



Global construction update

The innovation issue

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ReedSmith

Driving progress
through partnership

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[Access our previous newsletter editions: the sustainability issue; the nuclear issue; and the volatility issue.](#)

Global construction update

Welcome

One year on from the launch of Chat GPT on November 30, 2022, technology and innovation remains a top priority for Reed Smith and its clients. Most would agree that the world changed profoundly when Chat GPT hit the market – not only because its technology was now widely accessible but also because the true potential of AI to transform our world came sharply into focus. The construction industry has always been at the forefront of innovation – pushing the boundaries of possibility through staggering feats of architecture, engineering, and construction methods. In its time, the Brooklyn Bridge in New York was the longest suspension bridge ever built and was hailed a “wonder” of the industrial world, while Dubai’s Burj Khalifa, the world’s tallest building at 828 meters tall, reflects the literal heights to which current building technology extends. As the construction industry looks to the future, the potential for technology to deliver time and cost efficiencies on projects is a hot topic, particularly given the current climate of economic and political volatility. The drive towards more environmentally friendly and sustainable construction methods also demands innovation as the potential impacts of climate change remain a worldwide concern.

As 2023 draws to a close, this edition of Reed Smith’s global construction update explores the theme of “innovation,” including the opportunities that technology and new contracting methods present, along with the legal risks involved.

In this edition:

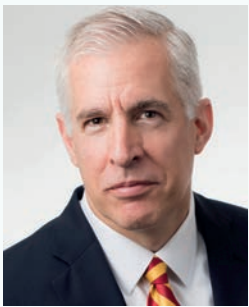
- Nicolas Walker (Partner), Yashovardhan Seth (Associate) and Vanessa Thieffry (Associate) (Paris) explore how comprehensive energy management frameworks, namely subscription-based EaaS and CaaS models, are disrupting the energy industry.
 - Antonia Birt (Partner) and Avinash Poorooye (Associate) (Dubai) highlight potential liability risks in projects driven by “building information modeling” (BIM) and consider how stakeholders can mitigate those risks.
 - Laura Riddeck (Partner) and Kyle Sethi (Senior Associate) (London) consider how 3D printing has revolutionized the construction industry and the legal risks presented by its more widespread use.
 - Clément Fouchard (Partner), Erwan Robert (Senior Associate) (Paris), and Deborah Behar (Legal Manager of VINCI Construction Grand Projects) explore the benefits of AI during the life cycle of a project. They also grapple with the fundamental question of whether and how AI can produce faster and better projects, as well as fewer disputes.
 - Tim Cooke (Partner) answers questions from Michael Chee (Associate) (Singapore) about developments and trends in Asia’s construction industry, including the increasing use of BIM, AI, and smart contracts for better project and contract management.
 - Sachin Kerur (Partner) and Alison Eslick (Senior Associate) (Dubai) put a spotlight on five of Saudi Arabia’s most eye-watering GIGA projects and the legal challenges their innovation presents.
- The second half of 2023 has also seen our global construction practice honored in various directories. Select examples include:
- Peter Rosher was named in the *2024 Best Lawyers France* rankings for Construction and International Arbitration. Vanessa Thieffry was also included in the “Ones to Watch” category.
 - James Doerfler was named in the *2024 Best Lawyers America* rankings for Construction Law.
 - Jarett Dillard was identified in the *2024 Best Lawyers America* “Ones to Watch” list for Construction Law and Litigation – Construction.
 - Peter Rosher, Michelle Nelson, and Sachin Kerur were ranked in *Who’s Who Legal* for Construction.

Finally, over the course of the last six months, our construction lawyers have attended and presented at numerous industry events and authored several thought leadership pieces. Highlights are as follows:

- John Simonis, Dan Hagedorn, and Ashley Jordan (Orange County) held a client webinar on “Construction contract negotiation and claims issues with respect to wrap insurance.”
- Francisco Rodriguez (Miami) was a panelist at Reed Smith’s MIAS Membership Meeting speaking on “Construction Damages: Counsel and Expert Witness Perspectives on Damage Calculations in International Arbitration Proceeding.”
- James Willn and Finlay Donaldson (Dubai) presented on nuclear energy projects in the Middle East and the unique regulatory and execution issues they involve.
- Peter Rosher, Vanessa Thieffry, Erwan Robert, and Clement Fouchard (Paris) hosted the *Association Française pour le Droit de la Construction et de l’Immobilier* (AFDCI) for an even exploring the topic of “New Technologies in the Construction Sector.”
- The UAE construction team hosted a “Construction Quiz Night” attended by clients, experts, and contacts.
- Sachin Kerur (Dubai) presented at the “Leaders in Construction Summit” in both Saudi Arabia and the United Arab Emirates.
- Antoine Smiley (Austin) and Matt Houghton (San Francisco) attended the AAA Construction Conference in Los Angeles.
- Lianjun Li, Matthew Townsend, and Patrick Chong (Hong Kong) co-authored the Investment Treaty Arbitration Review chapter on “Construction and Infrastructure.”
- Richard Ceeney (London) presented training on behalf of the CLLS on the topic of “Bonds, guarantees, and standard forms and insurance.”
- Alison Eslick (Dubai) moderated the final webinar in the Reed Smith and HKA webinar series titled “Maximising female talent in construction: Pay it forward – why mentoring and male allyship matter for women in the construction industry.”
- Michelle Nelson (Dubai) was a panelist at the CIArb and SCL(Gulf) event titled “Quickfire Q&A session” in Abu Dhabi.

To all our clients and contacts, we hope you enjoy this edition. We look forward to our continued work together and reconnecting in 2024.

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Beyond traditional models: How subscription-based EaaS and CaaS models are disrupting the energy industry

The construction sector stands to gain considerable advantages from the emergence of innovative models such as Energy as a Service (EaaS) and Comfort as a Service (CaaS). EaaS and CaaS have been instrumental in optimizing energy consumption within buildings by leveraging technologies such as smart sensors, internet of things (IoT) systems and energy management systems, enabling EaaS/CaaS providers to monitor, control and optimize energy usage. This leads to reduced energy waste, lower utility bills and a smaller carbon footprint. EaaS/CaaS often integrates renewable energy sources such as solar panels or wind turbines, which contribute to the use of cleaner energy and align businesses with their sustainability goals by reducing greenhouse gas emissions and environmental impact.

