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AI AND CONSTRUCTION DISPUTES: THE ROAD AHEAD!

Artificial intelligence (AI) is here! And its impact is felt in diverse domains including production, supply chain, distribution, R&D, corporate functions, customer service, sales and marketing to name a few. AI is steadily automating conventional practices, improving process efficiency and crossing manmade hurdles while ensuring increased accuracy.

So what is AI? AI is not merely automation of repeat tasks, such as record accumulation/pulling information from sources which are spread out. Rather, it is utilization of such accumulated data to simulate processes requiring human intelligence. Standout examples of AI's application include Tesla's self-driving cars¹ Google Maps², and Facebook/Instagram predictive interface technology³.

The engineering and construction domain is no stranger to innovation and technological advancement - AI included. AI need not merely be automation of software processes and could have linkage to specialised hardware delivering an intelligent function which previously required human involvement. For instance, Boeing's Echo Voyager – unmanned deep-sea robot assisting in O&G exploration⁴, and drones on construction sites, which engage in a process called 'reality capture' – digitizing the physical world, and ability to present data (including progress) on two and three dimensional basis⁵.

“The adoption of AI will necessitate revisiting established processes and adapting them at a sensible pace to ensure least disruption”

AI's potential could also benefit processes and whereby similarities and differences are identified through data analysis, and to better manage schedules and spot potential issues in large scale construction projects. At an even more advanced level, AI's predictive power is employed to analyse 'What-If' scenarios and to plan for contingencies during the course of project execution⁶.

“AI does house great potential from the construction disputes avoidance perspective and it is not impossible to imagine a future where the quality of disputes increases”

¹ [Artificial Intelligence & Autopilot | Tesla](#)

² [Google Maps using artificial intelligence to help point people in the right direction | ZDNet](#)

³ [Facebook and Instagram's AI-generated image captions now offer far more details | TechCrunch](#)

⁴ [Boeing's Monstrous Underwater Robot Can Wander the Ocean for 6 Months | WIRED](#)

⁵ Drones go to Work – Chris Anderson, May 2017, Harvard Business Review's 10 Must Reads on AI, Analytics, and the New Machine Age [Drones Go to Work \(hbr.org\)](#)

⁶ Transforming the Construction Industry – Kathleen Walch, Forbes, [AI Transforming The Construction Industry \(forbes.com\)](#)

APPROACHING AI

AI as a wide field can be approached through different angles which assist in better understanding. On a capability basis AI can be categorized as encompassing⁷:

- i) **Process Automation** – Robotic process automation of common digital and physical tasks (back office administrative and financial activities)
- ii) **Cognitive Insight** – Detecting patterns through large volumes of data and interpreting their meaning (predictive analysis, detect discrepancy in real-time, identify safety or quality problems and accurate modelling)
- iii) **Cognitive Engagement** – Smart engagement with employees and third-parties (including clients, subcontractors and suppliers) aimed at servicing functions which required human involvement (technical support functions, responding to common queries and supply chain recommendations based on specification)

However, a capability-based approach is likely to be generic from a disputes perspective. Alternatively, a technology/application-based approach is useful given that it focuses on practical application as detailed below:

- i) **Data Analytics** – The collection, transformation, and organisation of data in order to draw conclusions, make predictions, and drive informed decision making⁸. Data Analytics is currently used in the construction industry are Building Information Modelling (BIM), drone imaging technology and Electronic Document Management (EDM) system.
- ii) **Machine Learning** – AI programme with ability to learn from datasets, identify patterns/discrepancies and to predict outcomes. Utilized to improve design quality, create safer project site, assess and reduce risk and increase project's lifecycle by pinpointing O&M needs⁹
- iii) **Blockchain** – A common and autonomous electronic ledger of digital information (such as records, events, or transactions) which is protected, incorruptible, immutable and is maintained through a decentralised network.¹⁰ Cryptocurrency (Bitcoin) is based on this AI application. Currently applied for predictive asset maintenance, accelerated payment processing, instantaneous collaboration, streamlined supply chains, smart contracts on track.
- iv) **Smart Contracts** - A computer coded digital contract which records and executes the terms of an agreement made between two parties built on blockchain foundation¹¹.

⁷ Artificial Intelligence for the Real World – Thomas H. Davenport and Rajeev Ronanki, Harvard Business Review's 10 Must Reads on AI, Analytics, and the New Machine Age [Artificial Intelligence for the Real World \(hbr.org\)](https://hbr.org)

⁸ [Google Data Analytics Professional Certificate | Coursera](https://www.coursera.org/certificates/google-data-analytics-professional-certificate)

⁹ How Machine Learning is Making Construction More Human, Grace Ellis, Autodesk Construction Cloud, Digital Builder Construction Blog, [How Machine Learning Is Making Construction More Human - Digital Builder \(autodesk.com\)](https://www.autodesk.com/insights/articles-views/how-machine-learning-is-making-construction-more-human)

¹⁰ Overview of Blockchain Technology: pdf (iop.org)

¹¹ [What is a Smart Contract and How do Smart Contracts Work \(bitdegree.org\)](https://www.bitdegree.org/what-is-a-smart-contract)

The application of these concepts need not be independent and are interlinked when serving a practical AI function. Moreover, predictive AI systems becomes stronger through analysis of historical data and quality of information accessible.

