



The Effects of Integrating Technologies in the Construction Dispute Resolution

آثار تكامل التقنيات على حل منازعات البناء

by

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Abstract

This research paper is about the effects be it positive or negative of technologies being implemented in the construction dispute resolution field. The technologies of interest are Online dispute resolution, Artificial intelligence, and blockchain technology, with the use of primary, secondary, and empirical research it was found that these technologies have their benefits and challenges some waying in more with benefits more than challenges and the opposite is true. ODR provided accessibility to proceedings and document circulation while imposing a challenge for cost saving. AI inflected a benefit of providing precise decision making while imposing a challenge of the lack of human touch in verdicts. Blockchain provided the benefit of having the records immune to tampering and alteration with a challenge of integrating such complex technology. These technologies provide improvement to such complex field nonetheless continues development and implementation is required to fill in the gaps and reduce the challenges it imposes.

خلاصة

، ODR تتناول هذه الورقة البحثية تأثيرات التقنيات المستخدمة في حل منازعات البناء. التقنيات محل الاهتمام هي تقنية ، وباستخدام الأبحاث الأولية والثانوية والتجريبية، وجد أن هذه التقنيات لها blockchain والذكاء الاصطناعي، وتقنية فوائدها وتحدياتها. وقد أتاحت تسوية المنازعات بالاتصال الحاسوبي المباشر إمكانية الوصول إلى الإجراءات وتعميم الوثائق في حين فرضت تحدياً فيما يتعلق بتوفير التكاليف. لقد حقق الذكاء الاصطناعي فائدة تتمثل في توفير عملية صنع فائدة جعل السجلات Blockchain قرار دقيقة مع فرض تحدي يتمثل في عدم وجود لمسة إنسانية في الأحكام. قدمت تقنية محصنة ضد التلاعب والتغيير مع التحدي المتمثل في دمج هذه التكنولوجيا المعقدة. توفر هذه التقنيات تحسناً لمثل هذا المجال المعقد، ومع ذلك فإن التطوير المستمر والتنفيذ مطلوب لسد الثغرات وتقليل التحديات التي يفرضها.

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Chapter 1: Introduction

The construction industry has long been a symbol of ingenuity and progress. It dates to around 400 BC when the main goal was to create shelter against nature's forces and adapt to ever changing climates¹. Throughout thousands of years this industry has undergone a transformation. From shelters it has evolved into towering skyscrapers, sprawling shopping complexes and intricate facilities that form the foundation of modern society. However, as the industry has expanded in size and complexity it has brought forth challenges, particularly in terms of disputes and disagreements among the diverse range of stakeholders involved. Enough construction law can be traced back to an unexpected period. Approximately 1750 1792 BCE.

Legal scholar Philip L. Bruner sheds light on this instance of construction law which emerged from a collection of laws derived from various tribal communities². This ancient code emphasizes the need for governance in construction practices dating back to even the earliest human civilizations. As construction techniques became more advanced and projects grew larger in scale it became increasingly clear that comprehensive and adaptable legal frameworks were crucial, for ensuring just practices within the field. The changes in construction law can be clearly seen through the example of FIDIC (International Federation of Consulting Engineers) and its construction standards.

¹ 'A Brief History of the Construction Industry | Constructible' <<https://constructible.trimble.com/construction-industry/a-very-brief-history-of-the-construction-industry>> accessed 28 April 2024.

² Philip L Bruner, 'Construction Law: Its Historical Origins and Its Twentieth Century Construction Law: Its Historical Origins and Its Twentieth Century Emergence as a Major Field of Modern American and Emergence as a Major Field of Modern American and International Legal Practice International Legal Practice' (2022) 75 Arkansas Law Review <<https://scholarworks.uark.edu/alr/vol75/iss2/3>> accessed 16 March 2024.]

FIDIC began its journey in 1913³ as construction practices progressed the FIDIC Standard forms went through several revisions to keep up with the dynamic industry. Notably there was a revision in 1957 and a major overhaul in 1999. By 2017 another revision was underway to address the evolving demands and complexities of the construction sector⁴. In today's world where technology advancements and refined skills prevalent in the construction industry it is crucial for construction law and dispute resolution to adapt accordingly to protect everyone's interests involved. The COVID 19 pandemic has acted as a catalyst pushing for integration of technology in the construction industry. Online dispute resolution (ODR) has become a favored method for resolving conflicts, within construction contracts by providing a platform where parties can efficiently resolve disputes without needing physical presence⁵.

Additionally Artificial Intelligence (AI) advancements and technology's transparency have emerged as key drivers that could reshape how disputes are resolved within the construction field. AI, a technology that has traditionally been associated with automation and data analysis is now being utilized to address conflicts within construction projects. The use of AI algorithms and machine learning capabilities has the potential to transform the dispute resolution process by making it more efficient, accurate and cost effective. Moreover, when combined with technology construction dispute resolution can experience a significant shift towards transparency and accountability.

³ 'FIDIC | History | International Federation of Consulting Engineers' <<https://fidic.org/history>> accessed 28 April 2024.

⁴ 'A Brief History of FIDIC – Institute of Construction Claims Practitioners (ICCP)' <<https://www.instituteccp.com/a-brief-history-of-fidic/>> accessed 28 April 2024.

⁵ 'Online Dispute Resolution in the Age Covid-19 | Australian Disputes Centre' <<https://disputescentre.com.au/online-dispute-resolution-in-the-age-covid-19/>> accessed 28 April 2024.

Through blockchain contractual agreements and project, progress can be recorded immutably providing parties with real time access to information and greatly reducing the chances of disputes arising from inconsistencies or misunderstandings. This dissertation will specifically explore the impact of these technologies on dispute resolution in construction projects. It is quite surprising that AI advancements are now being applied in resolving disputes, within the construction industry.

1.1 Research Problems

The construction industry, which has existed since times has been slow to adopt technological advancements. Instead, it tends to stick to methods of operation. This resistance to change has hindered the industry's progress. Prevented the widespread adoption of innovative technologies like machines, drones, Artificial Intelligence (AI) and machine learning. Although change was hard to implement that does not mean technologies were not implemented. Such technology would be Building Information modelling (BIM) which is now being used to model the life cycle cost of projects⁶ as well as many more features. These technologies have the potential to revolutionize project planning and reduce disputes. There are factors contributing to this hesitance.

1. Commitments to Clients; Construction projects often involve timeframes and budgets that construction companies must adhere to. As a result, they may be cautious about experimenting with technologies that could potentially cause delays or complications impacting their ability to fulfill these commitments.

⁶ Tomas H., Thomas M., Marianne A., Katharina S., Miloslav V., Michal M., & Jana K. 'Life cycle cost modelling using 6D BIM in construction: A comparative study'.
<https://doi.org/10.1051/mateconf/202439606001>

2. Fear of Disputes; The fear of disputes arising from issues or complications when implementing new technologies is another major concern. Construction projects already face challenges and introducing unfamiliar technology can exacerbate these concerns.

3. Lack of Familiarity with Technology; The construction industry typically relies on established methods and may lack familiarity, with cutting edge technologies.

Unfamiliarity with technologies in the construction industry can lead to skepticism and resistance among professionals who view them as risky or unproven. One of the challenges in adopting these technologies is the need for training and upskilling of the workforce, which can be time consuming and costly. Despite these concerns it's important for the construction industry to realize that embracing technology has the potential to significantly improve efficiency, safety and project outcomes. By incorporating tools and techniques construction companies can achieve more accurate planning, reduced delays and fewer disputes. Overcoming resistance to change and addressing these concerns is crucial for long term growth and competitiveness within the industry. Disputes in agreements are universally undesirable due to their negative impact on relationships, time consumption and financial burdens. The lengthy litigation process is especially frustrating, for all parties involved.

To illustrate how time-consuming dispute resolution through litigation can be let us look at the Al Tamimi and CO case numbered 304/1993. This case began in 1983. Finally concluded in 2015 after going through multiple stages of litigation and appeals⁷. It serves as an example of the challenges that come with traditional dispute resolution. The Al Tamimi and CO case lasted for over three decades starting in 1983 and wrapping up with a decision in 2015. Initially it

⁷ [1993] no. 304 AD [1993]

started at the court of instance, but it wasn't until 2013 that a decision was reached. However, that decision wasn't the end of the road as the defendant decided to appeal to the Court of Appeal. On March 17th, 2015, the Court of Appeal issued its judgment further prolonging the duration of this case. After this ruling the defendant pursued another appeal to the UAE Federal Supreme Court. The final judgment was delivered on December 9th, 2015, ultimately favoring the defendant side. This long legal battle lasted 32 years before both parties could finally assert their rights and bring an end, to this case.

The Al Tamimi and CO case serves as a reminder of the drawbacks and time-consuming nature of traditional litigation. It highlights the pressing need for modernization and the integration of technology into the dispute resolution process. Technology holds potential in expediting and streamlining evidence gathering while ensuring compliance with UAE laws and regulations. Just imagine the possibilities if advanced tools for data management document analysis and legal research were incorporated into such an enduring case. Moreover, technology driven platforms, for resolving disputes like online dispute resolution (ODR) could have provided a more efficient and accessible approach to settle this case.

Now to not get ahead of ourselves truly implementing technologies to this field and especially in the field of construction law and disputes resolution would have its negative effects such as:

1. Training the legislators, arbitrators, and mediators on how to use these tools effectively.
2. Comfortability, and trustiness of the parties with the use of these new tools.
3. Effectiveness and morality of when to and when not to use it these tools.
4. Once one of the laws are broken there wouldn't be the human emotions affecting the ruling.

5. It would take a huge period to imbed the circumstantial conditions that can only be seen or considered by humans as the role of arbitrators, or legislators issuing rulings.

1.2 Significance of the Research

The integration of emerging technologies like Blockchain and Artificial Intelligence (AI) in construction dispute resolution has created uncertainty among the parties involved. It is important to assess individuals' level of knowledge and trust in these advancements. These innovations have the potential to revolutionize how construction disputes are handled. Their acceptance depends on certain factors.

1. Recording Disputes on Blockchain; A crucial aspect of this technological shift is the idea of permanently documenting all dispute proceedings on the blockchain. This offers increased transparency and credibility. However, concerns about privacy and confidentiality emerge as information could potentially be exposed. Therefore, it is essential to understand peoples trust in a system that maintains anonymity while ensuring data integrity.
2. AI Assisted Resolution; The involvement of AI technology in resolving construction disputes introduces a dynamic. AI brings objectivity to the process by reducing the influence of bias and emotions that often cloud judgment. Moreover, this shift towards AI raises concerns about the loss of human empathy and personal touch, in dispute resolution. It is crucial to assess peoples trust in the ability of AI to deliver equitable outcomes in complex construction disputes.
3. Adaptable Proceedings: The integration of technology also offers an adaptable approach to conducting dispute resolution processes. This adaptability has the potential to expedite the

proceedings and make them more convenient for all parties involved. This transformation may also raise concerns as individuals might question whether it could result in depersonalization or compromise their ability to effectively present their cases. Understanding people's perspectives on finding the right balance, between flexibility and fairness is of importance.

1.3 Objectives

This dissertation will open the door to see what the effects of the fast newly developed technologies on our construction dispute resolution system are, such as Online dispute resolution (ODR), Artificial intelligence (AI), and lastly Blockchain. This would help pave a way in improving the methods used to reduce disputes and if disputes arise then resolve these arising disputes in a much more effective and faster manner than using traditional methods. This will open a door for the parties for much flexible and more friendly way of resolving the differences without carrying the worry of the lengthy process of dispute resolution.

1.4 Methodology

This dissertation will dive into the effects of technology on the Construction dispute resolution field using doctrinal methods to formulate a verdict on if implementing these improvements would hinder or boost the already frowned upon sector of construction. In addition to that an empirical research method will be conducted to grasp most of the actual people who go through this process think and if any good what can be improved on the current system in place for resolving disputes. This will allow actual primary data to be used to formulate what the field thinks and not only depend on theoretical data on what might or might not work.

1.5 Dissertation Structure

This Dissertation will be divided into six chapters: Chapter one's purpose is to introduce the dissertation. It exposes the reader to the topic of research, provides a structure to how the information will be delivered, as well as the process of finding the information presented in the dissertation.

