risk Register identifying the risks relevant to a sub-contract agreement between a Main Contractor and Subcontractor in a Construction Project? The Sub-Contract agreement includes a payment condition which is the Main Contractor will not pay the sub-contractor until paid by the project's Employer (Back-to-back provision). The register shall include the proactive mitigation and preventive actions required.

*Make it in a table format, focusing on the Contractual Risks from the perspective of the Sub-Contractor*⁶⁶

- Given Risk Register by the AI was as bellow:

Table 3

Risk Register Generated by Perplexity

ID	Description	Likelihood	Impact	Risk Level	Mitigation	Preventive Action
1	Ambiguous contract terms and conditions	High	High	High	Review and negotiate contract terms and conditions with the Main Contractor to ensure clarity and alignment of expectations.	Seek legal advice to ensure the contract terms and conditions are fair and protect the Subcontractor's interests.
2	Inadequate scope of work definition	Medium	High	Medium	Clearly define the scope of work in the sub-contract agreement, including deliverables, timelines, and quality standards.	Conduct a thorough review of the project's specifications and requirements to ensure the scope of work is comprehensive and accurate.
3	Lack of change order management	Medium	High	Medium	Establish a change order process that includes documentation, approval, and pricing mechanisms.	Regularly communicate with the Main Contractor to identify and address potential changes in the scope of work.

⁶⁶ Perplexity AI, Home, <https://www.perplexity.ai/> accessed 6 October 2023.

ID	Description	Likelihood	Impact	Risk Level	Mitigation	Preventive Action
4	Inadequate dispute resolution mechanisms	Low	High	Medium	Include a dispute resolution clause in the sub-contract agreement that outlines the process for resolving conflicts.	Maintain open and transparent communication with the Main Contractor to address any issues or concerns before they escalate into disputes.
6	The Main Contractor's financial instability	Medium	High	Medium	Conduct a financial background check on the Main Contractor before entering into a sub-contract agreement.	Include a payment bond or performance bond requirement in the sub-contract agreement to protect the Subcontractor in case of the Main Contractor's default.
7	Inaccurate or incomplete payment applications	Medium	Medium	Low	Maintain accurate and detailed records of work performed, materials supplied, and any additional costs incurred.	Submit payment applications promptly, ensuring they are complete and supported by appropriate documentation.
8	Substandard workmanship or materials	Medium	High	Medium	Implement a quality control process to ensure that all work meets the project's specifications and requirements.	Regularly communicate with the Main Contractor to address any concerns or issues related to workmanship or materials.
ID	Description	Likelihood	Impact	Risk Level	Mitigation	Preventive Action

ID	Description	Likelihood	Impact	Risk Level	Mitigation	Preventive Action
9	Inadequate resource allocation	Medium	Medium	Low	Develop a resource management plan that includes a contingency for unexpected changes or delays.	Regularly monitor the progress of the project and communicate with the Main Contractor to address any resource allocation issues.
10	Inefficient project management	Low	Medium	Low	Implement a project management system that includes clear communication channels, regular progress updates, and proactive issue resolution.	Regularly communicate with the Main Contractor to address any project management concerns and ensure alignment of expectations.

- Perplexit has proposed “as mentioned in the Register” in Risk No. 06, to introduce a payment bond or performance bond as a condition in the Sub-Contract agreement as a cover in case of the Main Contractor’s default.
- The AI gave some additional recommendations after generating the Risk Register such as;
 - If the back-to-back provision poses significant risks to the Subcontractor, the Subcontractor to explore alternative payment arrangements with the Main Contractor, such as milestone-based payments or performance-based payments.
 - If there are any concerns or issues related to the back-to-back provision, consult with legal professionals to ensure the Subcontractor's rights and interests are protected.

- When the same request has been given to Chat GPT, besides asking him to focus on the anticipated risks that might be generated from the back-to-back provision, it gives another advantageous recommendation such as:
 - Specify a dispute resolution mechanism that applies specifically to disputes arising from payment delay or contract termination. This may involve mediation, arbitration, or other alternative dispute resolution methods.
 - In case of the Main Contract termination, clarify that the subcontractor is entitled to payment for work performed up to the termination date, including any approved change orders or variations.
 - The sub-contractor should seek legal counsel with expertise in construction contracts and payment matters to review and provide guidance on the subcontract terms. Ensure that the terms comply with applicable laws and regulations.

As previously clarified, the more detailed to be given to the AI tool, the more accurate outputs might be obtained.