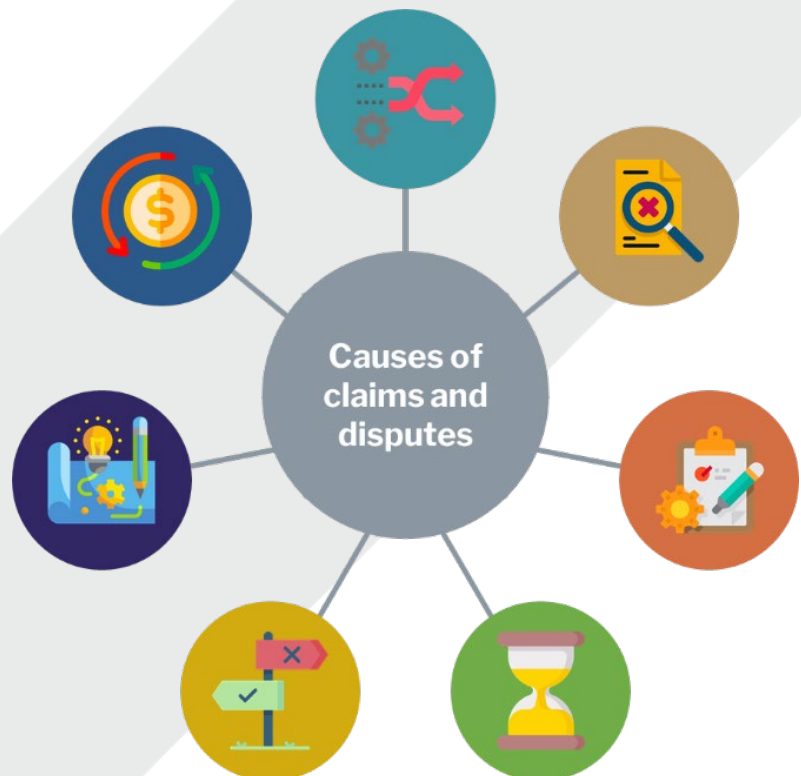
DISPUTE CAUSATIVE FACTORS

To understand AI's impact on construction and engineering disputes, it made sense to get to the root of the problem and address the dispute causative agents and how they could be prevented. To do this we used HKA's CRUX Report¹².



The CRUX report identifies the top causative factors for engineering and construction disputes from a global and regional perspective based on in-depth data accumulated from over 1,100 projects spread across 88 countries representing a total CAPEX of greater than US\$1.8 Trillion.

This Report identified 15 headline causes of claims and disputes between 2018-2020¹³. From which, the 7 causes wherein AI could serve as a deterrent are identified and explained below on a high-level basis:



¹² [2020 CRUX Insight: Engineering and Construction A Regional Analysis of Causation | HKA](#)

¹³ [CRUX Findings \(Page 6\), 2020 CRUX Insight: Engineering and Construction A Regional Analysis of Causation | HKA](#)

i) Change in Scope

This top dispute factor is triggered through change orders or variations during the course of construction contracts. The predictive capabilities of Data Analytics and Machine Learning have the potential to identify the possibility and extent of variations by focusing on reference points including stakeholders (employer, consultant/engineer, contractor, subcontractors/suppliers) behavioural patterns (including for scope, specification and schedule changes), inadequate/unclear project objectives, possibility for replacement of materials and procedure, and forecasting eventualities linked to weather conditions, safety considerations, government regulations, economic conditions, supply chain impact and other unforeseen issues. The accuracy of predictive analysis is likely to improve with time as more data is presented and corrections are factored into the underlying algorithm¹⁴.

A current trigger to this dispute factor is when the contractor receives revised drawings, which are not clear and unaccompanied by a change order. Through integration of Blockchain and Smart Contract technology with Building Information Modelling (BIM), any changes made to the design will be recorded as a new block and it would automatically trigger the requirement for formal issuance of change order.

ii) Contract Interpretation Issues

It would be far-fetched to assume AI has the ability to solve contract interpretation issues entirely. However, it might reduce the number of contractual interpretation issues which arise during the project lifecycle. Data Analytics and Machine Learning by digesting the contractual framework, correspondences and behavioural patterns, can demarcate areas wherein unanimous contractual interpretation and compliance by stakeholders has been observed. From a dispute standpoint, this is likely to narrow down contentious issues to facilitate efficient resolution.

iii) Contract Management and Operational Performance

This dispute cause takes into consideration contract management issues at different levels, including with employer/contractor/subcontractor/supplier, and operational performance. This is a section wherein the entire suite of AI technologies discussed above are likely to be of relevance. The combination of Block Chain and Smart Contract technology helps to keep project execution on track by providing a uniform real-time interface which:

- assists in identifying activity/obligation to be complied by stakeholders,
- duration within which compliance is to be undertaken,
- collateral impact and liability for failure to comply, and
- potential remedies in the event of non-compliance.