Chapter two named "Online Dispute Resolution (ODR)" This chapter explores this new mechanism of solving disputes and dives in how it affects the construction dispute and compare the difference between it and the old traditional method for dispute resolution.

Chapter three with the name of "Artificial intelligence (AI)" this chapter focuses on the effects of the AI being implemented in construction law and how it would improve or hinders the rulings of the court, and if reducing the human involvement in deciding on rulings would make it much efficient. Another aspect would be on the ethical effect of using AI in certain conditions where human involvement is needed.

Chapter four named "Blockchain and its effect on construction disputes" this chapter will introduce the technology of blockchain how it started, how it affects the procedures of construction disputes, if the use of decentralization and transparency benefits parties while using it.

Chapter five will focus on empirical data collected from a survey that is made to capture the exposure of the people in construction that deal with the dispute cases as well as the people exposed to construction in general.

Chapter six will be under the title of conclusion where this dissertation will be summarized, and a verdict will be made on whether these technologies drastically help in reducing or easing the process of dispute resolution or vice versa.

Chapter 2: Online Dispute Resolution

2.1 History of ODR

ODR is a new method of conducting disputes in construction and in other fields as well. ODR is any online Information technology used by the court in the aid of solving or reaching a settlement in a dispute between parties⁸. ODR was first heard of in the year 1996 in an AI conference that took place in USA. Its main use was due to the increasing popularity of the internet. The main disputes that utilized it was related to copyright disputes. It mainly stayed in this development till the hit of the pandemic at the end of 2019. Commercial and construction fields started to weigh in on this method of dispute resolution. In 1999 eBay was one of the key developers of ODR, due to the nature of eBay an internal system was needed for parties to settle their disputes that raised from transactions in an online manner⁹. Today eBay has reached close to 60 million disputes per year, which closely comes to the same number as the cases filed through US civil courts. People may argue that it could cause the parties to not take the dispute seriously since it does not require them to physically be attending. While this point might be valid to some extent other points of view outweigh it by saying having this dispute method made available for parties without physically being present would make it easier and faster for the procedures to commence due to the lack of physical presence. The following chart demonstrates the raise of interest in using the ODR method for resolving disputes across the years¹⁰.

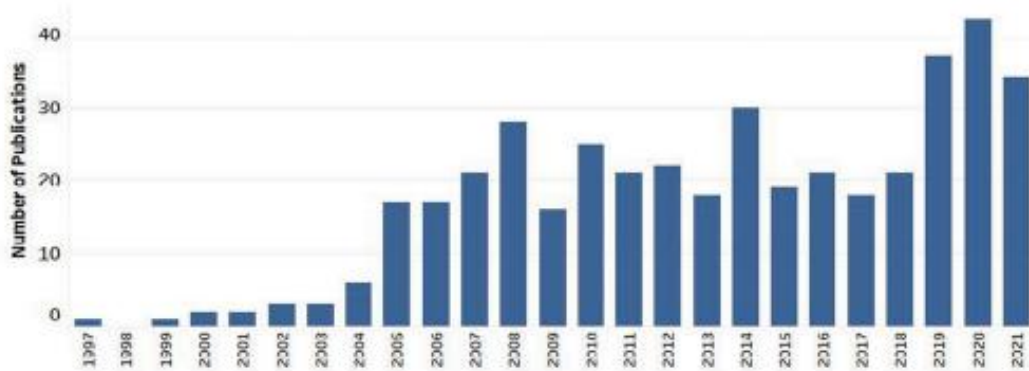
⁸ ‘ONLINE DISPUTE RESOLUTION MECHANISMS IN CIVIL AND ADMINISTRATIVE COURT PROCEEDINGS Guidelines and Explanatory Memorandum Legal Instruments’ < <https://rm.coe.int/publication-guidelines-and-explanatory-memorandum-odr-mechanisms-in-c/1680a4214e>> accessed 24 July 2023.

⁹ Ethan Katsh, ‘ODR: A Look at History’ < <https://www.ombuds.org/odrbook/katsh.pdf> > accessed 30 July 2023.

¹⁰ Murathan Saygili, Isa Emre Mert and Behzat Tokdemir, ‘A Decentralized Structure to Reduce and Resolve Construction Disputes in a Hybrid Blockchain Network’ <<https://doi.org/10.1016/j.autcon.2021.104056>> accessed 22 July 2023.

Figure 1

Trends of the research of ODR through the years



With the convince that the parties are finding the method to be the more they end up choosing it to resolve their dispute instead of resorting to the old school dispute resolutions such as arbitration or litigation where physical presence is required for the procedures to commence. Now keeping in mind, the convince of this method of dispute resolution it would better suit a dispute that parties aim to settle between each other. Whereas the more complicated the dispute gets the harder it is to use this method for several reasons:

1. Expert witnesses would be required to have a proper understanding on where the fault lies between the parties.
2. The technical difficulties the parties might face in submitting the required documents with the required format.
3. The technical difficulties parties might face in conducting virtual meetings for the hearings.

2.2 Positives of Integrating ODR in Construction Disputes

ODR as you may know by now is a form of Alternative dispute resolution (ADR) the only difference is that instead of the process happening physically it happens using online means where parties do not have to appear in court physically to resolve their disputes. ADR and ODR mainly focus on reaching a settlement between the parties to avoid wasted time and broken relationships. The saying Justice delayed is justice denied plays a big role in complex disputes like this. The use and improvement of the current judicial system should always be the top priority among countries and standards that governs this type of work. Another point that maybe looked at as a positive for ODR is the reduction of document printing which in cases adds a hefty sum with respect to the fees due to sharing and submittal of documents. This reduction of paper usage also impacts the environment in a positive way where trees are not being chopped as often as before which helps in the reduction of global warming.

The current development of ODR systems is mainly in transactions and e – commerce, the perfect example of such system is eBay’s ODR system, another example for such a system is the ICANN system for dispute resolutions¹¹. Even though there are examples of ODR systems being used the implementations of it being implemented and integrated in different industries globally is lacking the scale and efficiency of larger and much more complex disputes such of the nature of construction disputes. A well-known platform that supports the ODR techniques in solving disputes is the United Kingdom is the Online Solution courts, another well-known and most developed platform for ODR is the British Columbia’s civil resolution

¹¹ Janet Hui Xue and Ralph Holz, ‘Applying Smart Contracts in Online Dispute Resolutions on a Large Scale and Its Regulatory Implications’ <<https://elibrary.law.psu.edu/cgi/viewcontent.cgi?article=1004&context=jlia>> accessed 25 July 2023.

tribunal which was in operation for as long as 8 years to date¹². Furthermore, although ODR has its advantages and disadvantages the research done on ODR in construction dispute resolution is almost non-existent this is due to the complexity and intertwining of evidence in construction disputes. Construction disputes are deemed to be of two kinds:

1. High value dispute where the disputed value can reach up to tens of millions if not more.

These types of disputes usually happen between large companies among this field. An example would be:

- a. The disputes that the DIFC courts announced in 2018 with a value that exceeded the AED 10 billion¹³.
2. Low value disputes where this type of dispute varies based on the jurisdiction as well as the size of the works being undertaken. For example:
 - b. In the UK England wales in specific a low value dispute would reach a maximum cap of 32,350 US dollars.
 - c. As for the UAE based on the UAE federal court a low value dispute would reach a maximum cap of 273,000 US dollars¹⁴.

Such disputes with so called small cap value can be resolved using ODR method due to the low-profile nature of the dispute as well as the simplicity of it. As it shows the small cap value disputes change from a country to the other this makes it flexible for countries to categories these form of disputes in the way they see fit for the nature of projects developing in

¹² James Metzger, 'THE CURRENT LANDSCAPE OF BLOCKCHAIN-BASED, CROWDSOURCED ARBITRATION' <<https://civilresolutionbc.ca>> accessed 25 July 2023.

¹³ 'Value of Claims Brought to DIFC Courts Exceeds AED 10 Billion in 2018' <<https://www.zawya.com/en/press-release/nbsp-value-of-claims-brought-to-difc-courts-exceeds-aed-10-billion-in-2018-vz4dkfgj>> accessed 26 February 2024.

¹⁴ Udechukwu Ojiako and others, 'An Examination of the "Rule of Law" and "Justice" Implications in Online Dispute Resolution in Construction Projects' (2018) 36 International Journal of Project Management 301 <https://www.researchgate.net/publication/320899734_An_examination_of_the_%27rule_of_law%27_and_%27justice%27_implications_in_Online_Dispute_Resolution_in_construction_projects> accessed 25 July 2023.

that respective country. The positives of ODR would play a huge role in these situations for the following reasons:

1. Due to the low value of the dispute parties will be able to resolve it with cost effective methods which helps not exceeding the value of the claim raised by the claimant. some expenses would be in the form of:

- a. Procedure fees for tribunal entity.
- b. Reduction in fees for physically being present in the country of the hearings.
Based on the method the parties wish to proceed with which is agreed in the contract the dispute resolution tribunal fee is requested to appoint a chair for arbitration if 1 arbitrator is required or 3. These fees can be reduced by eliminating the transportation and accommodation of the bodies to the arbitration or mediation.
- c. Reduction in cost of printing and providing hard copy documents. This form of cost might be overlooked or not given the proper attention. Non the less the cost of printing stacks up whereby the end of the project in may reach to tens of thousands if not hundreds of thousands of dirhams. An example of how much printing costs is the Blue Heaven project in Palm Jumeirah. This project has adopted the technological way of dealing with documents, their cost for printing to this day has stacked up to 50,000 dirham and it has another two more years for completion. Once the snagging start and the commercial team take over this figure would be doubled or tripled.

2. Time saving procedures ODR provides such as eliminating physical appearance, and transportation time compared to other traditional ADR methods.

Woolf did a study and found that the average cost of these low valued disputes ranged between 40% to 95% of the dispute value¹⁵.

2.3 Challenges of Integrating ODR in Construction Disputes

Now that we looked at the benefits and positive side of ODR and how it can be a cost and time saver for construction disputes with small cap value it comes the time to view the challenges that faces ODR as a dispute resolution method. For ODR to become a very well utilized in construction as a method of Alternative Dispute resolution it requires to scale up and handle complexity of the disputes with such high cap value that has more than one side to view it. Such complexities that would impose challenges include:

1. Numerous parties to the contract.
 - a. These contracts with a high cap value usually is not as simple as only having two parties to the contract, these contracts may involve up to ten parties including the owner, different contractors, and consultants.
2. Complex disputes that require physical quantification¹⁶.
 - a. Quality Disputes. This dispute as the name states is caused by the disagreement between the parties regarding the quality of work performed. For this to be quantified and assessed it is required for a person who is competent to be on site

¹⁵ *ibid*.

¹⁶ 'Complexity of Construction Disputes Makes Them Perfect for ADR' <<http://www.hicksadams.ca/>> accessed 19 September 2023.

where the work is being performed and assess the required quality compared to the agreed contract.

- b. **Safety Disputes.** Safety disputes happen when the parties disagree or ignore the standard of safety to be followed on site, this requires the tribunal to investigate the standards of safety set by the ruling government, as well as the standards set by the Client party. This form of assessment requires a physical examination of the environment where the safety violation took place, and whether the responsible party took their precautions to avoid this safety violation.

ODR can affect the confidentiality of arbitration where in Zoom hearings anyone can walk in and join the video conference which completely goes against the rule of confidentiality, another reason why ODR still needs more development is that it would be difficult to know if the parties are being coached by someone out of the camera reach which would completely affect the integrity of the testimony¹⁷.

2.4 Possible Way of Integrating ODR in Construction Disputes with its Current Form

With that said ODR can still be used in construction disputes but not as the major dispute resolution tool. For example, in Arbitration, the meetings between parties can take place online using tools such as Microsoft teams or zoom calls. In 2020 Courts in the UAE moved from public hearings to remote hearings such as:

1. Remote court hearings by the Judicial department in Abu Dhabi¹⁸.

¹⁷ 'Zoom Court Is Now In Session: How the Legal World Has Pivoted to Virtual During COVID-19 | Zoom Blog' <<https://blog.zoom.us/zoom-virtual-law-firm-virtual-courtroom-during-covid-19/>> accessed 19 September 2023.