EaaS and CaaS are comprehensive energy management frameworks that encompass the entire energy value chain, from energy sourcing to infrastructure development, operations and maintenance, and demand management.

Instead of selling equipment such as solar panels and geothermal pumps, or delivering a product such as a contract for electricity or heat supply, service providers shift to selling “the outcome” generated by the equipment. In other words, the service provider delivers energy (kWh) and/or comfort facilities such as cooling, heating, lighting and compressed air, and end customers pay for the service they receive rather than the physical energy product.

In EaaS/CaaS models, the service provider installs, maintains and retains ownership of the power production or building services equipment, recovering the costs through periodic recurring payments made by the customer. The customer benefits from lower usage costs, the absence of upfront capital investments and a transparent pricing structure, while the service providers will benefit from a long-term sustainable revenue stream.

When considering energy-efficient innovative projects, building contractors, designers, developers and building managers should be aware of and consider incorporating these new service delivery models.

Brief background

In the early 2000s, solar energy suppliers started installing solar panels on building roofs and selling the solar power they generated back to the occupiers (customers) at a fixed price. Occupiers could save money by using solar energy without having to buy, install or maintain their own solar infrastructure. This was one of the first examples of EaaS, where both the provider and the building user benefit from an innovative energy pricing model.

However, there was limited uptake of these service-based models, owing to substantial initial expenses, a perception of heightened risks, uncertain profitability, competing priority investments, insufficient maintenance expertise and limited financing alternatives.

More recently, apart from the fact that there has been an increase in the uptake of connected buildings, building information modelling (BIM) systems and new regulatory regimes requiring energy and heat efficiency in new building projects, an increased use of EaaS has been driven by a demand within the commercial sector to streamline their energy needs, emphasizing cost efficiency and sustainability. These businesses aim to enhance their ability to control energy expenses while dealing with changing time-of-day demand patterns, evolving sustainability objectives and fluctuating expenses.

This innovative business model, featuring a subscription-based payment system, effectively addresses significant financial obstacles and promotes a faster uptake of energy-efficient technologies. It is well suited to both small and medium-sized enterprises (SMEs) and large businesses. SMEs benefit by receiving integrated energy-efficient solutions but do so without burdening their limited capital. This significantly lowers the perceived risks involved. Large businesses benefit by meeting sustainability objectives, either laid down by governments or driven by socially conscious citizens or investor groups, and by demonstrating environmental leadership with a commitment to sustainability and corporate social responsibility.

Functions and advantages over traditional models

Traditional energy management models usually involve facility owners who are energy consumers and who own and independently operate their energy infrastructure, including power generation, heating, cooling and lighting systems. For example, a building owner will typically own all of a project's integrated climate control equipment and internal electrical distribution systems. These traditional models require substantial upfront capital investments for infrastructure acquisition and the ongoing responsibilities of maintenance, repairs and daily management. Financial risks are inherent, as building owners grapple with the unpredictability of energy prices and market dynamics. Budgeting for energy costs becomes a complex challenge, marked by fluctuating expenses and unexpected maintenance outlays. Environmental sustainability also often takes a backseat in traditional models, where reliance on conventional technologies and fossil fuels may overshadow the adoption of energy-efficient solutions and renewable energy sources. Additionally, traditional models may lag in embracing innovative technologies, lack performance guarantees and divert organizational resources away from core activities. The shift to EaaS/CaaS models offers an attractive alternative, alleviating many of these challenges and fostering sustainability and performance assurance, through partnerships with specialized providers.

EaaS and CaaS operate through a process that begins with an assessment of the customer's energy needs and sustainability objectives. Following this, a customized energy solution is designed by the service provider, incorporating energy-efficient technologies and often renewable energy sources. The EaaS provider takes charge of installation, implementation and continuous monitoring of the system's performance. The service often owns the required equipment. Regular maintenance and upkeep are also part of the service, ensuring the system operates reliably and efficiently. Instead of upfront expenses, building owners and users pay a regular subscription fee, making budgeting more predictable.



Service providers, in turn, benefit from revenue stability, as EaaS/CaaS subscriptions offer dependable, recurring income streams that reduce the revenue volatility often associated with one-time sales. Service providers also cultivate long-term partnerships with building owners and users that can lead to additional business opportunities and referrals. Also, these models offer performance-based income, allowing providers to tie their earnings to the achievement of specific performance metrics. Furthermore, providers can gather valuable data on energy or comfort usage, enabling them to refine their services and create customized solutions for consumers based on insights derived from the data.

Current and prospective projects

In this section, we explore ongoing and potential EaaS/CaaS initiatives that exemplify the evolving landscape of energy and comfort solutions. These projects demonstrate how EaaS/CaaS models are being applied across various sectors and regions to enhance sustainability, cost-efficiency and consumer experiences. They also raise novel legal issues.

Smart cities

EaaS/CaaS models hold significant potential in the context of smart cities, contributing to energy optimization, sustainability and overall urban quality of life. In smart cities, EaaS/CaaS providers can offer a range of energy-efficient solutions, such as upgrading street lighting, enhancing public buildings and optimizing transportation systems. These services reduce energy consumption and operational costs while supporting the city's green initiatives. Additionally, EaaS/CaaS can facilitate the integration of renewable energy sources such as solar and wind into city grids, promoting local clean energy generation. EaaS/CaaS can also support the development of microgrids, electric vehicle charging infrastructure, demand response programs, smart building technologies, energy storage systems and data analytics solutions. Collaboration between local governments, service providers and private sector entities can unlock the full potential of EaaS, enabling smart

cities to achieve their sustainability goals while enhancing energy efficiency and resilience. However, the use of EaaS/CaaS in this context often requires sophisticated regulatory environments that allow for private distribution networks and flexible town planning controls.

By way of example, Siemens initiated a project in Berlin, Germany, to rejuvenate the historic Siemensstadt area and transform it into Siemensstadt 2.0,¹ a contemporary, sustainable, and intelligent urban district. An EaaS model will be used, encompassing energy-efficient building solutions, renewable energy integration and the implementation of smart infrastructure.