It can be concluded that using modern AI tools in identifying and planning risks, especially in the case of low-experienced project staff may give advantageous ideas and recommendations that may lead to enhancing the Contract drafting process, which in turn may lead to minimizing the risks and mitigating the projects' disputes.

In this case under study, the court's decision stated as below;

“Notwithstanding the back-to-back condition, the Sub-Contractor would be permitted to terminate the Contract if he couldn't perform his obligation due to some causes which are beyond his control. This is adhering to article 893 in the UAE Civil Code which states that *“If any cause arises preventing the performance of the contract or the completion of the performance thereof, either of the contracting parties may require that*

the contract be cancelled or terminated as the case may be". Furthermore, after considering the same principle governing the Contractual relationship between an Employer and a Main Contractor in this Sub-Contract agreement, and under article 472 in the same code, which explicitly stipulates that the Contractual right shall expire in case the obligor failed to perform due to external causes which he played no part in. In the light of the precedence, the Court has unequivocally deemed the Sub-Contract agreement to be null and void, consequently affirming the Sub-Contractor's rightful entitlement to receive outstanding payments from the main contractor.⁶⁷

4.2.2.5 AI competency of Dealing with Conflict before Being a Dispute. One of the most beneficial aspects of AI is its capability to serve as an up-to-date dynamic platform, accessible for consultation at any time, across a variety of scenarios and situations throughout the projects' life cycles. Continuing with the above-mentioned hypothetical scenario, envision a consultation by the Main Contractor from AI after the Project's Employer has terminated the contract. This request pertains to the legal and contractual status of the outstanding payments owed to the Subcontractor. We already get this applied by proposing/inserting the below input to Chat GPT-4;

"For the same case, if I am the main contractor, and I have a sub-contract agreement with a sub-contractor, with a back-to-back term in the payment provision. We have a sudden situation while the project Employer has terminated the main contract, what is the most ideal legal and contractual intention I shall adopt regarding the outstanding payments for the sub-contractor? The work done by the sub-contractor is inspected and delivered to me (the main contractor). There are no provisions in the contract stating the situation of the sub-contractor's outstanding payments in case of contract termination by

⁶⁷ Abu Dhabi Court of Cassation, 151/2014, dated 11 November 2014.

the employer. As per the precedence, shall I pay the outstanding payments to the subcontractor?”

The AI bot has given many proposals, but one of the given recommendations is stated below:

Good Faith and Fair Dealing:

“In many jurisdictions, there is an implied duty of good faith and fair dealing in contracts. Even if the subcontract agreement does not explicitly address the situation, you may still have an obligation to act in good faith and not take actions that would unfairly deprive the subcontractor of payment for work they have completed and that has been accepted”

Here, we observe a remarkable consistency between the court's decision on the dispute and the guidance offered by the AI tool. This underscores that if the Main Contractor had engaged the AI tool for advisory purposes prior to escalating the conflict, considerable savings in costs and time, as well as the avoidance of other collateral damages, could have been achieved.

Chapter 5: The Potential Privileges of Utilizing AI to The Dispute Resolution System.

5.1 Using AI in the Legal System

The legal sector is characterized by vast volumes of documents, complex research, and time-sensitive tasks. With the advent of AI, legal professionals are harnessing the power of technology to streamline their practices and improve the legal system as a whole.

Upon its inception, Artificial Intelligence (AI) presents as a newborn being, hungry for knowledge, akin to a student embarking on their educational journey with an empty backpack and pristine notebook. However, as illustrated by the preceding examples, AI acquires knowledge through a distinct process. It assimilates information by analyzing data, which must be meticulously organized into a format comprehensible to AI, essentially forming a synthesized dataset.⁶⁸

With a huge database of previous cases that contains thousands of decisions made by decision-makers about law violations. Details of each violation (such as the severity, degree, and type of collective information) are reserved in specialized databases. The algorithm processes all the cases and formulates a set of rules that link the decision made to the specifics of each case. In this framework, when a new case is introduced to the AI, it refers to the pre-established rules derived from its learning phase and determines the suitable course of action.⁶⁹

As such, the growing use of AI tools led to many efforts to progress and evolve Automated Litigation, and for such reason, on November 23, 2020, the EU Parliament adopted two proposals including new AI tools to streamline the legal systems in the EU,

⁶⁸ Michael Chui, James Manyika, and Mehdi Miremadi, "What AI can and can't do (yet) for your business", (2018). P11.