¹⁸ 'Virtual Litigation | The Official Portal of the UAE Government' <<https://u.ae/en/information-and-services/justice-safety-and-the-law/litigation-procedures/virtual-litigation>> accessed 19 September 2023.

2. Virtual sessions agenda by Dubai courts
3. e-Filing system by the Ministry of Justice.

These are examples on how the incorporation of parts of ODR can help in ADR and Litigation to ease and help smooth sail the process of dispute resolution. First example being conducting the court hearing on video call software such as teams, and zoom for example Cole, Scott & Kissane (CSK) lately transitioned to virtual law firm and standardized the use of zoom software to conduct the pre-depositions, mediation, and other legal proceedings¹⁹. This move helped the firm not to lay off people during covid restrictions and fulfill the obligations required for its clients. This feature was used in Litigation cases where the firm successfully initiated and executed the virtual trial by jury over zoom.

Some ways to mitigate these pitfalls is by applying more control, for example:

1. Having arbitration hearings private and protected with a passcode to allow only the required people to attend.
2. For litigation the parties can be prepared by their own respective attorneys to be able to maneuver and use the software in the right way.

2.5 Conclusion of Using ODR

ODR is an online dispute resolution method that is used by courts and arbitration interties to resolve disputes between parties. This method is a new form of resolution that was introduced in 1996 in an AI conference. The main use of this method was the disputes in relation to copyright infringements until the Covid pandemic in the year 2019 where commercial and

¹⁹ 'Zoom Court Is Now In Session: How the Legal World Has Pivoted to Virtual During COVID-19 | Zoom Blog' (n 16).

construction disputes started utilizing this method. As it shows in figure 1 by the year 2005 the interest of using ODR started increasing till the year 2020 where it reached the peak.

As it shows ODR has its benefits and Pitfalls the benefits come in a form of cost and time saving. This can be achieved by eliminating the need for the parties participating in the process to be physically attending, this reduces the cost of the process where accommodation, and transportation costs are eliminated. Another form of cost that is eliminated is the cost of printing documents where the documents can be shared through electronic means to the heads leading the ODR.

On the other hand, ODR has challenges to overcome for it to be appealing to the construction dispute resolution field. Among these challenges are the complex nature of the construction disputes which involves more than two parties to the contract. Another challenge that arises due to the complexity of the disputes in construction is damage assessment where certain qualified individuals are required to assess damages to verify which party is at fault and if the requested compensation is fair.

Another challenge that arises in the proceedings is the ability for certain unwanted people from joining the proceedings which poses a threat on the confidentiality of the proceedings. Finally, parties might be coached on what to do or say while the proceedings are ongoing due to the lack of the surrounding awareness by the head leading the proceeding. Although the mentioned challenges are serious some can be mitigated while others are not that easy to mitigate, this puts the pressure on construction law industry to come up with solutions for the ease and increased efficiency of the process of ODR for the future if they want to implement it.

Chapter 3: Artificial intelligence (AI)

3.1 Introduction to AI

The emergence of Artificial Intelligence (AI) can be traced back to the period between 1940 and 1960 a time marked by the advancements during the Second World War. AI at its core is about combining machine capabilities with the processes inherent in human thinking. Although the official term "AI" was not mentioned until later its foundational technology was pioneered by two visionaries who are often recognized as the founding fathers of AI: John Von Neumann and Alan Turing²⁰.

Von Neumann and Alan Turing played vital roles in shaping computing by leading the transition from decimal logic to binary logic. This fundamental shift, initiated by these pioneers forms the basis of computing architectures that we see today. While John McCarthy is commonly associated with coming up with the term AI and envisioning it as a mechanism of advanced mental processes like critical reasoning and memory organization it's important to acknowledge the foundational contributions of Von Neumann and Turing. In the 1950s even before AI had a name these pioneers laid down technological groundwork that set the stage for future developments. The shift, from decimal to logic in computing established computational capabilities that eventually became synonymous with AI.

Despite the hope for progress in the 1960s AI faced challenges that caused it to lose momentum and enter a period of stagnation until the 1970s. However, despite these setbacks researchers persisted in their efforts to replicate the way reasoning is performed by humans to

²⁰ 'History of Artificial Intelligence - Artificial Intelligence' <<https://www.coe.int/en/web/artificial-intelligence/history-of-ai>> accessed 5 February 2024.

be performed by a machine. During this time a noteworthy achievement was the creation of a machine that aimed to mimic human thought processes.

This machine consisted of two systems: one specialized in molecular chemistry while the other focused on diagnosing blood diseases and providing prescription drug recommendations. By inputting data into the system this machine was able to generate responses that demonstrated a level of expertise in these specific fields. Although these AI systems held promise operators encountered difficulties in fully understanding how they worked, which led to maintenance issues and lack of trust on the use of such technology. Despite the breakthrough, faster and more cost-effective alternatives emerged during this period which contributed to the decline of AI interest and development.

By the 1990s AI fell out of favor due to skepticism surrounding its practicality and value. However, there was a turnaround in the late 1990s with IBM's Deep Blue an AI system that engaged in an iconic chess match, against a Russian Chess grandmaster. The remarkable victory of Deep Blue marked a turning point for AI demonstrating its ability to surpass humans who have mastered sections in specific fields²¹.

However Deep Blue's triumph in chess highlighted the limitations of AI when it comes to tackling the complexities of real-world activities. Chess, with its defined rules and possibilities represented only a fraction of the multifaceted challenges that AI needed to confront to reach its full potential. The early 2000s witnessed a surge in AI capabilities fueled by remarkable advancements in computer hardware and software.

²¹ *ibid.*

The combination of enhanced processing units in cards and processors along with refined search algorithms revolutionized the speed and efficiency of AI outcomes²². Google's research lab, Google X exemplified this progress by developing an AI that could identify objects like cats in videos. Although seemingly mundane this capability opened possibilities by showcasing how AI can recognize objects based on their characteristics. As we continue to move into the 21st century the topic of AI unfolds with a promise of even greater advancements.

The ongoing collaboration between innovations and the evolving landscape of AI positions this technology as a crucial element for future progress. From its beginnings to where it stands today the evolution of AI is a remarkable testament to human creativity, determination and our unwavering pursuit of pushing the limits in technology. As we gaze into the future the path of AI holds potential to transform industries redefine how we approach problem solving and make substantial contributions to humanity's ever-growing wealth of knowledge and capabilities.

3.2 AI and Construction Disputes

When exploring the power of AI in construction dispute resolution it is important to understand how AI can revolutionize processes, harness innovation and create permanent change. The integration of AI technologies not only addresses existing challenges but also propels the construction industry towards enhanced efficiency, transparency and fairness. ODR emerges as an area where AI can have a significant impact. The matter of fact that AI being a tool plays the role of an impartial fourth party fundamentally changing how disputes are resolved.

²² *ibid.*

By offering rulings that can be reviewed by a human mediator, arbitrator or even litigator this way AI introduces objectivity that is often difficult to achieve in traditional human managed disputes. This fair assessment facilitated by AI has the potential to be a game changer in construction disputes by providing parties involved with a fair and standardized resolution process²³. The value of AI as a party in ODR goes beyond streamlining processes it acts as an important safeguard against potential biases or subjective interpretations that humans may unintentionally introduce.

AI promises consistency and transparency in decision making, which helps minimize the impact of human error and biases during the resolution process. This combination of technology brings objectivity to construction related conflicts leading to standardized and fair rulings. When we consider negotiation support systems AIs influence becomes more significant. Construction projects often involve negotiations with multiple stakeholders with intricate details and diverse interests.

Intelligent Negotiation Support Systems like Negoisst (2003) aid in human negotiators by going beyond traditional support mechanisms. These systems offer communication support, aid in decision making, and help manage contracts. With AI as an ally cooperation among teams involved in complex construction projects is greatly enhanced²⁴. The evolution of AI in negotiation support reached a massive milestone with systems like the Split-Up System.

By incorporating machine learning this system does not only assist in decision making but also promotes a fair distribution of assets—a feature initially designed for dividing marital

²³ John Zeleznikow, 'Using Artificial Intelligence to Provide Intelligent Dispute Resolution Support' (2021) 30 Group Decision and Negotiation 789 <<https://link.springer.com/article/10.1007/s10726-021-09734-1>> accessed 5 February 2024.

²⁴ *ibid.*

property under Australian law. The versatility demonstrated by the Split-Up System showcase broader applications of AI in various negotiation scenarios beyond its original scope. Research programs conducted by institutions like the University of Minho play a role in advancing discussions on AI's role in dispute resolution²⁵.

Through the evaluation of ODR using AI these studies dive into the intricate details of 24 commercial providers and six research projects. This comprehensive analysis serves as a foundation for shaping policies guiding professionals and directing the development of AI technologies in the field of construction dispute resolution. It highlights the importance of taking an approach that considers the diverse applications and potential impacts of AI and not place it on the shelf due to the fear of changing the system that is available. However, due to the lack of an accepted definition of AI, this technology is complicated and is in continuous development.

Different point of views exists, ranging from viewing AI as collecting data to hopefully develop it as a robotic judge capable of making independent decisions. Another point of view that exists is that AI can be used as an assisting tool to help improve the methods and outcomes of construction dispute resolution. This wide range of information and skill showcases the capabilities that fall under the umbrella term of AI. Therefore, it is crucial to have a comprehensive understanding of both what AI can do and its limitations. As we continue exploring the potential of AI and its role as a tool for the use of judges, arbitrators, or any form

²⁵ Elena P Ermakova and Evgenia E Frolova, 'Using Artificial Intelligence in Dispute Resolution' (2022) 254 Smart Innovation, Systems and Technologies 131 <https://link.springer.com/chapter/10.1007/978-981-16-4621-8_11> accessed 5 February 2024.

of dispute resolution it becomes increasingly important to understand the nature of this technology and how it functions.

By serving as a court clerk AI can astonishingly record statements made during hearings manage document flow efficiently and alleviate burdens off the person in charge of leading the dispute resolution process. Incorporating AI in this capacity enhances effectiveness without compromising on the human element required to ensure fairness, for all parties involved.

Another advantage AI provides is by leveraging the AI's capabilities in allowing for document review that offers insights and expert opinions based on evidence provided by disputing parties. This collaborative approach ensures that the process of resolving disputes becomes more effective, not just a result of technological advancements but integrating both human and technology. It represents a shift in how conflicts are dealt with in the construction industry. The ongoing exploration of AIs capabilities and its crucial integration into such frameworks and its collaborative role alongside human expertise demonstrate a forward-thinking approach.

This technological advancement not only simplifies the resolution process but also contributes to the ongoing transformation of the construction industry. As AI continues to evolve and become more integrated into dispute resolution it offers the potential to create an efficient transparent and fair environment, for all stakeholders involved in complex construction projects. Although AI provides benefits to the field it also provides change that comes with challenges that needs to be addressed and controlled.

3.3 Benefits and Challenges of AI in Construction Disputes

Looking at the parts that AI can be effective and facilitate in the dispute: The integration of AI into dispute resolution processes brings about not only a reduction in costs but also an acceleration of proceedings in litigation, or any other ADR methods. However, the decision to employ AI in construction disputes necessitates a thorough examination of its suitability, requiring comprehensive research and a meticulous weighing of its advantages and disadvantages. Just as with any innovation, AI introduces both benefits and drawbacks that demand careful consideration. An essential aspect to address is the potential civil liability associated with the negative impact of AI on another party.

In the event of adverse consequences caused by the AI system, the system itself cannot be held responsible; rather, the fault falls on the manufacturer, operator, owner, or user of the system although there is law governing this grey area. This attribution of liability poses a risk on the parties involved in dispute resolution processes as well as the manufacturers, these risks are required to be considered before integrating AI into proceedings²⁶. A notable concern revolves around the accountability of parties using AI in legal proceedings. Should the AI system negatively impact another party, the responsibility does not rest with the system but with the human entities involved. This raises the question of whether parties should consult an AI system in any dispute resolution process, considering the potential liabilities associated with its use. Manufacturers, operators, owners, and users alike must navigate this complex situation of accountability, making informed decisions on when and how to leverage AI. Another argument surfaces concerning the burden of proof on the damaged party.