Hotels

CaaS in hotels is a multifaceted approach that prioritizes guest comfort, sustainability and operational efficiency. This service leverages smart technologies, including advanced heating, ventilation and air conditioning (HVAC) systems, lighting controls and room occupancy sensors. These technologies ensure that guest rooms and common areas are maintained at optimal comfort levels while also conserving energy. Guests benefit from personalized experiences with intuitive controls through mobile apps or tablets that allow them to customize room settings to their preferences. CaaS not only enhances guest satisfaction but also contributes to sustainability efforts by reducing energy consumption and operational costs. For hotels, this approach streamlines operations, helps with resource allocation and can provide a competitive edge in the hospitality market by offering a superior guest experience.

For example, E.ON partnered with the Radisson Blu² hotel chain in Frankfurt, Germany, with the objective of advancing sustainability efforts. The innovative EaaS/CaaS solution involved the installation of a fuel cell technology within the hotel premises. This technology generates electricity and heat through a combustion-free process, resulting in significantly reduced emissions. As a result, the hotel was able to produce a substantial portion of its own energy requirements in an environmentally friendly manner, effectively lowering its environmental

¹ <https://www.siemensstadt.siemens.com/en>

² <https://www.eon.com/en/about-us/media/press-release/2017/radisson-blu-and-eon-form-partnership-for-a-low-emission-hotel-in-frankfurt.html>

footprint. This project not only exemplified new standards of sustainability within the hotel industry but also underscored the potential of fuel cell technology in driving eco-conscious operations.

Industry

Clover,³ a prominent dairy and beverages company in South Africa, is actively pursuing a comprehensive facility upgrading plan aimed at improving its operations throughout the country, with a specific focus on optimizing its refrigeration systems. At the forefront of this initiative is the Queensburgh site, which is pioneering the adoption of CaaS in collaboration with Energy Partners Refrigeration. By implementing CaaS at the Queensburgh site, Clover aims to enhance the efficiency of its refrigeration systems, ensuring precise temperature control critical for product quality while reducing energy consumption and operational costs.

Health care

CaaS holds the potential to impact hospitals and health care delivery premises by prioritizing patient comfort and well-being, as well as improving operational efficiency. Through CaaS solutions, hospitals can create environments that optimize factors such as temperature, lighting and air quality, contributing to patients' comfort and recovery. By reducing noise levels and offering comfortable waiting areas, CaaS enhances the overall experience of patients and visitors. Moreover, efficient HVAC systems and customizable patient controls can ensure consistent comfort while minimizing energy waste. CaaS could not only elevate patient satisfaction but also help hospitals meet regulatory standards.

KIMS Sunshine Hospital,⁴ a group based in Hyderabad, India, which is planning 10 new facilities in major cities in India over the next two to three years, entered into a 12-year CaaS contract with Smart Joules. The first project is currently ongoing and has achieved 22% increase in energy efficiency (last measured in October 2022).⁵

Sports and entertainment

In the Netherlands, Cofely (ENGIE) and Amsterdam ArenA (now Johan Cruyff ArenA)⁶ implemented an EaaS model, encompassing energy-efficient lighting, cooling and heating systems, and the integration of on-site renewable energy generation through solar panels and advanced energy storage solutions. This initiative resulted in the complete transformation of the stadium and has received the support of the World Economic Forum.⁷

Key terms that EaaS/CaaS contracts typically include

In this section, we summarize some of the key contractual clauses and issues that are likely to be the subject of negotiation in EaaS/CaaS contracts:

1. Operational procedure

- A specification sheet that includes a detailed description of the services provided (for example, heating/cooling/lighting), specifying elements such as equipment description, continuous supply and terms of supply of services, licensed areas where the system will be installed, start and end dates of the service, description of the units, maximum usage, temperature range, normal usage hours, permitted availability tolerance and planned outage duration. The licensed area and delivery point, where the service is delivered and metered, should be defined with accompanying drawings. Additionally, service requirements (for example, the regulation of temperature for the efficient provision of services), should be clearly stipulated.

2. Terms of installation, ownership and maintenance of the system/equipment

- Clauses confirming the ownership of the equipment by the service provider, specifying that the service provider must install the system at its own cost and ensure that the system is commissioned and fully

3 <https://www.caas-initiative.org/casestudies/2105/>

4 <https://www.caas-initiative.org/casestudies/a-leading-hospital-chain-in-india-turns-to-cooling-as-a-service/>

5 <https://www.smartjoules.co.in/case-study/kims/>

6 <https://johancruyffinstitute.com/en/blog-en/sport-management/johan-cruyff-arena-a-smart-stadium/>

7 WEF Article <https://www.weforum.org/agenda/2018/07/netherlands-football-johan-cruyff-stadium-electric-car-batteries/>

operational to provide the service, and at its own costs be responsible for servicing, maintaining, repairing, auditing, planning, designing, procuring, constructing, installing, testing, commissioning and operating the system, along with a clause confirming that the client must arrange for their facilities to be in conformity with technical guidance and requirements reasonably requested by the service provider and that the service provider has unrestricted access to the licensed area for the same.

- A clause enlisting the metering stipulations, including who (usually the service provider) installs and maintains the meter to measure the number of units supplied to the client.

3. Terms of invoicing and payments

- Clauses stipulating the fee/charges/price paid for the services – including the details of the subscription model – whether monthly, quarterly etc. Usually, service providers charge a fixed monthly fee that is calculated by multiplying the measured units used (by the client) by the price per unit.
- Clauses stipulating the timeframe for payment and process of disputes.

4. Obligations of the parties

- Clauses enlisting the service provider and client's obligations relating to the usage of the system, modifications, availability and outages, third-party usage, and termination and suspension of the contract and services provided.

5. Optional/negotiable clauses

- System purchase: A clause stating that the client has the option to purchase the system/equipment at the end of the contract, at the market value at the time.
- Security deposit: A clause mandating a security deposit from the client, ensuring that the service provider can use the security deposit to recover any amount owed by or outstanding from the client at any time.