Given the scale of large construction projects, the ability to have contract management personnel of diverse stakeholders on the same page will assist in addressing management issues at an early stage. Data Analytics and Machine Learning from a predictive perspective can identify areas wherein fine-tuning in the operational chain is required for improving efficiency.

¹⁴ Significant Causes and Effects of Variation Orders in Construction Projects. Extracted from [Significant-Causes-and-Effects-of-Variation-Orders-in-Construction-Projects.pdf \(researchgate.net\)](https://www.researchgate.net/publication/351111111)

iv) Delay Issues

The dispute factor associated with delay encompasses late issuance of design information, access to site/workforce being restricted and/or late, and approvals which are delayed. There are two major contributors to which complicate addressing delay, and these are:

- identifying the party responsible for the delay, and
- consideration of delay at a later/exaggerated stage (mostly when nearing project completion).

The entire suite of AI technologies can assist in reducing delay. The Blockchain and Smart Contract function can track party-specific time-related obligations in real time during project lifecycle and assist in attributing delay for specific events when the deadline is missed. The predictive side of AI through Data Analytics and Machine Learning can identify the probability of delay – assist in highlighting the potential activities to be impacted, offer opportunity for course correction, facilitate addressing delay issues in site meetings, identify logical and sequencing errors, and label activities requiring action with best practices to serve as a guiding beacon¹⁵.

v) Claims Packaging

Claims which are spurious, over-inflated, opportunistic and/or unsubstantiated fall within this category. The success of claims depends on the credibility associated with the dataset on which they are based. By engaging integrated solutions offered by Blockchain and Smart Contract technology, dataset authentication can result in focusing of legitimate claims and provide clarity on contractual entitlement.

vi) Design Issues

This dispute factor encompasses incomplete or incorrect design. For portions of a design which are conventional or are supported by a historical dataset, AI can assist in identifying design inaccuracies or lack of completeness. On a pre-emptive basis, this can prevent the back and forth through Request for Information (RFI) process and prudent utilization of time.

While BIM has helped to root out design inaccuracies, when new information gets added, revised or modified continuously, discrepancies tend to arise. To compliment such existing technologies, Blockchain has the ability to maintain an accurate and incorruptible record with a digital timestamp whereby every progress, change or new information will be recorded as a new block, requiring validation by all parties concerned to become a permanent block in the chain. The use of Blockchain will not only simplify and organize the documents better. This will greatly mitigate misunderstanding caused due to design discrepancies and resulting disputes.

vii) Payment Issues

AI may have the potential for reducing the contentious nature of payment issues, especially the ones relating to certification, milestone payments, penalty imposition, bank guarantees and variations. Usage of Blockchain and Smart Contract technology is likely to provide clarity on the satisfaction of contractual triggers relating to payment entitlement.

¹⁵ [Using AI and machine learning to predict construction schedule delays \(oracle.com\)](#)

In practice, this technology utilises the established “if... then...” concept underlying Blockchain whereby each subsequent activity (block) is conditional upon the completion of activity before it and/ or a list of pre-defined contract conditions¹⁶. Upon respective stakeholders meeting these conditions, automatic transfer of the valued sum is triggered making the process seamless.

CONCLUSION - PINCH OF SALT

While an attempt has been made to provide high-level insight into the question of AI serving as a deterrent for engineering and construction dispute causes, widespread adoption is unlikely and focus will be on catering to small pockets. The adoption of AI will necessitate revisiting established processes and adapting them at a sensible pace to ensure least disruption.

More importantly, AI is not what pop-culture portrays and it is a misconceived notion to regard AI as replacing humans and changing construction practices as it exists. Given complexities in this domain maximizing efficiency cannot be undertaken without human involvement. The biggest challenge is to ensure that AI delivery is on par with human intelligence, and this can only be undertaken through involvement of diverse industry professionals involved at different levels contributing towards creating, maintaining and error correcting applicable algorithms and keeping them practically relevant.

AI does house great potential from the construction disputes avoidance perspective and it is not impossible to imagine a future where the quality of disputes increases. On the downside, disputes may also involve uncertainties brought about by application of AI.

We intend to follow-up with other publications which deep dive into specific AI concepts and their practical applicability.

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¹⁶ [Blockchain and construction: the how, why and when - BIM+ \(bimplus.co.uk\)](https://www.bimplus.co.uk)