²⁶ Tetiana Drakokhrust and Nataliia Martsenko, 'Short Commentary Artificial Intelligence in the Modern Judicial System' (2022) 1 J Mod Educ Res 5 <<https://www.doi.org/10.53964/jmer.2022005>> accessed 5 February 2024.

To hold any of the parties liable for the consequences of being negatively affected by AI, the damaged party needs to establish that the responsible entity could foresee and prevent the negative consequences. Only then can the liable party be held accountable for the damages incurred. Using the same standards and laws that are used in construction which shines the light on the lack of legal and standard procedures to use such technology. This places the burden on the claimant, opening the door for potential legal challenges and considerations in dispute resolution processes where AI is employed due to its risk.

Given the multifaceted nature of AI's impact on legal proceedings, insurance becomes a pivotal consideration. Parties utilizing AI systems in dispute resolution should contemplate insuring themselves against potential damages caused using AI. This proactive measure not only mitigates risks but also adds a layer of protection for all entities involved, fostering a more secure and responsible integration of AI into the legal field. Examining the specific aspects that AI can influence and facilitate in the dispute resolution process underscores the need for a comprehensive understanding of its capabilities and limitations. From streamlining document analysis to providing insights based on data, AI has the potential to enhance efficiency and offer valuable support to judges, arbitrators, and legal professionals involved in the resolution of construction disputes.

Some of the jobs that can have AI integrated in are as follows with their challenges:

1. Judge

- a. The first idea that comes to mind for a judge to be an AI would be the level of fairness and strictness of the rulings that would be issued in cases. Having a judge controlled by an algorithm indicates that the human touch is no longer available. As for the developer/manufacturer of the AI's algorithm should

not be bias nor can alter the code to suit disputes while changing it for others to favor a party over the other.

2. Paralegals

- a. Lawyers can replace their paralegals with AI which can help in finding the documents required faster and efficiently, but for that to happen all the case files should be fed to the AI system which poses a threat of hacking or leaking of confidential documents related to the case. This goes back to a full circle where the manufacturer and programmer should not alter or have interest in a case outcome between parties. These alterations can come as a form of maintenance or update to the system.

Understanding the challenges related to incorporating AI in construction disputes it is crucial to explore the benefits that this technology brings to the field. Examining these advantages not only sheds light on the potential gains but also emphasizes the level of transformation seen by using AI in dispute-resolution processes in the construction industry and its drastic Impact.

One significant benefit of integrating AI into construction disputes is its influence on the speed and efficiency of hearings resulting in more accurate and fair judgments by the heads of the dispute resolution method used. By utilizing AI to assist in analyzing and reviewing data presented during hearings we witness an improvement in dispute resolution timeframes. The ability of AI to provide insights into dispute complexities within a shorter period stands out as a key factor in enhancing overall efficiency.

This streamlined approach competes with traditional methods by offering a faster and clearer and more accurate path toward achieving just and accurate rulings. The integration of AI technology expands beyond data analysis within firms; it also involves leveraging AI to predict case outcomes or arbitration results introducing a predictive element into decision-making processes. Two universities have implemented a system that showcases the potential of AI in dispute resolution. This system utilizes an algorithm that has been trained with data from 584 court cases in Europe. Impressively it achieved an accuracy rate of 79% when providing rulings for cases²⁷.

While this might not yet meet the standards of court cases or ADR it does show promise and serves as an encouraging sign. The construction industry is now urged to invest resources and conduct further research to enhance the accuracy of AI algorithms. This pursuit aims to improve the dispute resolution process, and in some cases, even eliminate disputes altogether. The success of AI technologies in predicting case outcomes only intensifies the pressure on the construction industry to embrace this transformative technology. As advancements in AI continue to enhance its accuracy there is a growing need for increased investment and research within the industry.

The potential to achieve efficiency and reliability in resolving disputes becomes a driving force for embracing and adapting to AI capabilities. This shift towards digital court hearings marks a milestone in judicial systems with countries, such as Korea, Hong Kong, and Singapore leading the way. These countries have fully embraced digitalization eliminating the use of paper in their processes. This transition in court hearings not only simplifies legal

²⁷ *ibid.*

proceedings but also demonstrates a commitment to using technology for improved efficiency and accessibility in the justice system.

Conducting court hearings and sending rulings electronically to involved parties is an example of how legal processes are being modernized, creating a more seamless and responsive judicial environment. In the United States, AI is being uniquely integrated into the legal field specifically in predicting potential crimes based on historical data. This predictive technology could also be applied to the construction industry offering clients and contractors insights into disputes and the likelihood of resolution before entering into contractual agreements²⁸.

Through analyzing interactions and disputes between clients and contractors AI can provide valuable information to guide decision making allowing proactive measures to mitigate potential conflicts. This proactive approach aligns with the feature that is provided by implementing the use of AI to enhance risk management and strategic decision-making across various industries including construction. Moreover, AI has an impact, on improving resource allocation within the system itself for greater efficiency. In the United States AI judges are utilized for cases, which allows human judges to prioritize their attention to complex legal matters that necessitate a deep understanding of the law and detailed analysis. This approach effectively enhances the capacity of the judicial system to handle a wide range of cases in an efficient timeframe.

Estonia provides an example of how AI is efficiently implemented particularly in handling initial-level cases like accidents and divorces. The successful integration of AI in Estonia has significantly reduced the number of cases that require intervention by judges

²⁸ *ibid.*

enabling them to dedicate 90% of their time to addressing complex and challenging legal issues. This not only optimizes judicial resources but also ensures that cases requiring a higher level of legal expertise and interpretation retain the human sense.

3.4 Conclusion of Using AI in Construction Disputes

After exploring the role of AI in construction disputes, we come to a clear understanding of its potential impact and how it is shaping the landscape of resolving conflicts and disputes. By drawing parallels with AI integration in various fields it becomes evident that AI is a powerful tool that can enhance and support the complex process of resolving construction disputes. The numerous benefits discussed earlier highlights how AI can streamline litigation, and ADR where it can improve hearing efficiency and contribute to effective outcomes for all parties involved. With its ability to rapidly analyze amounts of data AI provides deeper insights into disputes leading to faster resolutions and reducing overall resolution time. Moreover, the dynamic nature of AI allows disputing parties to leverage this technology as a tool during negotiations.

By utilizing AI for data compilation and analysis parties can strengthen their positions substantiate their claims and carry out informed and constructive discussions. This dual functionality of AI as both an aid in the resolution process and a valuable tool for involved parties showcases its versatility and potential in the realm of construction dispute resolution. After analyzing examples from different cases and government initiatives as mentioned earlier it becomes clear that AI has already shown significant advantages in a wide range of fields. The success stories of countries implementing AI in their systems like Estonia's effective use to reduce judge intervention in specific cases offer valuable insights into the potential benefits that the construction industry can benefit from. Despite the existing complexities and challenges in

construction disputes it seems likely that with refinement and development AI can become an essential tool for promoting fair, efficient and transparent resolution processes.

However, we must acknowledge that AI's role in construction disputes is still at a stage and necessitates ongoing improvement. Construction disputes are intricate and complex presenting obstacles that require tailor made solutions. Therefore, it is crucial to guide the continued evolution of AI by prioritizing exploring methods to address these challenges while refining algorithms and enhancing adaptability to the intricacies of conflicts related to construction. while acknowledging the benefits and potential applications of AI in construction disputes, we must approach its integration, with a forward-thinking mindset. Embracing innovation and investing in developing AI tools specifically designed for the needs of the construction industry.

With the progress of technology and the continuous improvement of AI there is a great potential for it to bring about a significant transformation in the field of construction dispute resolution. This transformation promises to deliver a combination of efficiency, fairness and effectiveness that benefits all parties involved. The ongoing development of AI in construction disputes is pushing the come of an era where technology and human knowledge come together to establish a more efficient and fair process, for resolving disputes.

Chapter 4: Blockchain technology.

4.1 Introduction to Blockchain Technology

In 2008 a name came to light that by the passing of time became a very famous figure known as Satoshi Nakamoto. He introduced a groundbreaking technology that would reshape the industry of digital transactions and introduced information storage across the blockchain. Despite the widespread recognition of this name as the father of blockchain technology, Nakamoto's identity remains a mystery, adding an aura of perplexity to the origins of a technology that has surpassed its initial purpose of facilitating Bitcoin transactions. As we fast forward to 2024, the evolution of blockchain technology is nothing short of remarkable. Initially designed to facilitate the cryptocurrency world, it has now matured into a versatile tool, finding applications securing storage of information and the streamlining of transactions and business dealings. Looking at the bigger picture of technological advancements, blockchain stands out as one of the five critical milestones that have fundamentally altered the way societies preserve and interact with information.

The historical technological revolutions that include the invention of computers, personal computers (PCs), the creation of the internet, the creation of social networking, and finally, the emergence of blockchain, have collectively shaped the trajectory of human connectivity, communication, information management, and transactions. Among these milestones, blockchain distinguishes itself by providing a decentralized and tamper-resistant system that ensures the integrity and security of stored data. At its core, blockchain operates as a series of interconnected blocks, each containing a chain of information. This information spans a spectrum, that includes not only financial transactions between parties but also the secure exchange of information from one individual to another.

Remarkably, this technology adds another layer of security where the identity of both the sender and the receiver remains secure and undisclosed, this not only adds security but also an extra layer of privacy to the participants in a blockchain network. The security features inherent in blockchain technology are pivotal in guarding against foul play. Once information is stored in a block, it becomes impossible and resistant to tampering or alteration. This tamperproof serves as a shield, providing a robust defense against fraud, hacking attempts, and unauthorized alterations to the stored data.

A cornerstone of blockchain's security lies in the unique tag assigned to each block, known as a hash sum. This tag encapsulates not only the time of the transaction but also the signature of the preceding block, creating a chronological and interconnected trail of information. This continuity ensures the transparency and traceability of all transactions within a specific blockchain while maintaining the anonymity of the transactors. This feature facilitates a level of connectivity that was never introduced before in any form of technology. Businesses and parties involved in transactions within a blockchain network can seamlessly trace back and verify the entire history of transactions and information exchanges.

This capability not only ensures accountability but also serves as a powerful tool for gathering evidence in case of disputes or discrepancies. The continuous evolution of blockchain technology has helped in igniting a transformative capability known as smart contracts, redefining how contractual agreements are executed. In essence, a smart contract operates as a digital agreement between two parties, distinguished by its unique feature of programmable conditions that must be met for the contract to conclude.

This innovation can be integrated in different fields, but looking at the construction field it can be found particularly promising to apply, where the details and complexities of project

management and contractual fulfillment can benefit immensely from the automation and transparency that smart contracts bring to the table. Smart contracts being self-executing adds a layer of efficiency and reliability to contractual engagements.

The programmed condition within the contract serves as the criteria for concluding the contract, ensuring that all stipulated requirements are met before finalizing the agreement. This dynamic functionality offers an enormous advantage: firstly, if the conditions are not satisfied, the contract remains open, safeguarding the interests of the parties involved; and secondly, upon successful fulfillment, the contract automatically concludes, mitigating the need for manual intervention. In the context of the construction industry, smart contracts can be tailored to engulf specific work packages, such as soil improvement work.

The contract remains in an open state until the party responsible for completing the designated work package provides verifiable proof, agreed upon and linked to the blockchain. This firm verification process ensures that contractual obligations are met before the contract is closed, thereby fortifying the integrity and reliability of the agreement. One of the paramount advantages of implementing smart contracts in construction lies in their utility as evidentiary tools if dispute arises. The blockchain, acting as a tamperproof and secure platform, storing every interaction, proof submission, and fulfillment of conditions within the smart contract which can be used in the unfortunate event of a dispute, these blockchain records stand as irrefutable and time-stamped evidence, providing a transparent and tamper-resistant trail that can be presented in a court of law. This not only expedites the dispute resolution process but also enhances the credibility and enforceability of contractual agreements.

4.2 Benefits of Using Blockchain in Construction

The introduction of smart contracts through the blockchain is a key innovation has brought a drastic shift in the way agreements and contracts are executed. Unlike traditional contracts that rely on intermediaries and legal enforcement, smart contracts operate as self-executing agreements with predefined conditions embedded in code. This transformative capability has found particularly promising application in the construction industry in theory. The well-known idea of construction is that it never likes change might be shaken which might mark this technology as a disruptive technology.