What to expect

The future of EaaS/CaaS models in the building and projects sector appears bright and dynamic. These service models are poised for widespread adoption across diverse sectors, including commercial, industrial, residential and public infrastructure. With a strong emphasis on sustainability, EaaS and CaaS solutions will increasingly prioritize green energy sources, carbon reduction and environmental impact mitigation. Regulatory support from governments and favorable policies will further encourage organizations to invest in energy efficiency and comfort enhancement initiatives. The integration of digital technologies, such as data analytics and automation, will drive more precise and proactive management of energy and comfort systems. Additionally, EaaS and CaaS will play pivotal roles in the development of smart cities and energy communities, fostering resilience and consumer engagement.

This bright and dynamic future also means that EaaS and CaaS contracts will be increasingly scrutinized and inevitably subject to disputes, risk accrued by the fast-evolving technological solutions and legislations worldwide in relation to the energy transition. Tackling these potential disputes will require strong contract management skills from the inception of the project and throughout the entire performance of the service contract.

It is highly recommended to define the service performance requirements clearly in the contract, with identifiable, objective criteria to determine whether the requirement has been met. Should a dispute arise as to whether these service performance requirements are met, parties may wish to include in their dispute resolution clause an initial step whereby an independent expert is appointed to give an opinion, which shall be binding on the parties as a matter of a contractual obligation, unless and until revised by a court or arbitral tribunal.

During the construction phase, attention should be brought to the quality and sourcing of materials, coordination of the supply chain, planning and proper execution of the works. Providing for a multi-tiered dispute resolution clause, including a dispute review

board or adjudication board, is highly recommended to assist with a speedy resolution of disputes (albeit at times only temporarily), without hindering the works.

Once the service is being provided, risks will be either operational (proper functioning of the service, its maintenance, availability of spare parts in case of system breakdown or malfunction, continuance of service), or legal and financial. Claims will typically be founded on the proper performance of the service, *force majeure* (notably in consideration of the imperative to continue providing the service), price adaptation clauses and the evolution of legislation.

Most of the risks of design, construction and operation generally lie with the service provider, who will typically seek to pass them along to the various members of the supply chain. However, the client also bears the risk of distributing the service to the end user toward whom the client is often liable. This risk allocation arrangement often results in hotly-negotiated back-to-back and hold harmless clauses.

Despite these risks and the inevitable negotiations over how they are allocated, the underlying economics supporting the EaaS/CaaS models remain sufficiently compelling that the adoption of these models seems poised to grow for the foreseeable future.

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Unpacking liability in building information modeling

Building information modeling (BIM) has revolutionized the way projects are conceptualized, designed and executed. As a relatively new technological advancement, BIM has ushered in novel legal challenges. BIM is not just a three-dimensional model; it is a vibrant digital ecosystem that bridges various stakeholders, disciplines and construction phases. With this interrelation comes the potential for miscommunication, errors and omissions that can reverberate through every stage of a project's lifecycle. From architects and engineers to contractors and owners, the adoption of BIM introduces multifaceted complexities that extend beyond the tangible components of a construction project. This article explores the intricacies of potential liability risks in BIM-driven projects, offering stakeholders insights to steer through the labyrinth of responsibilities and liabilities which BIM's emergence has raised.

Understanding BIM and its role in construction projects

BIM has been defined by the International Standards Organization (ISO) 19650-1:2018 as "a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions." In practical terms, BIM acts as a digital backbone for construction projects, offering an integrated and comprehensive repository of information. Whereas traditional building design has typically relied upon two-dimensional technical drawings (such as plans, elevations and sections), BIM models incorporate more information, including three-dimensional (width, height and depth) modeling, as well as information concerning time (sometimes called 4D BIM), cost (5D BIM), asset management and sustainability. In theory, these added resources and capabilities should allow for better clash and conflict detection during the design process and should enhance project efficiency and cost-effectiveness by minimizing the risk of error and reducing the need for costly rework. Thus, BIM aims to enhance transparency, accountability and collaboration among stakeholders. As BIM fosters real-time data sharing and visualization, legal frameworks must adapt to manage issues such as data ownership, liability allocation and intellectual property protection.

BIM holds a unique position in forensic investigative purposes due to its detailed digital representation of a construction project's entire lifecycle. When incidents or disputes arise, BIM's ability to chronicle the project, from design and construction to maintenance, provides expert investigators with an invaluable resource. This digital trail allows forensic experts to reconstruct events, identify root causes and assess liability with unprecedented precision. BIM's 3D modelling capabilities enable visualizations that aid in explaining complex scenarios to stakeholders, dispute boards and arbitrators, making it an essential tool for dispute resolution. Moreover, BIM facilitates the comparison of as-built conditions to design and regulatory standards, streamlining the investigative process and helping to ensure a fair resolution of construction-related disputes.

Liability in BIM-driven projects

General framework

One of the most significant benefits of using BIM is the ability to facilitate collaboration and coordination between different stakeholders who typically work on the same project at the same time. However, these collaborative capabilities also generate potential concerns. One of the primary concerns of stakeholders is the prospect of bearing the responsibility for errors made by other

parties, particularly concerning aspects that are beyond their control. BIM plays its role effectively by ensuring the traceability of data exchanges and facilitating the attribution of input errors or data deletions. BIM can therefore assist in identifying whether the fault lies with the party providing the erroneous file or with the one processing it, or whether any error existed outside of the BIM context before it was uploaded. This underscores the need to formalize the roles of all stakeholders through the establishment of a proper contractual framework. Responsibility becomes manageable once it is formally documented in writing.

Contracts play a pivotal role in delineating liability in BIM-driven projects that unite a diverse array of stakeholders under a single project umbrella. Stakeholders should pay close attention to the drafting of various specific contracts, including the BIM specifications from the owner, the BIM agreement between different users, the contract between the BIM software publisher and users and the data storage contract. Contract clauses such as indemnification, warranties and limitations of liability impact the allocation of liability. A clear delimitation of responsibilities and liabilities is desirable in such multi-stakeholder situations.

Moreover, a number of design and construction contract organizations have published BIM protocols designed to provide guidance on the proper use and allocation of responsibilities. Notable examples include the Construction Industry Council (CIC) CIC/BIM Pro 2018 protocol in the United Kingdom, the American Institute of Architects (AIA) E203-2013 BIM protocol in the United States and the Consensus DOCS 301 BIM addendum, also in the United States. The Fédération Internationale Des Ingénieurs-Conseils (FIDIC) organization has released a guidance note within the special provisions to its 2017 edition documents suite that deals with the use of BIM but has not yet issued a separate protocol. In the UK, the New Engineering Contract (NEC) similarly issued a practice note in August 2020 outlining how to incorporate a BIM framework into its NEC4 contracts.