⁶⁹ Stranieri, A., Zeleznikow, J., Gawler, M. et al. 'A hybrid rule – neural approach for the automation of legal reasoning in the discretionary domain of family law in Australia. Artificial Intelligence and Law' (1999). P153–183. <https://doi.org/10.1023/A:1008325826599>

which will assist in limiting delays, increasing legal certainty, and to provide more accessible and cheaper justice references.⁷⁰

In California USA, a chatbot has made history to become the first AI-powered lawyer to sit in a court. As per Joshua Browder, CEO of the company that developed the robot, “The AI lawyer is able to attend the hearings and provide useful legal advice”.

It is noteworthy that the robot lawyer works with artificial intelligence techniques so that he listens to the court's claim, tells the defendant what to say through headphones, and has been trained on many judicial files that include various topics.⁷¹In the same context, the introduction of AI tools in the legal system across the world may contribute to many advantages in the sector such as;

5.1.1 Legal Research for the Legal Sector

- AI in Legal Research: AI-driven tools, equipped with Natural Language Processing (NLP) and Machine Learning (ML), are transforming legal research
- Rapid Document Analysis: AI can review and analyze vast legal databases, statutes, and case law in seconds, assisting attorneys in building stronger cases.
- Predictive Analytics: AI predicts legal outcomes based on historical data, helping lawyers make more informed decisions.
- Enhanced Due Diligence: AI can quickly identify risks and discrepancies in contracts and agreements, expediting due diligence processes.⁷²

⁷⁰ Araszkievicz Michał, Francesconi Enrico, Zurek Tomasz, ‘Identification of contradictions in regulation’ (2021).

⁷¹ Al Arabiya, 'يزاول المهنة دون ترخيص. مقاضاة أول روبوت محام في العالم' (16 March 2023) <https://www.alarabiya.net/last-page/2023/03/16/-يزاول-المهنة-دون-ترخيص-مقاضاة-أول-روبوت-محام-في-العالم>.

⁷² Chay Brooks, Cristian Gherhes and Tim Vorley, “Artificial intelligence in the legal sector: pressures and

5.1.2 Legal Practice Efficiency

The integration of AI into legal practice offers several key benefits:

- Time Savings: AI automates repetitive, time-consuming tasks like document review, allowing lawyers to focus on higher-value work.
- Cost Reduction: By reducing manual labour and speeding up processes, AI can lower legal costs for clients.
- Increased Accuracy: AI minimizes the risk of human error in legal research and document analysis.⁷³

5.1.3 Breakthrough in Legal Practice:

The integration of AI into the legal system promises a notable breakthrough in legal practice by identifying trends and patterns in legal cases, contributing to the establishment of industry-specific legal precedents. Furthermore, AI can expedite the creation of initial drafts by swiftly referencing pertinent case law, presenting arguments, and countering both presented and anticipated arguments from opposing counsel. While human intervention will remain necessary to produce the final draft, AI significantly expedites the overall process.⁷⁴

5.2 Utilizing AI in the Dispute Resolution System

The anticipated role of AI technologies in the dispute resolution System can be optimistically predicted during all the processes, starting from identifying the conflicts to giving the final decision on the dispute. In her article published on May 4th, 2023, legal expert, arbitrator, and researcher Irina Durouva delves into the substantial influence of

challenges of transformation" (2020), 13, 135–152.

⁷³ Kariuki Muigua, "Legal Practice and New Frontiers: Embracing Technology for Enhanced Efficiency and Access to Justice", (2020), P9.

⁷⁴ John Villaseñor, "How AI will revolutionize the practice of law", (BROOKINGS, 20. March 2023) <<https://www.brookings.edu/articles/how-ai-will-revolutionize-the-practice-of-law/>>

employing AI tools in the evolution of Dispute Resolution. She elucidates the pivotal role AI is expected to play in reducing the time and cost typically associated with this process.⁷⁵

When considering the Arbitration process as an illustrative example of Dispute Resolution, it's evident that AI's role extends well beyond the following aspects:

- **Reviewing the case files and collecting data:** In this regard, the AI can be fed with all the case's substantiations including the contract's conditions, the project's specifications and mutual correspondences between the dispute parties. This may hopefully participate in organizing and sorting the documents.
- **Drafting the case's Statements:** Upon conducting a survey with Arbitration industry experts, it has been determined that drafting a professional Statement of Claim, which is considered a critical component of any arbitration case, typically requires a considerable time.