It is said that construction is the second lowest industry to implement technology in its process of work. Some people would agree that this technology is best suitable for construction contracts due to the preservation of the terms and information on the blockchain, while others would disagree with that. For us to understand and be able to reach to a conclusion we need to dive into its tools such as smart contracts and how it is beneficial for the resolution of disputes in this industry. Smart contracts in construction can be designed to include specific conditions that must be met for the contract to be considered fulfilled. These conditions can range from the completion of a designated work package, such as soil improvement work, to the submission of verified documentation or proof.

Once the predetermined conditions are met, the smart contract automatically executes and is deemed terminated by completion of works without the need for manual intervention. This automated process reduces the potential for disputes arising from ambiguous or subjective interpretations of contractual terms. The information stored on the blockchain is immutable and tamper resistant. This ensures that the records of completed work packages and associated proofs are securely stored and cannot be altered or disputed. This puts a benefit for all parties

involved in the construction project, including contractors, clients, and other stakeholders, since they can have real-time visibility into the progress of work and compliance with contractual obligations.

The blockchain serves as a timestamped and secure repository for all interactions and proofs submitted within the smart contract. This immutable proof is extremely valuable in dispute resolution, providing a clear and chronological record of events. Based on an article called a decentralized structure to reduce and resolve construction disputes in a hybrid blockchain network a framework has been developed to accommodate the construction disputes in the industry. This framework is called Decentralized construction enabling transparent resolution (DCENTR)²⁹.

In this framework the construction companies work as nodes to the blockchain network. These companies can work as both users of the network and jurors, arbitrators, and mediators for other companies disputes happening in this framework. This method would allow the experts to be used in these disputes, reducing the external interference which means the dispute can be resolved in the construction industry. This main feature would reduce the financial and time impact on the dispute rather than assigning an external third party to reach a resolution. The second benefit for this framework is that the disputes once it arises it is dealt with in transparency and fairness. This framework starts by having all parties to the contract meet and agree on the rights and obligations of each party, after this process is finalized and everyone understands

²⁹ Murathan Saygili, Isa Emre Mert and Behzat Tokdemir, 'A Decentralized Structure to Reduce and Resolve Construction Disputes in a Hybrid Blockchain Network' <<https://doi.org/10.1016/j.autcon.2021.104056>> accessed 5 February 2024.

their rights and obligations it is placed in a contract with the conditions agreed upon. The parties enter this contract fully aware that this contract cannot be changed or altered.

Once this contract is fully deployed every activity that is required for the completion of the contract will have a section for it to be marked by the designated party to show progress of the contract's conditions. A question comes to mind on how will it be possible to track the expenses of the construction contract, to answer this question the developers of DCENTR have taken into consideration the financial aspect of it, where also the expenditure and the income from one party to another will be recorded and maintained in this contract as a condition that is placed in the contract before starting, as well as raising of dispute if required³⁰.

A method for the client that helps in ensuring that the payment going out to the contractor and is being used for the specific task it was intended to be by the contractor creating a subcontract in the main smart contract with the condition of completing this certain type of work in that framework. The client can send the required funds for that task which would be held in the blockchain until the fulfillment of that condition which would automatically conclude the subcontract in the main smart contract and releasing the funds from the client to the contractor. This gives the client a guarantee that the money would not be given to the other party unless the work is complete and the party that is required to complete the task will have the incentive to finish the task as fast as possible with the agreed quality to release the funds being held.

Once a task is complete and marked on the contract the client's representative would visit the location of work and check for quality and conformity with the design required. Once that

³⁰ Drakokhrust and Martsenko (n 25)..

representative does his check, he can mark it as one of these three conditions which would decide the method of payment automatically:

1. If the work fully complies with the requirements set: In this condition the client will approve the payment which will cause all the parties connected to the chain of payment to be paid simultaneously from the contractor to the subcontractor from the held funds placed by the client to the specified task. Once these payments are sent it is recorded and stored in the blockchain as evidence that the funds have been sent to prevent any human tampering or baseless blame of financial claims.
2. If the work is partially conforming with the requirements set. For partial conformity of works the same process is followed for the conformed work where the transaction for this portion of work is given out as for the unconforming works the payment for that portion of work would be held until a rectification action is taken and completed or the work is produced with the required level of quality, safety and following of specifications. For all of this partial conforming work the safety inspections, nonconformance reports (NCR) there is a location where the information and documents are placed on the blockchain in case of any dispute arising.
3. If the work is not conforming with the requirements set. For the non-conforming works an instruction is issued for reworks with the hold of the payment for the particle activity until the reworks is completed and submitted. If the one party disagrees with the issued instruction, a meeting is set between the parties to come to an agreement of works. IF this meeting fails to achieve this agreement a look at JUS-DCENTR is considered and an external party from the DCENTR group will investigate this dispute.

4. JUS-DCENTR stands as a transformative framework at the most critical and vital technological implementation of justice-seeking within its unique framework, positioning itself as a formidable force in the domain of dispute resolution. At its core, this innovative approach revolves around the involvement of diverse construction companies, making them an integrated part in this intricate system. What truly distinguishes this model is its crowd-based methodology, a deliberate departure from the conventional reliance on third-party expert witnesses. This strategic shift not only eases the financial burden associated with expert hires but also streamlines the temporal demands entailed in exhaustive investigations into the roots of disputes, contractual breaches, and rightful claims.

A major advantage of the JUS-DCENTR framework lies in its proactive incentive structure, establishing an environment where the pursuit of justice is not a mere expectation but an actively incentivized matter with beneficial results to other construction companies posing as the jurors, arbitrators, and mediators. The implementation of the Worth of Justice (WOJ) system stands as a clear example of this system, rewarding parties that consistently make correct decisions with a share of fees similar of arbitration costs. This incentive mechanism similar to a skill-based reward system serves as a major motivator for parties to consistently uphold the principles of justice, thereby generating an ethical and efficient dispute resolution process.

Furthermore, the Level-of-Justice (LOJ) incentive introduces a credibility point system, where parties accrue higher ratings for their unwavering commitment to delivering fair decisions³¹. This standardized metric becomes a benchmark for assessing the reliability and trustworthiness of a party as a potential jury or ADR driver in the dispute resolution ecosystem.

³¹ Ibid.

As parties accumulate higher ratings through a history of impartial and sound decision-making, they naturally evolve into more attractive choices for dispute resolution promising an elevated level of fairness, efficiency, and faster accurate resolution all while minimizing the financial, and ethical burdens typically associated with such processes. Fundamentally the integration of the LOJ incentive goes beyond its immediate impact, adding an extra layer of transparency and accountability to the construction dispute resolution process within the JUS-DCENTR framework. This integration reaffirms the commitment of the system to a fair, ethical, and efficient justice-seeking environment providing a comprehensive and innovative solution to the complex field of construction dispute resolution³².

As the jurors, arbitrators, and mediators are different construction companies their identity would be a threat to them if they rule against another party in the future due to future business possibilities, blockchain has that covered by concealing all the parties involved identities so no harm nor foul play can be made due to previous rulings. This gives a thicker layer of protection for all the parties involved.

4.3 Drawbacks of Using Blockchain in Construction Disputes

With all the benefits that blockchain provides in regard to construction disputes, one can only stop and think of its drawbacks and challenges. As mentioned before blockchain is transparent and can be traced by anyone who has the address of a certain transaction, but what happens when arbitration takes place and the documents that are uploaded on the chain is visible for all to see and go through. What would be the ethical implication of this feature on the proceedings, and better yet what would parties think in regards of having their documents shared

³² Saygili, Mert and Tokdemir (n 28).

with everyone who has access to the chain, another fruit for thought is when jurors have a different opinion how would the proceedings move forward from that. Crowded decision is a double-edged sword which makes it quite risky at times. For example, there are four jurors in the proceeding one agrees that party A is in the right, while the second agrees that party B is in the right, now the decision of the third juror might affect the decision of the fourth which in turn would make the ruling unjust unless the jurors are 100% impartial.

Another worry that might come to mind is that this process is happening online which puts a hacking, or scamming threat on the board of worries. Such many incidents that are reported, the well-known scam happening on the blockchain is having a live feed of the renowned chef executive operator CEO of tesla speak about cryptocurrency and how this program that is falsely being promoted would double the donated amount and have it sent back to the transactor. The nature of it being too good to be true did not stop naive people from falling into that trap this is realized by the Federal trade commission reports that have found almost seven thousand people have nearly lost eighty million dollars to this scam from October 2021 till March 2022³³. These scams are well known and easily identified; some other scams cannot be seen coming nor does it seem too good to be true such as the scam that took place in the late 2022 involving the exchange called feature trading also known as FTX.

This exchange has come into existence in May 2019 just before the craze that took place when crypto currency reached an all-time high. This exchange has scammed its users by convincing them to buy crypto currency on their platform while in the background the exchange has been using and investing people's money in high-risk reward trades without the information

³³ 'Elon Musk Impostors Scammed \$2 Million in Cryptocurrency, U.S. Says - The New York Times' <<https://www.nytimes.com/2021/05/18/business/elon-musk-cryptocurrency-fraud.html>> accessed 8 February 2024.

nor the agreement of the customers. And as it is mentioned in the names of these investments the risk was way too high which caused FTX to lose about eight billion dollars worth of people's investments. Once the customers started pulling their nonexistent money out of the exchange the exchange crumbled from the inside out with late funds sent to customers to the inability of pulling the funds out altogether.

As the technology starts getting more into different fields such as construction and construction disputes more intricate and complex scams will appear, and these scammers would start taking advantage of the fresh users who would fall in such scandals and scams if not careful and well informed about the usage of this technology. Another downfall of using blockchain in construction dispute resolution or any dispute as a matter of fact is that once the ruling is issued through the smart contract this ruling cannot be reversed or revised. This is due to the nature of the coding that is imbedded in the smart contract this code is known as law in the world of decentralized digitalization and blockchain. This means once the code is set no alterations nor changes can be made to it not even by the creator of the code. This puts a sense of lack of control in the parties of the proceedings and if by any chance the ruling was a flawed or false ruling there would not be a way to reverse it.

In addition to that challenge is the challenge of knowing how to use this technology, parties might be weary of using this technology due to the fear of mistakenly not being able to upload all the documents or evidence to support their position due to lack of knowledge of maneuvering and operating this technology. According to Aleksei Gudkov he mentions that the jurors, arbitrators, and mediators in a blockchain arbitration or hearing depend mostly on

common sense³⁴. This builds another form of challenge around these bodies not following the laws that are followed when traditional litigation, arbitration, or mediation is in process. This leads to the fact that these bodies with authority lack the knowledge required in terms of laws and regulations to carry the hearings and proceed with proceedings.

A survey was made that gave these bodies the ability to carry the proceedings under the Afghani law, which is unfamiliar by most bodies, it came out that sixty one percent were willing to proceed with the proceedings despite the lack of awareness and knowledge of the laws placed³⁵. As mentioned earlier the ruling bodies from the blockchain leading the proceedings lack skills and knowledge, but it does not stop at the laws, the jurors and arbitrators might be highly specialized in one section of construction but if a case is drastically complicated this knowledge in that section of construction might not be enough to reach a fair and just ruling which poses as a threat compared to the traditional drivers of the proceedings. Another challenge of using blockchain as the source of dispute resolution whether it is arbitration or litigation or ODR is that in some instances the whole digital platform might experience total outage or partial outage due to the high number of transactions that can flood it. In instances these outages might span from couple of minutes to a couple of days which in turn can disrupt the process of dispute resolution on the network. An example of this outage is a network called Solana which on the 25th of February it experienced an outage of eighteen hours and fifty minutes³⁶.

This fatal issue casts doubt on the use of blockchain in whether it is reliable to be used for important disputes such as construction. The last challenge that is explored that might rise is

³⁴ 'CROWD ARBITRATION: BLOCKCHAIN DISPUTE RESOLUTION'

<<https://cyberleninka.ru/article/n/crowd-arbitration-blockchain-dispute-resolution/viewer>> accessed 5 February 2024.