Additionally, the legal framework of the jurisdiction that has been agreed as the governing law for the contract can impact liability distribution. Contrary to common law jurisdictions, parties of BIM-driven projects in civil law jurisdictions should give consideration to obligations imposed under the applicable codes, which may apply in addition to the agreed contractual framework.

Allocation of liability

The involvement of numerous stakeholders renders the allocation of liability the most contentious issue in BIM-driven projects. In broad terms, liability is allocated among the following actors:

- The owner (or employer) usually bears the responsibility for providing accurate project requirements and objectives, thus setting the stage for collaboration among stakeholders.
- Designers are responsible for accurately creating design documents, which are fed into BIM models. They typically address errors, omissions, clashes and design coordination issues to prevent downstream problems during construction.
- Contractors typically implement BIM on-site and are responsible for coordinating construction activities. They usually address minor conflicts in the BIM model to ensure smooth project execution.
- The BIM manager typically oversees the BIM process.





Challenges in determining liability

The dynamic and collaborative nature of BIM models can complicate liability assessments when disputes arise. Below, we explore the potential challenges that may arise in the absence of appropriate safeguards.

Design coordination failures and delays

Design coordination failures in construction projects can lead to significant disruptions, causing misalignments among various design elements and affecting architectural, structural, mechanical and electrical systems among others. BIM aims to ensure precise coordination but when it fails, conflicts and inconsistencies arise, potentially necessitating redesigns leading to delays, cost overruns and communication breakdowns. This can lead to a quality compromise to meet deadlines, raising liability concerns. For instance, inaccuracies in BIM models may trigger disputes over responsibility between the employer, design team and the contractor for resulting problems, exacerbating project challenges.

Moreover, if clash detection issues arise during construction, addressing such issues can lead to project delays, exceeding the contractual deadlines. This may trigger blame from the contractor toward the owner or design team for inadequate BIM model coordination, while the design team might argue that the contractor was responsible for the coordination during construction.

Contractual ambiguity: Integration of BIM within the contractual framework, risk allocation and uniformity

In BIM-driven projects, it is crucial to define contractual responsibilities and liabilities, considering the legal framework of the project's jurisdiction and addressing specifics such as software glitches and data loss. As traditional concepts such as privity of contract can limit


claims, parties should ensure their contracts uniformly address issues such as reliance, third-party rights and clear definitions regarding BIM model modifications. The contract between the owner/employer and the design firm should define who is responsible for BIM model updates and changes during the project. This can avoid disputes when modifications are needed.

Model ownership and control

In BIM-driven projects, determining ownership and control of the master model can be contentious, necessitating clear contractual guidelines, often suggesting ownership by the owner/employer who then provides access to all stakeholders. Given the collaborative nature of BIM, protecting individual intellectual property rights and ensuring unrestricted access are essential. No party should be entitled to withhold access arbitrarily and unilaterally from the model, as was the case in *Trant Engineering Ltd v. Mott MacDonald Ltd* [2017] EWHC 2061 (TCC).

In this case, Trant Engineering Ltd (Trant) applied for an interim injunction to regain access to design data stored on licensed BIM software. The dispute originated from a project to construct a power station on the Falkland Islands, where Trant had enlisted Mott MacDonald Ltd (MML) for design consultancy services while Trant was tendering for a contract with the employer. A dispute arose over work scope and payment. As a result, MML revoked the passwords previously issued to Trant for accessing the BIM model, effectively denying Trant access to the design data. The court concluded that an injunction was warranted.

This case was the first time that an English court addressed BIM model access within a construction dispute. Although the ruling deals with an interim injunction, it underscores the critical importance of access to the model.



Another key issue is addressing the liability risk associated with downstream use or unauthorized re-use of the BIM model. In cases where the owner or subsequent design professionals use the BIM model on projects where the original design professional is no longer involved, potential liability issues can arise. To mitigate these risks, it is essential to establish clear contractual boundaries. This proactive approach ensures that all parties involved understand their liabilities and obligations concerning the BIM model's downstream use, promoting smoother collaborations and reducing the risk of legal complications.

Data integrity breach

A Data integrity breach in a BIM system occurs when data accuracy, reliability or security is compromised, with potential consequences spanning the project lifecycle. Breaches can result from unauthorized access, data corruption, mistakes or loss, posing significant risks, especially in sensitive projects such as airports or nuclear plants. Such breaches may trigger legal disputes, damage stakeholders' reputations and lead to liability disputes. To mitigate risks, strict access controls and data validation processes should be implemented. Preventive measures and rigorous data management are crucial to maintain BIM data integrity.

Conclusion

Managing liability concerns in BIM-driven projects is a fundamental component of effective project management, aiding in the prevention and expedient resolution of disputes. To achieve this, stakeholders should proactively delineate responsibilities, engage in clear communication, and adopt best practices to facilitate the seamless execution of BIM-driven projects. By staying abreast of emerging industry trends, stakeholders can empower themselves to thrive in the constantly evolving realm of BIM construction.

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The 3D printing revolution in construction

The use of three-dimensional (3D) printing in the construction industry has been gently simmering in the background over the past decade or so. However, 2023 appears to have been a defining year for this form of innovative technology, with its use becoming increasingly widespread. There is now more focus on the topic than ever before. This article looks at how 3D printing is currently being used in construction, the challenges that may arise from using the technology and whether 3D printing could become a major player in the construction industry.

A construction revolution

3D printing in construction is undoubtedly transforming the way in which projects are being procured; this is evident from the large-scale progress being made around the world where this technology is at the center of cutting-edge design and construction of buildings.

Global research specialists have forecast that the 3D printing construction market size will reach nearly \$48 MUSD by 2030, expanding at an annual growth rate of 101%. To put this in perspective, 5G cellular technology, one of the world's fastest-growing markets, is set to expand at an annual growth rate of 37% in the same period.¹

The touted benefits of using this technology in the construction industry are clear: it is efficient, less labor intensive and more sustainable. Construction periods can be significantly shorter, thereby reducing the risk of delays and cost overruns. Fewer people on site can reduce costs and improve safety. Further, the technology offers unique opportunities to use recycled materials, which reduces carbon emissions.