Following the initial stage of uploading the case files into the AI-powered chatbots, providing the AI with a template or format for the legal statement to be drafted (such as a Statement of Claim), is the primary action required to generate a thoroughly drafted Statement of Claim. This can be achieved within a significantly condensed timeframe, offering further opportunities for refinement and improvement by the human user.⁷⁶

As a practical application, when the AI bot (ChatGPT) was fed with a ready template for a Statement of Claim for an Arbitration case, and then asked if a similar SOT for another Arbitration case could be provided in the same format, its answer was as below:

⁷⁵ Irina Durouva, "ChatGPT and the Future of Dispute Resolution: The Benefits and Risks of Using AI", (ENYO LAW, 4th May 2023) < <https://www.enyolaw.com/posts/234/chatgpt-and-the-future-of-dispute-resolution-the-benefits-and-risks-of-using-ai>>.

⁷⁶ Ibid.

“Yes, I can assist with that. If you provide me with the template and the necessary details about the new case, I can help draft a Statement of Claim in a similar format. Please ensure that any information you share is free from personal or sensitive details, as this is a public platform. Also, note that while I can provide a draft, it's essential to consult with a legal professional before submitting or relying on such a document in a formal setting, as they can provide context-specific advice and ensure accuracy. Please provide the template and the new case details, and I'll assist you further!”

The aforementioned details clearly illustrate the substantial time and cost savings that can be realized by employing the AI tool in the arbitration process. Such efficiency has the potential to catalyze a breakthrough in the field of Dispute Resolution.

Expedited Assessment for Cases: From the perspective of Arbitrators, the application of AI for automated document review and analysis can markedly enhance the efficiency of case document examination. With the professional Arbitrator's oversight, AI can expedite the initial assessment of cases within less time and with higher accuracy.

Another example of incorporating AI in Ad Hoc Arbitration is many online meetings software that depends on Artificial Intelligence, have introduced new features that make it easy to record the Arbitration sessions such as SOC or SOD, the expert's judgement, and make comprehensive analysis and summaries of the recorded sessions at a later stage.

Using AI can significantly reduce the time and costs associated with document review, allowing lawyers to focus on more substantive aspects of the case. However, AI can only be used with initial setup, training, ongoing supervision, and quality checks by humans. AI is not a substitute for human expertise and judgement, while human oversight is still needed to ensure accuracy and fairness in the review process.

- **Predictive Analysis:** AI predicts case outcomes based on legal precedents and relevant data such as: Enhanced Communication: AI-powered chatbots and virtual assistants improve communication between parties and lawyers/councils during dispute resolution. Predict potential disputes by identifying risk factors in contracts. AI can help in recommending the Tribunal based on their professional history, in addition to the selection of the experts, using the database that can be fed into them. Supported by the analysis of the AI tool, it can play a significant role in helping the arbitrator in giving the final award of going for Arbitration.
- **Avoidance of Bias:** Another advantage of incorporating AI in Arbitration or litigation procedures is its inherent neutrality. As a computer-based application, sophisticated AI tools can greatly minimize the risk of bias, which poses a significant threat to the integrity of the process and can impede the realization of a fair and impartial award.
- **Cost Efficiency:** The use of AI in dispute resolution has the potential to lower legal fees related to Alternative dispute resolutions. For Arbitration as an example of ADR, this may include the expenses related to counsel, legal experts, and the Arbitral Tribunal. This cost-effectiveness could positively impact the future adoption of arbitration across
- **Recommendation of Experts and Tribunal Members:** The expansive database of Artificial Intelligence tools is designed to assist relevant entities in identifying and selecting appropriately qualified individuals for involvement in various alternative dispute resolution processes. AI possesses the capability to conduct thorough deep analyses of potential candidates, encompassing both experts and tribunal members, based on their expertise and the specific nature of the case at hand. This approach has the potential to significantly reduce the time required for

this selection phase, while simultaneously enhancing the overall quality of the process. By ensuring the placement of the most suitable individuals in their respective roles, the efficiency and competency of the entire procedure are markedly improved.