³⁵ *ibid.*

³⁶ 'Solana Status - Uptime History' <<https://status.solana.com/uptime>> accessed 5 February 2024.

that for every document, information, or transaction that is carried on the blockchain it would cost a certain fee for these documents or information to be transferred or sent. These fees depend on the demand that the network is facing for example a transfer of hundred thousand dollar worth of a currency called USDT was transferred using the Ethereum network, this transfer required a fee for it to be completed. The fee that was paid for this transfer was up to twenty-three million dollars worth of Ethereum. This is just a currency transaction which can be accepted or rejected and another attempt of sending such amount can be undertaken. Once the importance of the items being transacted increase the payment of the fee would become more of a necessity than before which would in turn increase the cost of the proceedings keeping in mind that these fees cannot be reversed or returned. This incident caused a lot of discussions and research on how to improve and prevent cases like this from happening.

4.4 Conclusion of Using Blockchain in Construction Dispute Resolution

With all the improvements and adoption of blockchain from the year it started in 2009 till our very day this technology has gathered a vast number of benefits and challenges. benefits can be attributed to the transparency of the transactions that happen on the network; this is conducted by the storage of the transactions made on the blockchain. The second benefit that is vibrant in using blockchain is trackability of everything that has happened on the network. By identifying the address that is of interest the history of all transactions made being sent from or to that address can be found which builds a level of credibility and safeguard against foul play in construction which in turn can assist in courts where a party states that the second party to the contract has breached a section of it, with a hard proof that this breach has taken place and a documents have been transacted to that party through the blockchain.

Another prominent positive remark for using blockchain in construction is that the transactions that happen are open to the world but the identity of the transactor and the person receiving the information remains anonymous, this doubles down on the idea of keeping the proceedings of the litigation, and arbitration confidential under the DIFC arbitration law in the UAE under article 14 which states unless otherwise agreed upon the matter between the parties all the information shared by the parties in the arbitral proceedings shall stay confidential and private unless it is required for the information to be public by the order of the court³⁷.

Let us not forget the benefits of blockchain aiding in ODR by streamlining and increasing security of submitted vital documents in the hearing on the blockchain, the compatibility of ODR and blockchain use is predominant in the aspect of this technological advancement, easy of proceedings, streamlining the process, and security of vital information shared by the parties. With all these benefits in hand we also looked at the negatives that plagued the use of blockchain and how that would affect its use on the construction dispute sector. As soon as the word blockchain is heard the main idea that comes with it is that it is filled with scams and is easy for people to hack it.

Example of such scams is the very well-known scam where the CEO of Tesla company Elon Musk is seen having a live stream on YouTube where he promotes and encourages viewers to donate crypto to a certain address in the promise of having that donated money sent back to the donors with double the amount. As obscure as it sounds a huge amount of people tend to fall for this scam. The latest biggest scandal that happened was with the exchange FTX. This exchange worked as a center for changing crypto currency from one form to another on the

³⁷ *ibid.*

blockchain, as well as using fiat money to buy these crypto currencies. This exchange started in May 2019 and by the end of the year 2022 this exchange filed for bankruptcy with having people's money tied to it that reached up to eight billion dollars in value. This made people understand that the crypto currency that was placed in that exchange was not under their control to begin with.

This scandal left a bad taste in the mouths of people who casually use the blockchain and especially people who do not have any information about this technology. The second challenge that plagues this technology is the learning curve it comes with for operators to be able to use it efficiently. Companies would have to invest in their infrastructure and employees to have them trained especially for this type of technology. On top of training a huge amount would be spent on awareness and education against scams since a mistake in this field can open a huge door of damages and loss. Due to the unforgiving nature of this technology a transaction that takes place cannot be reversed or be retracted by anyone, which means any piece of information that a party to the contract wants to send to the other part of the contract must be checked double check and triple checked before commencing with sending it to avoid any mistakes or wrong documents transferred to the other party.

It does not only apply to the documents parties send but also to the ruling of the dispute at the end of the dispute resolution process. A ruling is final once it is issued in the blockchain which means if any party comes to find an error in the proceedings, options might be slim to none in rectifying this error which leads to a new case with a new panel and arbitrators if they choose to go the arbitration path. In addition to the learning curve that is needed to know how to properly use the blockchain technology is also the lack of knowledge of the arbitrators and jurors that carry the proceedings in the blockchain with the laws and standards required.

The jurors and arbitrators in the blockchain use the skill of common sense more often than having the skills and knowledge to issue a ruling dealing with a complex dispute in construction. This poses a threat of having the ruling not deliver a just and fair ruling for all parties involved. This was seen by the survey that asked jurors if they were willing to provide their verdict following the Afghani law which they knew nothing about, this survey gave a shockingly high number of jurors stating that they would give their verdict despite their lack of information. Another challenge that can affect the dispute resolution process on the blockchain is the outages of the network, this means that the network cannot be used for any activity for a certain period. This can be seen with the network called Solana where on the 25th of February the network went offline for almost a full day³⁸.

This deemed all activities and tasks on the network suspended until it came back online. This can cause delays in submitting documents as there is a window of submitting these documents for it to be considered in the dispute resolution. This would also cause delay to the process since these outages happen due to the traffic of the transactions that are taking place on the network. The last challenge that was explored and talked about in the use of blockchain and how it can affect the dispute resolution process is the fee that can be charged for the transfer of information, as it is seen in transfer of a hundred thousand worth of a currency called USDT.

The transfer took place with a fee of twenty-three million dollars due to the extremely high demand that existed on the Ethereum network which was used to complete the transfer. All in all, blockchain technology has a huge potential in changing the process of how dispute resolutions are undertaken especially in the construction field. Nevertheless, these potential

³⁸ *ibid.*

benefits as of now is not enough to catapult it into the scene of construction dispute resolution due to lack of compatibility of how complex these disputes develop to be, in addition to that how the law and regulations would be implemented on such a vast decentralized network due to the lack of infrastructure and familiarity of the laws and processes of construction disputes.

Chapter 5: Empirical Data and Analysis

5.1 Survey for the Use of ODR, AI, and Blockchain in Construction Dispute Resolution

To do a literature review and see what people came up with about the use of these technologies in construction dispute resolution gives you an insight of what theoretically is possible. On the other hand, conducting a questionnaire/ Survey to see what people in different fields of construction think about these technologies provides you a different angle of understanding practically in the implementation of these technologies. To be able to understand what people in the United Arab Emirates think of these three technologies and if they would fit in our dispute resolution system specifically in construction. To be able to explore this a survey was made and distributed to people in construction, and blockchain with majority being involved in contracts and disputes with the following question structures. This survey was made using Survey monkey, and was distributed digitally using email, and links through social media. It took approximately 4 months to accumulate and analyze the data that was provided for this survey due to the time it took for people to respond.

The first group of questions works as an identifier on whether the survey responders have a background on ODR, AI, and Blockchain in general as well as being used in construction dispute resolution. The second form of questions revolves on what these responders thought in terms of benefits and challenges involving these technologies in our construction dispute resolution system in our current time. The third and final form of questions were about how these responders foresee the use or effects of the implementation of these technologies and whether they think it would benefit the construction dispute resolution field in the long run as well as how it would pose a challenge. We will start with the first group of questions:

1. Are you familiar with or participated in construction dispute resolution processes using online platforms (ODR)?
 - a. Yes
 - b. No
2. Are you familiar with the use of Artificial Intelligence (AI) in construction dispute resolution?
 - a. Yes
 - b. No
3. Are you familiar with or encountered or participated in construction dispute resolution processes facilitated by blockchain technology?
 - a. Yes
 - b. No

These questions were sent to more than two hundred people, among these people seventy-six people responded, the results came as follows:

Question 1. An astonishing amount of people have selected Yes with a percentage of 62 percent while 38 percent selected No. This is because the pandemic pushed the whole world to use this form of dispute resolution to resolve their legal issues be it from civil to construction disputes.

Question 2. Although AI is gaining a huge boost in popularity it was shockingly disappointing that most of the people who participated in the survey have answered No with a percentage of 79 while the remaining 21 percent have heard about theoretical use of AI in

construction dispute resolution similar to the DCENTR program system found in chapter four section one.

Question 3. Astonishingly not many people are familiar with the use of blockchain in construction disputes nor in normal life activities. The result for this question came back with a staggering 96 percent answering No and a 4 percent answering yes. The most known use for blockchain is to transfer digital currencies.

With the results of the first group of questions analyzed the picture starts to become clearer that the awareness of these technologies in the United Arab Emirates needs to be pushed by institutes that are thriving to integrate technologies in their infrastructure, as well as improve their method of processing documents. An example of such institute is the Khansaheb civil engineering institute where they use a program called Adobe creative cloud (ACC).

This software technology helps reduce the use of papers as well as transmit documents and information related to the project between parties effortlessly. These results show that many people started to understand how ODR works and have experienced it from the start of the pandemic in early 2020. The lack of awareness in regard to AI and blockchain technology being used in construction disputes show that the road is long, and improvement is necessary until we see the interest in these technologies reach to a point of an actual functioning model implemented in real life.

The second form of questions dived into the benefits and challenges that revolves around these technologies, and if they have encountered these technologies in their professional career.

1. If you are familiar with ODR or have encountered it, please indicate the aspects you find beneficial in using it for construction disputes:

- a. Time Efficiency
- b. Cost savings
- c. Accessibility
- d. Transparency
- e. Others

2. If you are familiar with ODR or have encountered it, please indicate the aspects you find challenging in using it for construction disputes:

- a. Time Efficiency
- b. Cost savings
- c. Accessibility
- d. Transparency
- e. Others

3. What potential benefits do you associate with integrating AI into construction dispute resolution?

- a. Improved decision accuracy
- b. Cost efficiency
- c. Data security
- d. Reduction of human element
- e. Others

4. What potential challenges do you associate with integrating AI into construction dispute resolution?

- a. Disconnection from human touch and empathy
- b. Cost efficiency

- c. Data security
- d. Infrastructure rebuilding
- e. Others

5. In your opinion, what advantages does blockchain technology bring to construction dispute resolution compared to traditional methods?

- a. Increase transparency.
- b. Immutability of records
- c. Security of transactions
- d. Complex technology adoption
- e. Others

6. In your opinion, what drawbacks does blockchain technology bring to construction dispute resolution compared to traditional methods?

- a. Steep learning curve.
- b. Trackability of transactions by all users.
- c. Security of transactions
- d. Complex technology adoption
- e. Others

Question 1. The most picked benefit that is seen in implementing ODR is “C” (**accessibility**) with a pick rate of 65 percent. It is only logical to have accessibility as the most seen advantage due to parties and users of this technology being able to conduct the dispute resolution process from anywhere in the world without having to attend physically. The second most picked benefit is “B” (**Cost saving**) with a pick rate of 15 percent. As expected, once we

eliminate the need to physically being present there is a huge sum of cost that is eliminated with it such as: transportation cost, accommodation cost as well as the cost of printing the required documents.

Choice “A” came in as the third most picked benefit with a pick rate of 14.5 percent which is **Time efficiency**. Although in this point especially people might be divided and lean towards this being a challenge than a benefit, this is due to the technical knowledge and maintenance required if the online means used to communicate crashes or loses connection due to internet or server issues. On the other hand, the other group of people who agree with this being a benefit see that the use of these online communication methods have been used since skype came out in 2003, as well as when the pandemic hit in 2019 these means were used extensively due to the work from home restriction due to the lockdown that was placed for almost a year.

The last 5.5 percent was taken by option “E” which is **others**. In this choice people wrote what they think was a benefit in using ODR some of these benefits that were written were the simplicity of providing information and documents needed, this is by sharing it digitally to the individual carrying out the proceedings, another benefit that was mentioned was the flexibility of the time where the ODR process starts and ends.

Question 2. This question talks about the challenges that responders think comes with the use of ODR. The highest pick rate was “B” (**cost saving**) with a pick rate of 45 percent. The cost required for training and having to maintain the general knowledge of using and navigating through all the steps and procedures to successfully perform a successful ODR session.

The second most picked choice was “A” (**time efficiency**) with a pick rate of 33 percent. With the high learning curve and the need of technical support in case something goes wrong in

the online communication software, as well as sharing the required documentation online it creates a level of disruption and time loss until the required knowledge of solving these technical issues are learned and applied. The use of internet across the world might also affect the use of ODR. For example, in Egypt the outage of electricity affects the use of internet even though it is just two hours per day if an online proceeding is taking place, it would disrupt it until the power is restored or the parties would have to agree on a certain time where the power outage would have passed. As for the UAE for example, power is never an issue which means the internet would stay connected unless a technical disconnection happens from the internet provider directly.