3D printing in the construction industry is a fairly new technology with relatively few players actively using it. Many people have some familiarity with using small 3D printers to produce isolated or small-scale components or construction models. However, the technology is scalable and capable of generating large structural elements in a building. Indeed, the majority of the 3D printers used in the construction industry, or under development, use concrete extrusion – typically a small continuous filament

pumped through a nozzle. For example, construction is underway on a data center in Heidelberg, Germany that is being hailed as Europe's largest 3D-printed building. The technology involves printing layers of concrete on top of each other before it is painted by a specially developed painting robot. The entire process is expected to take just 140 working hours, which is equivalent to printing four square meters per hour and uses only around two construction workers at any one time.² While current technology can 3D-print walls, foundations and other concrete components, other trades on a project, at least for now, continue to utilize traditional construction means and methods, and specialists often must be on-site during the printing process to install holes for the necessary building systems, such as the plumbing and electrical wiring and for the doors and windows.

However, the use of 3D printing is not limited to large-scale, expensive projects and this is one of its most valuable qualities. The housing market has been in flux over the last few years amid COVID-19, inflation, a global skill shortage, supply chain restraints, fluctuating demand and rising interest rates. Where 3D printing may prove most revolutionary is in house building and addressing the global housing crisis. As with the use of 3D printing technology on commercial or industrial projects, the use of this technology in the housing market initially is most pronounced in its use of 3D concrete printing to extrude unique architectural designs of the homes from a computerized model with reduced cost and waste.

The speed and efficiency with which projects can be delivered may help the industry achieve economies of scale; an increase in production and a reduction in overall

1 Straits Research: <https://www.globenewswire.com/news-release/2022/09/05/2509958/0/en/3D-Printing-Construction-Market-Size-is-projected-to-reach-USD-47-95-million-by-2030-growing-at-a-CAGR-of-101-Straits-Research.html>

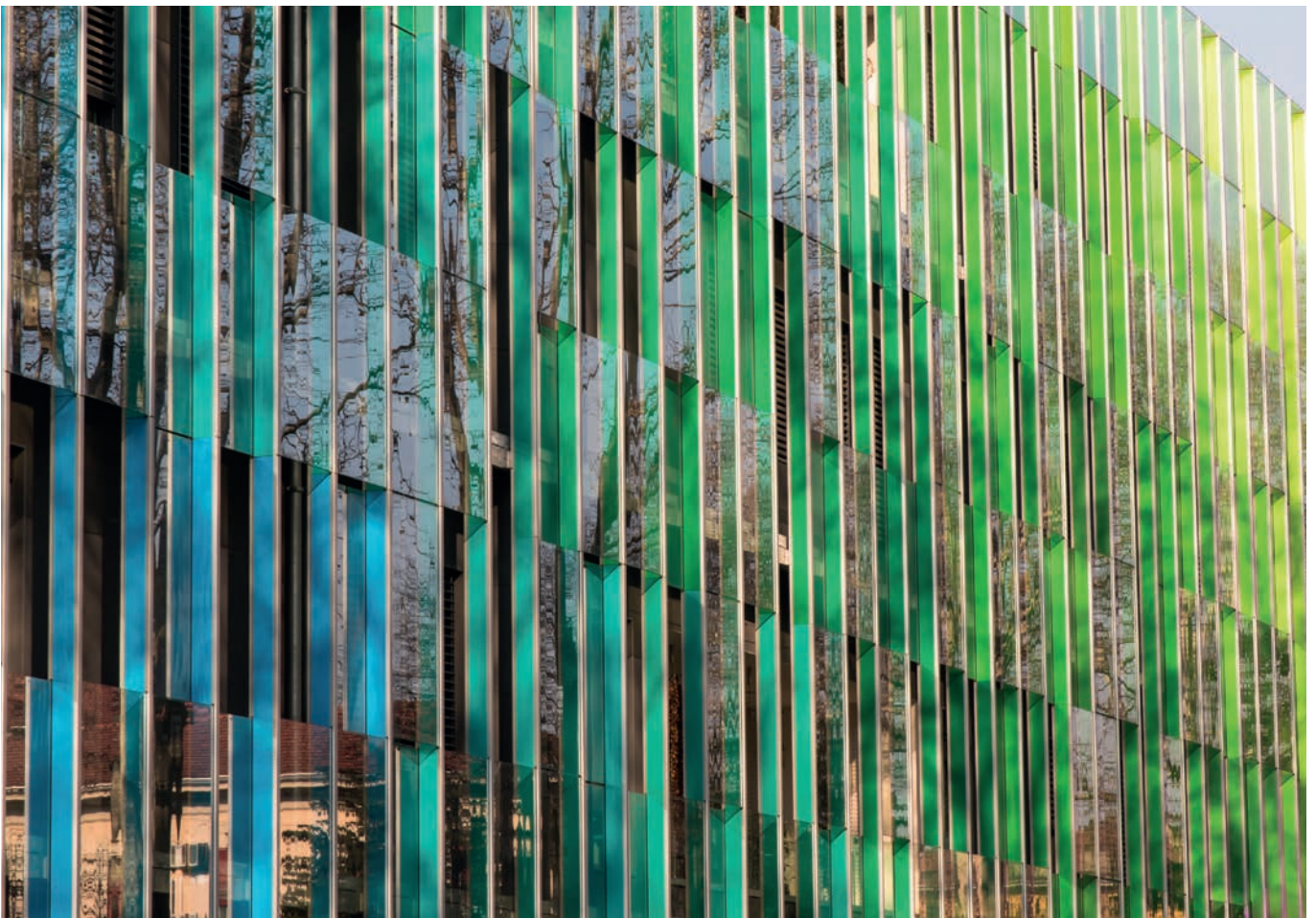
2 <https://cobod.com/europe-largest-3d-printed-building/>

costs could mean that developers benefit from higher profits, which may result in an increase in development activity. This would, in turn, benefit consumers too; the increase in the volume of 3D-printed homes, for example, could drive housing costs down. Further, the companies producing 3D-printed homes initially, such as Harcourt Technologies in the United Kingdom, or SQ4D and ICON in the United States, often tout the associated environmental benefits of using these advanced construction methods due to the on-site fabrication capabilities, and the reduced waste and carbon emissions compared to similar structures built using traditional construction means and methods.