5.3 AI to Re-shape the Rules of Contractual Liabilities in UAE Law

As stipulated in Hudson's legal texts, one of the major achievements desired by a property owner involved in a building or engineering project typically is securing a competent Contract administration to ensure a prompt and cost-effective delivery for projects.⁷⁷

To get this target achieved, it is quite important to properly allocate the liabilities among the parties involved in the contracting process. Such kind of liabilities are used to begin upon the commencement of the contract, till obtaining the final hand-over certificate.⁷⁸

In addition, it is important to emphasize that the required level of standards and skills will vary based on the specific facts and circumstances unique to each duty. Such standards can be discerned through the interpretation of the terms agreed upon in the contract. Hence, the contract serves as the fundamental reference for distributing liabilities and obligations.⁷⁹

In alignment with the aforementioned principles, and considering the legal tenet that contractual liabilities stem from a correlation between a breach and the resultant damage for all parties involved in the contract⁸⁰, Artificial Intelligence (AI) emerges as a novel addition that can be integrated into this equation. Given the rapid evolution of AI

⁷⁷ I.N Duncan Wallace Q.C "Hudson's Building and Engineering Contracts – 11th Edition" [1996].

⁷⁸ Edelman –v- Boehm (1964) 26 SASR 66, South Australia.

⁷⁹ Femeena Mohamed "Limitation of Liabilities– Analyzing a balanced approach to Limiting Liabilities in Construction Contracts" [2014] P9.

⁸⁰ Adam Kramer. "The Law of Contract Damages- 2nd Edition", (2017).

technologies, incorporating AI as a new element into the contracting process shall contribute to adjusting the level of liability for all the contractual parties. If the employment of AI tools is demonstrably effective in preventing or reducing faults or breaches, this could substantially contribute to the elimination or mitigation of ensuing damages.

This approach of mitigating liabilities and damages might have a substantial impact on reducing both expenses and the overall budget of projects. This shall potentially positively transform the entire construction industry.

5.4 Adopting AI in the Legal System in UAE

5.4.1 Introducing the AI by the Government of UAE

In the United Arab Emirates (UAE), the embrace of modern AI tools across different sectors has been a recent and progressive initiative. Aligning with this technological advancement, the UAE has distinguished itself as the first country globally to establish a dedicated Ministry of Artificial Intelligence, reflecting its commitment to integrating AI into the nation's development and strategic planning⁸¹.

On 19th October 2017, UAE accomplished an innovative step by announcing the appointment of Omar bin Sultan Al Olama, as Minister of State for Artificial Intelligence. The announced minister is one of the 100 most influential people in artificial intelligence by Time magazine.⁸²

Commenting on this extraordinary event, the Country's Prime Minister Shaikh Mohamed Bin Rashed stated that. *"The next global wave is artificial intelligence, and we want to be the most prepared country for it."*⁸³

⁸¹ UNESCO, 'Minister of State for Artificial Intelligence (2020), <https://es.unesco.org/creativity/policy-monitoring-platform/minister-state-artificial>

⁸² TIME 100/AI (2023). <https://time.com/collection/time100-ai/>

⁸³ <https://www.france24.com/ar/20171020-الإمارات-تعديل-وزاري-استحداث-ذكاء-اصطناعي-أمن-غذائي-سعادة> تسامح

In 2020, the UAE issued the Artificial Intelligence Guide as part of the country's National Program for Artificial Intelligence. In this guide, a comprehensive overview of AI has been provided, encompassing its history, and some of its main mechanisms like deep learning, machine learning, and data science.

Furthermore, it summarized the pertinent applications of AI already implemented across diverse sectors in the UAE, highlighting the initiatives by various governmental bodies in the nation to oversee and guarantee that AI is utilized for the enhancement of societal welfare. The guide has included the proposals and framework for building AI competences and lists the recent initiatives, ranging from School education programs to the stages of Higher education.⁸⁴

In the same way, in 2021 UAE launched the National Strategy for Artificial Intelligence. Via this strategy, the UAE has declared its vision to become one of the leading nations in AI by 2031. This ambitious target is integrated with the UAE Centennial 2071 plan seeks to forge new pathways in economic, educational, and social development for its citizens, government, and businesses. This forward-looking strategy is geared towards catalyzing transformative change and is anticipated to generate up to AED 335 billion in additional economic growth, positioning the UAE as a leading nation in the realm of innovation and artificial intelligence.⁸⁵

Another example showing the cognitive advance in utilizing AI by the government of UAE was the exceptional foundation of the first digital bank country.

In 2022, the first digital bank Zend, obtained the UAE Central Bank's license to be the first Bank in the UAE authorized to operate as a fully independent digital commercial

⁸⁴ AI GUIDE, NATIONAL PROGRAM OF ARTIFICIAL INTELLIGENCE (2020). https://ai.gov.ae/wp-content/uploads/2020/02/AIGuide_EN_v1-online.pdf.