The third most picked answer was “C” (**accessibility**) with a pick rate of 20 percent. Unlike the first question, accessibility is one of the choices where it is found that people gravitate towards for benefits more than challenges. Although the ratio of people thinking it being beneficial to it posing a challenge is 3.25 it shows that there is no choice where you find all the people agreeing that it helps in dealing with construction disputes. People tend to find it difficult to deal with technology especially if it is being used in critical activities. The learning curve of utilizing all the features in the communication program, as well as the fear of mistakenly sharing wrong or critical documents that can cause them to be in an unfavorable position in the hearing.

Now that the questions of the benefits and challenges of ODR is answered and the results are analyzed it is dominantly obvious that the accessibility is the most agreed upon benefit in using ODR due to the reasons mentioned above. The second and third most benefits came in as Time efficiency and Cost saving respectively. The challenges that the responders picked were cost saving, time efficiency, and accessibility respectively. This shows the least picked option in the first question is the most picked option in the second question.

Moving to what the responders to the survey think of AI being integrated in the construction dispute resolution process. **Question 3** came with the investigation of the benefits that is accompanied with this technology. The most picked choice was “A” (**improved decision accuracy**) with a percentage exceeding the 70 percent. The use of AI aids the drivers of the dispute resolutions process be it in arbitration, mediation, and litigation. Through the literature review that was made earlier all the fingers point at the efficiency, fairness, and accuracy of rulings based on the documents provided by parties, as well as the roaming information about the person or persons driving the process whether they are fair and just and vice versa. This accuracy is achievable due to the intensive analysis of documents and information that the AI can find and is fed to come up with a ruling where the arbitrators, judge, or mediators can use to aid in providing the required ruling.

The second most picked choice with respect to the benefits found in integrating AI in construction dispute resolution was “E” (**Others**) where the most dominant benefit was time efficiency with a pick rate of 28 percent. It’s only evident that the time needed to analyze and come up with a summary of the documents submitted in a construction dispute resolution process would be drastically reduced giving the arbitrators, litigators, and mediators a clear idea of how the process should commence. Although the AI can provide the proper analysis depending on how strong the AI program is, the human intervention should always be there to decide on matters that requires a human intervention.

The third most picked benefit was “D” (**Reduction of human element**) with a percentage rate of 1.5 percent. This choice can be seen as a benefit due to the reduction of human error due to tiredness/ miss interpretation of laws and regulations. Although it is the third most picked benefit in integrating AI in construction dispute resolution, the pick rate is overwhelmingly low

which shows that not a lot of people see this a benefit. As a matter of fact, once we move to the challenges, we will realize that this is posing as a challenge more than a benefit.

Question 4 explores the challenges that accompanies the integration of AI in construction dispute resolution. The highest pick rate came as choice “A” (**Disconnection of human touch and empathy**). As mentioned previously in question 3 the 3rd highest pick rate was the reduction of human element which came at a low rate of 1.5 percent.

As a challenge it came up to a pick percentage of 88 percent. Eliminating the human element from construction dispute assessment works against the fairness and justness of ruling due to the complexity and interact details that accompanies such disputes. Using AI and following it blindly would element the reasoning behind some actions being taken, as well as the having the main goal is making one party win over the other rather than creating a negotiating environment where both parties would not be harmed, or if any harm is ensued it would be minimal with the ratio of damages faced by the claimant.

The second most picked challenge came out to be choice “B” (**Cost efficiency**). This choice came with a percentage rate of 11 percent which makes sense for people to pick due to the way the AI system is constructed. AI requires a huge amount of programing to capture the required specification it was built to execute, when it comes to construction these specifications become more complicated and prone to challenges and complex combination of scenarios that would cost hundreds of millions of dollars to build.

On the other hand, the computing power needed to keep such software running erodes as the complexity of data being fed to it increases. An example of cost incurred in running an AI

software is Chat GPT, with a huge loss of 540 million dollars in the year 2022 alone³⁹. Stanford University estimates that the average cost of building an AI chatbot application can range from 100,000 to 1,000,000 million dollars based on how complex the chatbot is, as well as the features included in it⁴⁰. This part of developing an AI application is the most expensive part that a company or a developer will face. Now that we scratched the surface of developing the AI system and how much it would cost, comes the maintenance cost that would be required frequently to make sure the system is running on full capacity without crashes or glitches that might be vital in complex field like construction especially in the dispute resolution section of it. Aside from the cost of developing and performing maintenance on the system the running cost of such a powerful tool can exceed the 100,00 dollars per day. Based on CIO coverage the estimated cost of running Chat GPT per day is at least 100,000 dollars⁴¹.

With the complexity of construction dispute resolution this cost can be catapulted to 400,000 dollars per day if not more. With both questions of the benefits and challenges that arise with the use of AI in construction dispute resolution the picture becomes clear about what people think of that technology, we see a trend where the improvement of decision accuracy as a well sought after feature in this field. This feature is vital to the construction dispute rulings because if a decision is not accurate and true a party that is in the right would be harmed far more than the harm that was inflicted by the other party.

³⁹ ‘ChatGPT Cost a Fortune to Make with OpenAI’s Losses Growing to \$540 Million Last Year, Report Says’ <<https://finance.yahoo.com/news/chatgpt-cost-bomb-openais-losses-125101043.html?guccounter=1>> accessed 27 February 2024.

⁴⁰ ‘Chatgpt’s Breakthrough: How Much Does It Cost to Build? | AWS in Plain English’ <<https://aws.plainenglish.io/chatgpts-breakthrough-how-much-does-it-cost-to-build-9ccce611982d>> accessed 27 February 2024.

⁴¹ ‘OpenAI’s ChatGPT Reportedly Costs \$100,000 a Day to Run – CIOCoverage- Driven for Technology Leaders’ <<https://www.ciocoverage.com/openais-chatgpt-reportedly-costs-100000-a-day-to-run/>> accessed 27 February 2024.

This accuracy is accomplished by assisting the head of the construction dispute procedure be it a judge, an arbitrator, a litigator by analyzing the documents submitted and providing a well summarized document that mentions the vital and critical information to the dispute. As for the challenges the most predominant one was the disconnection from human touch and empathy. Even though the accuracy of AI in providing information is vital the element of a human being is a major deal breaker for major disputes. The reason why a human element is necessary is that AI cannot fathom the human reasoning for some actions that are taken. If the AI was developed for analyzing and giving out rulings and verdicts without the negotiation element being investigated parties who enter in a dispute would not be working together in the future, this is where the human touch and reasoning kicks in. In conclusion AI and humans should work together to produce the best outcome of this technology.

Moving to **Question 5** we dive in the benefits that come with integrating the use of Blockchain technology in the process of construction dispute resolution. With the rapid adoption of Blockchain technology in all industries it started catching the interest of the legal sector as well. The benefit that captured the most selection in this survey was choice “B” (**Immutability of record**) with a pick percentage of 27 percent. The fact that once the documents are placed on the blockchain they are secured and protected from tampering is a big advantage in case a party claims that the other party does not have evidence, or this evidence was fabricated.

The second most picked choice came in as “C” (**security of transaction**) with a pick rate of 17 percent. The reason this idea is predominant in blockchain technology is because once a transaction or an information is transacted and placed in the chain no one can alter or change it, this means information throughout the project period can be reverted to for payment disputes, breach of contract disputes, or any other dispute that might arise from construction contracts.

What also makes the transactions secured is that it can be traced back to the issuer of the transaction. In this instance they might be money transactions or documents sent from any party to the contract. This advantage puts blockchain as a high candidate for using it in construction disputes as well as integrating it in construction companies to help promote and push the use of this technology in the most difficult industry to change.

The third most picked choice was “A” (**increased transparency**) with a pick rate of 16.5 percent. The increased transparency of the activities happening on the blockchain can be achieved by the traceability of transactions and documentation transferred through a smart contract. Any party involved in this contract be it directly or for specific work will have access to the documents and transactions that they are permitted to view based on the conditions programed in the start of the smart contract.

Question 6. After exploring the benefits of using blockchain technology in construction dispute resolution and what people think will be advantageous for implementing this technology, it is time to look at the challenges that people think would affect in the integration of this technology. The highest pick rate among the challenges was option “D” (**complex integration of technology**). This choice gathered a pick rate of 63 percent. The reason why the pick rate of this choice is way higher than all the choices in the benefits is due to the drastic change that needs to be made in any company’s infrastructure, as well as the changes that needs to be made in the legal sector of the countries. A big example of how it takes time and financial means for a company to change its old methods to a new technological method is the use of a software Aconex software. This software replaces all the old methods from raising inspections using hard copy documents to monitoring the progress of the project from the financial aspect as well as the constructability aspect. For employees of the company to be well trained in using

this software a lot of financial means and time is needed for training and sorting out issues that would arise from using technology in general. If the impact on a company would be this huge what would the impact on the legal system of a country would be. The integration of these technologies would scare justice seekers away from this new method unless the country pushes for it by advertising it and pushing it to the public. This would cost money and time until a change happens. Another financial affect would be the training of the judges, arbitrators, mediators to efficiently, and efficiently use this technology and not make mistakes in issuing verdicts.

The second most picked choice as a challenge in integrating this technology is “A” (**steep learning curve**). This choice has a pick rate of 20 percent which supports the first choice of challenges. The steep learning curve of this technology is scary at the start, the fear of being fooled by scams, the fear of creating an error in transaction of money of documents, and mainly the fear of using a technology that is not known by many. These are some of the fears that would make people move away from integrating this technology in one of the most critical parts of construction. Add to all these fears the incredible persistence and resistance of the construction industry to adapt to changes. The reason for this resistance is a simple phrase “if it is working do not change it”. For companies to change their ways would affect the confidence of their clients in completing the projects without delays and defects in the structure, finishing, or quality of work in general.

The third most picked choice was “E” (**Others**). This option had 5 percent pick rate, with people mentioning the worry of a blackout of electricity or the disconnection of internet worldwide, as well as the dependability on the internet and technology that if these features go

away the traditional work would be forgotten, and it would be almost impossible to return unless a huge amount of time has passed.

With all of the questions regarding the benefits and challenges are gathered and analyzed we can move to the final form of questions which talks about what the participants think of integrating this technology as a future benefit if they all are combined, whether or not the integration of these technologies would improve or disrupt and hinder the efficiency and fairness of construction dispute resolution, what are potential foreseen barriers/ challenges that may arise from the mass adoption of such technologies in construction dispute resolution, and how do they predict construction dispute resolution would look like by the continuous integration of these technologies.

1. How do you perceive the potential synergy of integrating ODR, AI, and Blockchain in construction dispute resolution?
 - a. Extremely useful
 - b. Very useful
 - c. Somewhat useful
 - d. Not so useful
 - e. Not useful at all

2. Do you believe that the integration of these technologies could enhance the efficiency and fairness of construction dispute resolution processes?
 - a. Strongly agree.
 - b. Agree.
 - c. Neither agree nor disagree.

- d. Disagree.
- e. Strongly disagree.

3. What barriers or concerns do you foresee in the widespread adoption of ODR, AI, and Blockchain in construction dispute resolution?

- a. Lack of technological literacy.
- b. Privacy concerns.
- c. Resistance to change.
- d. Legal uncertainties.
- e. Others.

4. How do you see the future of construction dispute resolution evolving with the continued integration of ODR, AI, and Blockchain?

- a. Greater efficiency.
- b. Enhanced accessibility.
- c. More inclusive decision making.
- d. Potential legal challenges.
- e. Others.

Question 1 explores what participants say/think regarding the potential of integrating all the technologies together to create one system with all the benefits as well as the challenges of these technologies. Majority of the participants have agreed on choice “B” (**very useful**) with a pick rate of 86 percent that the potential strength and benefit of combining these technologies together would improve the construction dispute resolution field greatly in terms of

accessibility, fairness and efficiency of coming up with decisions and rulings, as well as analyzing the documents related to any dispute, and with the security of information and transaction of information, payments, and other required documents related to a certain project. This analysis was reached using all the data that was collected from the previous two question forms as well as the last question form.