Challenges and potential issues

The potential of 3D printing technology to revolutionize the construction industry does not mean, however, that the technology comes without its own challenges and risks. One particularly problematic issue is apportioning liability for defects in design and/or construction.

Three-dimensional printers could see manufacturers and software developers open to claims that would normally sit against parties responsible for design and construction in a traditional construction team. It is easy to picture a scenario where a 3D-printed building is defective, whether that is due to defective design, improper materials used or workmanship related. It



is not clear how liability would be apportioned in this scenario and the risks borne by each party involved would need to be carefully considered in the context of the contractual relations and applicable governing law. Establishing causation would involve a complex, technical investigation to establish whether the defect is attributable to the original design, a fault in the printer itself, a software malfunction, an error in how the design was fed into the printer, something else altogether or a combination of contributing factors.

If the 3D printer is owned or leased by a contractor and the printer itself is found to be defective, the contractor may have a claim under a product warranty against the manufacturer. If the printing software is defective, the software developer could reasonably be on the hook for the costs of repairing the defects. If a sub-contractor is responsible for feeding designs into the printer and does so incorrectly or fails to operate the printer correctly, they could be held responsible for a finished product that is defective. Material suppliers may be open to unprecedented claims for failing to ensure that their materials are 3D printing compatible and, in turn, designers and contractors will need to ensure that they are providing specifications that are compatible with the specific 3D printer being used.

Finally, there are potential intellectual property issues to consider. Some of the text objects used in printing a 3D item may be thought to be non-copyrightable because they're too utilitarian or generalized in nature but, nevertheless, someone may have a patent on the design of that object, may hold a trade dress registration for the printed item or the ultimate design may be protected by copyright on its own. If a business hires a contractor or third-party company to create ".stl" files for it to use, the business should ensure that it has the rights and/or licenses to print the design with the author of that design so it can use or possibly modify the design for future projects.

These scenarios serve to highlight a plethora of other potential problems: employing suitably skilled workers to operate the printers in a situation where 3D printing projects are still rare; ensuring that necessary quality controls are in place; a current lack of regulatory standards to assess the suitability and safety of printed structures and mitigating equipment breakdowns; and the avoidance of potential intellectual property disputes.

Conclusion

We remain a long way off from 3D printing being used as an everyday means of designing and constructing entire buildings. There are substantial obstacles to overcome and risks to consider as a result of the innovative nature of the technology involved. However, ongoing development of the technology and increasing implementation around the world would suggest that 3D printing in the construction industry has a very promising future and one that will invariably generate new sets of legal issues for users of this nascent technology.

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Spotlight on Middle East – Innovation in Saudi Arabia's Giga projects

The year is 2023 and the Kingdom of Saudi Arabia looks different. Under the leadership of the Crown Prince, His Royal Highness Prince Mohammed bin Salman bin Abdulaziz Al Saud, the Kingdom is laser focused on delivering an ambitious 2030 vision to emerge as “The heart of the Arab and Islamic worlds, the investment powerhouse, and the hub connecting three continents.”¹ Enter the Kingdom's staggering “Giga Project Program,” a series of geographically diverse tourist, residential, commercial, retail and industrial capital projects aimed at transforming the Kingdom into a tourism and entertainment hub, while creating hundreds of thousands of jobs in the process. Added to this, the Kingdom has focused its efforts on sustainability, which is a key feature of the 2030 Vision, with a stated aim of the Kingdom having 50% of its energy from renewable sources by 2030.

Without a doubt, the Kingdom's Giga Project Program is a massive endeavor and hugely ambitious, and at one level it might seem all too unfathomable. On the other hand, the United Arab Emirates has been incredibly successful in developing a portfolio of megaprojects that have transformed the country. Rewind to 1993 when UK architect Tom Wright of WS Atkins prepared the design concept for Dubai's iconic Burj Al Arab, a project born of His Royal Highness Sheikh Mohammed bin Rashid Al Maktoum, who dared to dream that the Emirate could emerge as an international tourist destination and a center for business in the region. Enter Dubai's megaprojects, including the Palm Jumeirah, Dubai Marina, Burj Khalifa, Dubai Downtown, Business Bay and several others, which have transformed the Emirate over three decades into the popular destination for business and pleasure that it is today. Testament to its success is Dubai's emergence as the No. 1 global destination in Tripadvisor's 2023 Travelers' Choice Awards for the second year running. Viewed in this broader historical and geographical context, the Kingdom's Giga Project Program is not so unusual, particularly considering Saudi Arabia's geographic size, its population of over 36 million citizens and residents, and its vast oil resources

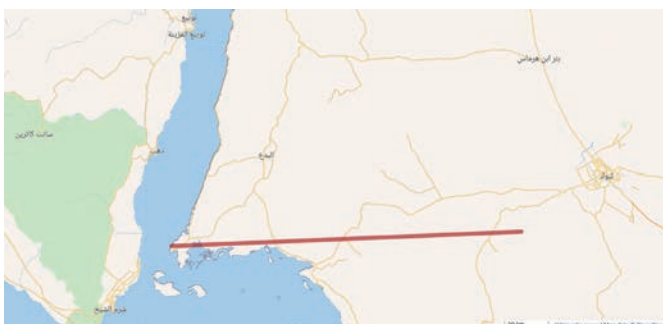
that enable the funding of its vision. Further, the cutting-edge technology used in the development of these Giga projects, the eye-catching innovative designs developed by some of the world's leading architectural and engineering firms, and the massive scale of these capital projects, all suggest that the Giga Project Program will have relevance in the construction industry far beyond the geographical limits of the Kingdom, and may establish a new benchmark worldwide for what is possible by designers and builders.

Funded primarily by the Kingdom's Public Investment Fund (PIF), the total pipeline value of the Kingdom's Giga projects has reportedly grown to more than \$850 billion in 2023. Billed as “once in a generation projects” by virtue of their size, scale and ambition, a single Giga project is typically valued at \$10 billion or more. Although there are five “official” Giga projects (NEOM, Red Sea Global, Diriyah Gate, Qiddiya and ROSHN), there are several others underway that arguably qualify as Giga projects, with even more expected to be announced. In this article, we highlight five of the Kingdom's most unique Giga projects and consider the top five legal and contractual risks that the Kingdom's Giga projects entail.