⁸⁵ UAE NATIONAL STRATEGY FOR ARTIFICIAL INTELLIGENCE (2021). <https://mbzuai.ac.ae/wp-content/uploads/2022/07/UAE-National-Strategy-for-Artificial-Intelligence-2031.pdf>

bank. By granting a license to this new banking entity, the country is poised to launch pioneering banking services that will contribute to the UAE's established legacy of innovation. This step is anticipated to be a significant contributor to the nation's ongoing economic expansion and diversification, aligning with its strategic objectives for financial sector advancement.⁸⁶

In a different vein, the UAE Cabinet established the UAE Artificial Intelligence and Blockchain Council, tasked with supervising the integration of AI technology within society and governmental domains. This Council is responsible for proposing strategies to cultivate an environment conducive to AI, fostering advancements in research, and enhancing cooperation between public and private entities, including global institutions, to expedite AI adoption. Additionally, the Council is charged with promoting the exchange of expertise and insights in the AI arena, incorporating AI into educational frameworks, raising awareness in the public sector, and employing AI to enhance individual well-being and happiness.

The Council also manages the optimistic utilization of artificial intelligence, ensuring the privacy of user data, maintaining data security and integrity, and facilitating efficient data sharing with relevant authorities. Additionally, the UAE Artificial Intelligence and Blockchain Council manages blockchain technology and strategizes its application across government operations. The establishment of this council represents one of the five key themes delineated in the Government's AI strategy, emphasizing its pivotal role in the technological advancement and digital transformation of the UAE.

⁸⁶ The National News, 'Dubai Digital Bank Zand Gets UAE Central Bank Licence' (5 July 2022) <https://www.thenationalnews.com/business/banking/2022/07/05/dubai-digital-bank-zand-gets-uae-central-bank-licence/>.

5.4.2 AI in the UAE Legal System

In the same way, the adoption of AI in the legal system in UAE started to come into view during the past few years. In 2020, the “Guidance of Using AI in the Legal Services and Judicial Procedures” was issued as the first document formalizing the use of the modern tools of AI in the jurisdiction system in the UAE⁸⁷.

Furthermore, as part of the United Arab Emirates' ongoing initiatives to promote the adoption of artificial intelligence across various sectors, including the judicial domain, with the aim of harnessing AI technologies to streamline legal processes and expedite the issuance of judgments, the Dubai Courts unveiled a range of innovative smart services during their participation in the thirty-ninth edition of the "Week... GITEX Technology."

One notable offering presented by the Dubai Courts is the "Digital Justice Platform." This platform is designed to significantly accelerate litigation procedures, particularly in commercial cases, and has the potential to reduce the time and effort expended by parties involved in a case by up to 80%. It leverages cutting-edge video communication technologies, placing it at the forefront of global advancements in this field.

Additionally, the Dubai Courts introduced the "Smart Payment Service for Case Fees, Deposits, and Fines." This service provides a dependable and comprehensive platform for electronic and intelligent payments. Importantly, it eliminates the need for individuals to physically visit the court's premises or log in to an online portal, making the payment process more convenient and efficient.

In addition to the above, the courts unveiled the "Smart Marriage" and "Partnerships" services, both of which are equipped with advanced interactive features.

⁸⁷ <https://www.mohamoon-uae.com/upload/files/32-2020-11.pdf>.

These features enable customers to swiftly and smoothly complete various legal procedures remotely, adhering to the highest standards of reliability and efficiency.

As per the council Acting as Undersecretary of the UAE Minister of Justice Dr Said Ali Bahboubh, the Ministry is focusing currently on the development of unique, innovative initiatives. Among these groundbreaking projects, are the virtual judge project, which revolutionizes how rulings can be made, an electronic portfolio system for judicial documents, which digitizes and streamlines case management, a real-time digital translation service for court proceedings, enhancing communication and understanding during trials and a smart platform dedicated to judicial and legal training, which aims to modernize the educational aspects of the legal system. These efforts highlight the Ministry's commitment to integrating advanced technology into the judicial process, thereby enhancing efficiency, accessibility, and the overall administration of justice.⁸⁸

In the same context, his Excellency Counselor Yusuf Saeed Al-Abri, Undersecretary of the Judiciary Department in Abu Dhabi, affirmed that the courts in Abu Dhabi have undergone a significant digital transformation. This shift has revolutionized all aspects of judicial proceedings and services, ensuring the delivery of comprehensive justice.