The second most picked option was “C” (**somewhat useful**) with a pick rate of 13 percent. The reason why some people have chosen this option would be to the lack of exposure to the AI, and Blockchain technologies and how they can be utilized to improve and enhance the quality of construction dispute resolution procedures as well as safeguarding the parties’ rights from any tampering and manipulation in the procedures. Another misconception that is widely spread is that since the transactions are traceable the information being transacted and sent from one party to the other can be exposed to the whole world to see.

Question 2 talked about the belief that the responders have in the effect of integrating these technologies on the fairness and efficiency of the construction dispute resolution. Based on the responses gathered choice “A” (**strongly agree**) has a pick rate of 56 percent believe that if these technologies are integrated the fairness and efficiency would increase due to the fast accurate analysis of documents provided by the parties involved in the dispute, while giving a method to conduct the proceedings with much more accessibility. The security that the blockchain technology provides in preventing tampering and changes to the documents transferred and transacted sum of money on the chain provides the peace of mind that the documents would be analyzed and studied in the fairest way possible.

The second choice that participants picked was “C” (**neither agree nor disagree**) with a pick rate of 23 percent. The reason people picked this choice is due to the lack of knowledge on

how these technologies would be integrated, let alone how would they benefit the construction dispute resolution field in terms of the fairness of the decisions that are being produced by the heads of the proceedings. As for efficiency as mentioned earlier, the time needed to deliver the knowledge of using these technologies in this field would be great with some errors happening in some cases until using the bodies leading these proceedings as well as the parties involved in the dispute.

The remaining choices were not picked which means only seventy-nine percent of the participants did not have an opinion about this question which poses a challenge in reaching a decisive conclusion on this matter. A further analysis would be required to have a more accurate analysis on the topic of these technologies being implemented.

Question 3 explores the barriers and challenges the participants expect to face in the future if these technologies spread and infiltrate the construction dispute resolution industry and dethrone the traditional methods that are currently being used. The most picked choice among these challenges came in as choice “C” (**resistance to change**) with a pick rate of 78 percent. The choice picked was expected due to the nature of how this field is. The ability to change or improve the construction industry is quite hard due to the mentality of fear of change. Due to the complexity and importance of this industry changes come with a big worry. Once new technologies are introduced the lack of standardization and how these technologies are legally controlled may cause disruption in this field. Now one can only imagine if these technologies are integrated in the field that resolves the disputes that happen in this complex field, changes to the laws and alterations will need to take place which would leave grey areas which can be exploited until the proper standards are created. We saw that with the FIDIC standard red book alone that changed more than 3 times with most of construction companies still use the 1999

version even though the 2017 version is available. Another reason why technology specifically is not that fast in its implementation in construction is due to the cost it comes with for altering the infrastructure of the company to have the integrated technology work smoothly as well as providing the technical training for operatives all these tasks would require more cost and time to get the employees of the companies aware and efficient on how to use these technologies let alone morphed in together.

The second most picked choice was “D” (**legal uncertainty**) this choice aligns with the reasons why this industry is one of the most industries resistant to change. This choice came in with a pick rate of 17 percent. Some of the comments that came in the last choice “E” (**others**) had the request of choosing option C and D due to how they are connected and affect each other in a major way.

The legal uncertainty comes from the nature of integrating new methods and technologies in a field, the loopholes, the coverage of almost all the complex scenarios that might arise in construction that could lead to disputes and how to reach to a resolution between the parties in dispute with minimum damage and fair outcome.

Question 4 explores how the participants forecast the state of construction dispute resolution with the continues exploration and integration of these technologies in the field. The most picked choice came in as “C” (**more inclusive decision making**) with a pick rate of 48 percent. We see this evolving and becoming a major feature in the integration of blockchain technology with the use of a framework like the DECENTER that motivates and encourages the other participants in this framework who act like jurors to study the case properly and issue a fair decision on the mater. As well as the companies that are in the framework who are picked

as the chair in the arbitration proceedings. And with the accessibility of ODR and the efficient, and accurate analysis of AI these benefits can be amplified.

As for the second most picked choice it came in as choice “D” (**Potential legal challenges**) with a pick rate of 40 percent. It is only natural that with new integration of technology in any field a new legal standard need to be put in place to protect the users and place a system to avoid any exploitation or use of loopholes. The only technology that is covered by the legal standard would be ODR which means the other two technologies would require more time, trial and error and constant refinement until the standers would be accepted by the giants of the field that would push the other companies in this industry to incorporate and start using these technologies as well.

The third most picked choice with a pick rate of 12 percent was “B” (**enhanced accessibility**). The reason why participants tend to also lean towards accessibility is due to the convenience they found in the period of the pandemic with arbitration, and litigation proceedings being carried online opened a huge door for performing these tasks with better consideration of parties being in different countries with the consideration of the legal jurisdiction that governs the contract and where it was conducted.

5.2 Survey Conclusion

After looking at the knowledge the public have on the technologies regarding construction dispute resolution, and what they have answered in the survey we can come to conclusion of how much exposure they really have on these technologies and what they think is beneficial to the field and what will cause a challenge in implementing these technologies. This was achievable by creating a survey that was 11 questions long with each question exploring a fair

number of details separated into 3 parts. Part 1 explores the familiarity of the participants to the technologies, part 2 explores the benefits and challenges in implementing such technologies in construction disputes, while part 3 explores the foreseen benefits and challenges that would arise due to the mass use of such technologies.

We can see from the data gathered from part 1 that the most familiar technology by the participants is ODR method with the most participation of seventy-six people. Moving to part 2 of the questions we find out that the most beneficial element that participants picked was the accessibility that ODR provides, this feature introduces the ease of conducting the proceedings of disputes, be it arbitration, litigation, and mediation, as well as the ease of sharing required documents for any dispute while the most predominant challenge that stood out was the cost saving due to increased training, maintenance, and alteration to the infrastructure of companies and legal department alike. The two other technologies even though they have been picking up pace in terms of development, adaption, and integration with different industries when the construction industry comes into play it seems that these technologies are not well known for their integration, or a better description would be these technologies are not favored by the giants in the industry.

The benefit that shined in AI was the improved decision accuracy, this makes sense due to the improved and enhanced document management and analysis, why the challenge that was competing with this benefit was the disconnection of human touch and empathy with rulings and decision making. As for the blockchain technology the most predominant benefit was immutability of records which is the main key feature of using this technology, as for the challenges due to how complex the construction dispute resolution gets the integration of such

technology would only increase the complexity of understanding, navigating, and integrating it for the field to use and utilize efficiently.

Looking at part 3 we found out that participants believe that the integration of all three technologies as a single system then integrating it in the construction dispute resolution would be very useful for the field where they strongly believe it would enhance the fairness and efficiency of the construction dispute process. They also weighed in on the challenges that would eventually slow down the integration of such technologies such as the resistance to change from the field to the legal uncertainties that would cloud these new technologies, but as a major look into the future of this behemoth of a field the precise and accurate decision making, and enhanced accessibility will be included while some other legal challenges will arrive for the pioneers of change and improvement in the field to solve.

Chapter 6: Conclusion

The construction is one of the oldest fields if not the oldest dating back to 400 BC. The role of construction evolved from providing shelter to developing and creating such beautiful high-rises, bridges, even infrastructure for cities and countries. Due to the continuous progress a standard was needed for people involved in this field to follow, hence the development of the FIDIC standard in 1913. Constant evolvement and development took place until the year 2017. With these improvements in technology in the construction field the need for a modified standard is predominant, the construction dispute resolution field must parallelly follow the improvements and integration of technology which was accelerated by the event of Covid 19 where the use of digital means to resolve disputes using ODR prevailed.

Another form of technology that made its way to the construction dispute resolution is the AI technology. The use of AI technology in this field would improve many features and provide better verdicts. The third technology is blockchain technology whose popularity has skyrocketed from the year 2008 till the current day, with a vast adoption and integration in different fields. This research paper has its limitations from recording disputes on the blockchain, the credibility and accuracy of using AI assisted procedures, and the adoption of such technologies in the proceedings of the construction dispute resolution.

The objective of this paper is to dive in the effects of the use of ODR, AI, Blockchain technologies on the process outcome and adaption in the construction disputes. The method of this research paper depended on primary, and secondary sources to see what other enthusiasts and professionals found, while implementing empirical method where information is gathered and analyzed.

The research paper is composed of 6 chapters the first being introduction, second being the first technology which is ODR, third is the second technology which is AI, and fourth is the third technology which is Blockchain, the fifth chapter is the empirical research conducted, and the final chapter is the conclusion of the research paper.

Chapter 2 explored the start of using ODR and what it was used for such as the copyright disputes that increased with the development of the internet, the effect of the pandemic in late 2019 disputes were shifted to the use of ODR due to the restrictions placed by social distancing and lockdowns.

The benefits found in using this technology was mainly the accessibility and flexibility of the dispute resolution process and document sharing with the heads of the hearing in construction field as well as other fields. Some of the challenges that emerged with the implementation of such technology is the requirement and need for decent knowledge of maneuvering such technology, disconnections due to power cuts, and internet disconnections.

Third chapter dived in the technology of AI and how it would affect the field of construction disputes. AI started way before its name came out with major experiments and improvements along the years with AI systems that won chess masters, to systems that can generate up to 79 percent accuracy to their rulings. Benefits that were seen in integrating such technology is the preciseness of decision taken, analysis of documents submitted by parties, and reduction of human error in such complex disputes.

As for the challenges that were found the reduction of human touch would make it more robotic and the consideration of human empathy would disappear. This would affect the fairness and fairness of the rulings issued, another challenge that was discussed was the potential cost of

integrating such technology with the development, maintenance, and education for the optimal use.

The fourth chapter dived in the technology of blockchain and the benefits and challenges it imposes on such field. The immunity from records and documents being tampered with, difficulty of hacking, and transparency of transaction of information poses as benefits that rates this technology as one of the highest technologies that grabs the interest of the construction dispute resolution pioneers.

Although the benefits are immense it comes with its challenges such as the complexity of integrating such technology, fear of scams and difficulties of learning such a complex technology in an even more complex industry that deals with immensely detailed situations. Fifth chapter looks at the results that came from the people who participate and work in the construction legal department as well as construction department in general.

A survey was conducted, and 3 forms of questions were asked, the first form of questions were about the familiarity and the exposure to such technologies in construction.

The second form of questions came as the benefits and challenges. The first technology that was explored was ODR with the Accessibility gaining the highest pick rate with a percentage of 65 percent which aligns with what the other researchers have concluded. The second question discussed the challenges with the highest pick rate being cost saving with 45 percent.

The third question discussed the benefits of using AI technology in construction disputes, the highest pick rate of choices came as improved decision accuracy with a pick rate of 70

percent with the challenge being disconnection from human touch and empathy with an 88 percent from question 4.

Question five and six explored the benefits and challenges of implementing Blockchain technology in construction disputes with the benefit of such technology being immutability of record with a pick rate of 27 percent and the challenge being the complexity of the adoption of such technology in an already complex field with a pick rate of 63 percent.

The third form of questions came in the shape of how the participants foresee the future of construction dispute resolution with integrating such technologies in one system, what are the benefits of creating such a system, what are the challenges, and how is the integration of these technologies will affect the field of construction dispute resolution.

The first question showed an insight that the participants believed that it would be very useful to integrate such technologies together in one system with 86 percent agreeing.

The second question showed that 56 percent of participants strongly agree that these technologies would increase the efficiency and fairness of the construction dispute resolution proceedings and outcomes.

The third question shows that the participants believe the major challenge that this industry will face in implementing such a system is the resistance to change with 78 percent of participants agreeing on such thing.

The fourth and last question shows what the participants believe the state of construction dispute resolution would be like with integrating such technologies with more inclusive decision making taking a percentage of 48 percent.

After the extensive exploration and investigation on how the use of ODR, AI, and blockchain technologies in construction dispute resolution would affect this industry, a verdict can be made where such technologies are still in their early period of improved and developed to further accommodate such complex matter to reach to a state where it would heavily benefit the industry, but for that to happen major research, trials, improvements, and incentives are required to push this industry to adopt and integrate such technologies.

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