This aligns with the enlightened vision of Sheikh Mohammed bin Zayed Al Nahyan, the President of the UAE, and is a direct result of the instructions from Sheikh Mansour bin Zayed Al Nahyan, the Deputy Prime Minister and Minister of Presidential Affairs, who is also at the helm of the Judiciary Department in Abu Dhabi. The overarching aim is to cultivate a smart and innovative judicial system. Such a system is

⁸⁸ <https://www.moj.gov.ae/ar/media-center/news/8/3/2022/> - مستقبل القضاء - يشهد قاضياً افتراضياً - وترجمة فوراً للجلسات.aspx

designed to bolster Abu Dhabi's competitive edge on the global stage and sustain its standing as a leader in adopting progressive judicial processes.⁸⁹

It is clear that the Dubai Courts' proactive adoption of AI-driven technologies and their introduction of these innovative smart services mark a significant step toward enhancing the efficiency of the judicial system and simplifying legal processes for all stakeholders involved. These efforts reflect the commitment to leveraging technology to expedite litigation procedures and improve access to justice.⁹⁰

5.5 AI in the Construction Law and Dispute Resolution System (CLDR) in UAE

When it comes to the Disputes Resolution System, UAE has become one of the leading countries in the world adopting the use of Artificial Intelligence as one of the effective dispute resolution tools. One of the major examples of this is adopting Artificial Intelligence in resolving rental disputes in Dubai. As per Judge Abdul Qader Moosa, the Chairman of the Rental Disputes Center in Dubai, *“The real estate sector in Dubai is experiencing a major shift in the use of technology to enhance its sustainability and readiness for the future through developing the first digital judicial rental system in the world that adopts artificial intelligence, available to litigants, whether they are inside or outside the country”*.⁹¹ This innovative step has been taken as a part of the plan to strengthen and develop the judicial system in the real estate sector in Dubai.

Consistent with that, in March 2023, the Dubai International Arbitration Centre announced the launch of a significant innovation in the field of alternative dispute resolution (ADR) with the introduction of its "Metaverse" platform. According to their

⁸⁹ Khaton Al Nowais, “Abu Dhabi District Court: 200 digital services and employment for AI and machine learning to achieve the necessary justice” (2023) Emirates News Agency-WAM. <https://www.wam.ae/ar/details/1395303174138>.

⁹⁰ Tarish Al Mansouri, “AI Techniques in Dubai Courts” (2019) Al Bayan, Available at <https://www.albayan.ae/opinions/articles/2019-10-20-1.3679094>.

⁹¹ Dubai adopts artificial intelligence to resolve rental disputes, Nabd. <http://nabdapp.com/t/123673929>

announcement, this pioneering platform is set to create a dedicated space within a virtual reality environment. It will enable parties involved in disputes to engage with the settlement process from any global location, thus obviating the requirement for physical travel. This advancement promises to make the arbitration process more accessible, efficient, and environmentally friendly, reflecting a commitment to sustainability in the practice of international dispute resolution.⁹²

⁹² <https://www.emaratalyoun.com/business/local/2023-03-30-1.1733522>.

Chapter 6: Conclusion and Recommendations

In this paper, it could be clearly illustrated that the huge advancement of the technology of AI over the past few years has broadened the chance of exceptional improvements for the construction industry. These improvements extend not only to the design, contracting, and management processes of construction projects but also to mitigate and resolve disputes within the environment of construction projects.

Through this study, and after adopting many practical applications, it could be stipulated that adopting AI tools in construction projects stands as a revolutionary tool in the realm of construction contracts.

Even though risks are an inevitable component of construction contracts, the matter heightens the probability of disputes, potentially delaying projects and resulting in significant financial and legal damages, however, the expertise in identifying, managing, and resolving risk-related disputes, offers the potential to greatly streamline the construction process.

Through the adoption of AI technologies, stakeholders can not only ensure more efficient project delivery but also cultivate a culture of collaboration and trust addition to effectively reducing the potential for conflicts and disputes.

In other words, effective management of project risks serves to minimize the volume of disagreements between the Contract parties, which may consequently mitigate the probability of potential disputes.

Risks in construction projects are multifaceted, ranging from preliminary design mishaps to unexpected events during projects' construction and close-out stages. Meanwhile, traditional risk management tools, while essential, sometimes falter in the face of complex, interwoven challenges inherent in modern construction projects.

As technology continues to advance, it is imperative for the construction industry, legal professionals, and policymakers to harness the potential of AI, ensuring that projects are completed efficiently, disputes are minimized, and when they arise, they are resolved in the most effective manner, through maintaining a smooth relationship between the project stakeholders.

When it comes to the adoption of recent AI tools in construction projects, it was explicitly found that AI uses are not limited to identifying and managing the project's anticipated risks which are considered the root cause of conflicts, or even resolving disputes, but also it was demonstrated to enhance the other project's important procedures such as tendering, planning, and communications.

The case studies included in this study accentuated AI's potential in both preemptively identifying risks and post-conflict resolution. In each case, the use of AI could significantly alter the trajectory of the risk's evolution, either by avoiding it in its entirety or by providing effective resolution pathways post-conflict.

Indeed, the utility of AI in the realm of dispute management transcends mere prevention. Its capabilities enhance the dispute resolution process itself, paving the way for resolutions that are not only cost-effective but also timely, thereby streamlining the overall management of conflicts.

Furthermore, AI-driven algorithms can analyze massive volumes of legal documents, contracts, and case histories to provide valuable insights. Not only the integration of AI into dispute resolution has a significant impact on construction project performance, but also, it might also have the potential to usher in a new era in construction law.

Consistent with its strategic objective to become a global leader in artificial intelligence by 2031, and in synergy with its Centennial 2071 blueprint for socio-economic

advancement, the government of the United Arab Emirates has taken significant strides in integrating artificial intelligence across various sectors. This initiative commenced with the pioneering establishment of the Ministry of Artificial Intelligence to be the first in the region, including the launch of the National Strategy for Artificial Intelligence in 2020 signifies a foundational step towards realizing this ambitious vision.

AI's entry into the legal sphere, particularly in the UAE, further bolsters the case for its integration into construction dispute resolution. The UAE government's proclivity towards AI, evident from its strategic adoption in the legal system, set a precedent for other nations to emulate.

The potential benefits, ranging from enhanced legal research capabilities to improved legal practice efficiency, are manifold.

In light of the precedent statistics, the below proposals would be highly recommended:

- It's essential for the standard Construction Contracts to propose an AI operator to be appointed during the procedure of drafting the Contract's particular conditions which might help in obtaining more competent conditions within less duration. This shall be applicable during the drafting of the bespoke Contracts as well.
- AI intensive training sessions to be held prior to the commencement of the construction projects to all the individual involved in the project's different stages such as tendering, planning, execution and closing out.
- Re-allocate liabilities between the Contract individuals consistent with the degree of the utilization of AI tools to reduce the total expenses of the projects.
- Suggesting to manufacturers of widely used AI tools, to develop a specialized, comprehensive version tailored for construction projects. This version should be capable of integrating various relevant processes, including but not limited to:
 - Tendering process,

- Time and Cost Estimation,
 - Contract clauses drafting,
 - The coordination of different designs and drawings such as civil, architectural, and MEP (Mechanical, Electrical, and Plumbing),
 - Assisting in the creation of diverse project management plans, such as scheduling, cost management, communications, human resources, risk management, and quality control plans,
 - The tool should also be equipped to aid in assessing claims and dispute resolution within the project environment (Automated Internal Arbitrator).
- The UAE government to consider adopting new specific regulations that aim to facilitate the determination of legal liabilities in the context of AI use, aligning with the need to adjust the level of liability for all parties involved in such contracts. Such kind of legalization would motivate parties in legal or contractual agreements to incorporate AI tools as supplementary resources, potentially improving the contracting environment.
 - Moreover, the government may advocate for the appointment of AI operators who possess legal and contractual expertise, to be a part of the Contracting process, particularly for the most sophisticated transactions. Such measures may lead to more proficient outcomes related to the minimization of the anticipated legal and contractual conflicts which in turn may lead to lessening the burden on the general judicial system in the country.

Eventually, it can be clearly stated that the emergence of a diverse array of artificial intelligence tools, software, and chatbots represents merely the initial phase in a rapidly evolving field. Given the substantial advancements realized in recent years, it is reasonable to forecast a burgeoning transformation likely to reshape the future of project contracting,

management, and dispute resolution significantly. Such a paradigm shift is poised to facilitate a profound and widespread impact on the construction industry, heralding a new era characterized by enhanced efficiency, reduced conflict, and improved overall project execution.

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