1 <https://www.my.gov.sa/wps/portal/snp/aboutksa>

NEOM: The Line

The Line is a linear smart city located in the northwest of the Kingdom, along the stunning Red Sea coast. It will be 170 kilometers (110 miles) long and consists of two mirrored buildings with an outdoor space in between, having a width of 200 meters and a height of 500 meters. Situated within the broader NEOM Giga project, the Line is touted as a sustainable and futuristic carbon-neutral urban center that will be a hub for technology, innovation and tourism. The city is designed to have no cars and all of its water will be sourced from desalinated sea water. The Line will have three layers: a surface area for pedestrians; an underground layer for infrastructure; and a separate layer for transportation. Residents will be able to use a high-speed train to travel end to end within the city in 20 minutes and will be able to meet their daily needs (via shops, medical facilities, schools, etc.) within a 5 minute walking distance area. The Line is scheduled to be completed by 2030 and is backed by \$500 billion from PIF and other government sources. There are several international and local consultancies and contractors reportedly involved in delivering the project. UK firm Atkins (a subsidiary of SNC-Lavalin, who recently rebranded as AtkinsRéalis) and two U.S. firms, Jacobs and Parsons, are delivery partners for the Line.



■ The Line – location

NEOM: Green Hydrogen Project

The NEOM Green Hydrogen Project is the world's largest utility scale, commercially based hydrogen facility powered entirely by renewable energy from onshore solar, wind and storage. It is a key part of Saudi Arabia's Vision 2030 and the world's efforts to tackle climate change. Located in Oxagon in NEOM, construction is underway, and completion is expected by the end of 2026. When commissioned, it is tipped to produce 600 tonnes per day of clean hydrogen and up to 1.2 million tonnes per year of green ammonia. It will be able to mitigate the impact of 5 million tonnes of carbon emissions per year. The total investment value is \$8.4 billion. The project is being delivered by NEOM Green Hydrogen Company (NGHC), a joint venture between NEOM, U.S.-based Air Products and Saudi Arabia's ACWA Power, and is being developed on an EPC basis.

The New Murabba Project

The New Murabba Project is a mixed-use real estate development in northwestern Riyadh and eastern Diriyah. Set to become the world's largest modern downtown, it will cover an area of 19 square kilometers and offer more than 25 million square meters of indoor floor area. It will have 104,000 residential units, 9,000 hotel rooms, 980,000 square meters of retail space, 1.4 million square meters of office space, 620,000 square meters of leisure assets and 1.8 million square meters of community facilities. The centerpiece is the "Mukaab," a 400-meter cube-shaped skyscraper, billed as the largest built structure in the world. The design of the Mukaab incorporates a tower seated on a spiral base, offering views of the city, while the interiors are walls with floor-to-ceiling video screens used for projections, creating the world's first immersive experiential destination. The estimated project cost is more than \$50 billion. The project, which was first announced in February 2023, is being developed by the New Murabba Development Company (NMDC) and is scheduled for completion by 2030. UK firm Atkins is leading the design for the project and will deliver consultancy and management services.

AIUla

AIUla is located in northwest Saudi Arabia and is one of the oldest cities in the Arabian Peninsula. It is home to Hegra, designated as a UNESCO World Heritage site since 2008, which is located 20 kilometers north of AIUla town. While many of the Giga projects are focused on showcasing the latest in technology, the AIUla project is unique in its focus on the preservation of important historical sites. The Hegra site features hundreds of ancient tombs, rock formations and monuments, some over 2,000 years old. AIUla covers an immense area of 22,561 square kilometers. AIUla’s development plan encompasses more than 7,500 hotel rooms, 5,000 residential units, a staff village comprising more than 1,000 units and supporting infrastructure that will transform AIUla into a hub for sustainable tourism while preserving the area’s precious cultural heritage and antiquities.

The AIUla Development Company, owned by PIF, is delivering the AIUla Giga project, working in close collaboration with the Royal Commission of AIUla (RCU), whose responsibility is to preserve and develop the historical site. There are several major players including world-leading infrastructure consultancy firm, AECOM, who signed a strategic partnership agreement with the RCU to implement Phase 1 of AIUla’s \$15 billion masterplan, and Paris-based firm AW, who designed the Banyan Tree AIUla, which is already open to the public.



■ Entrance to the Tomb of Lihyan, son of Kuza, Mada’in Salih, Hegra, Saudi Arabia

The North Pole Project

The North Pole Project is a new urban area sprawling over 306 square kilometers across northern Riyadh. It is a futuristic city that has been dubbed the “city of the future” and aptly named the “North Pole” due its position in the northern part of Riyadh. The development will offer a diverse range of facilities, including residential neighborhoods, commercial areas, industrial zones, entertainment hubs, green spaces, sports centers, educational institutions, medical facilities, government centers and cultural landmarks. Its proposed focal point is “Rise Tower,” set to be 2 kilometers tall, making it more than twice the height of the world’s tallest building, Dubai’s Burj Khalifa, which is a whopping 828 meters tall. The project places a strong emphasis on sustainable living and seamless connectivity to other parts of Riyadh under development. The urban concept plan includes vertical living and public transportation by air taxis, autonomous vehicles and a high-speed underground.

The North Pole Project is being developed by Saudi Arabia Holding Co., whose CEO is Mohammed AlQahtani. The concept plans for the North Pole Project were widely publicized in the Kingdom’s media in August 2023, and several international architecture firms have reportedly been invited to participate in a design competition. The target completion date has not been released.

Top five legal and contractual risks

Due to their size, scale and innovation, Saudi Arabia’s Giga projects present a host of legal and contractual risks for their stakeholders. There is an increasing awareness in the Kingdom’s construction market of the necessity for more collaborative contracting methods, not only to get these projects across the finish line, but also to ensure that all stakeholders – including contractors and developers – emerge profitably from these massive endeavors.

With any such endeavors however, and as history and experience shows, there are certain risks, which are perhaps inevitable, or at least more likely, given the scale and unprecedented nature of what is being attempted.

Risk #1: Delays and cost overruns

It is well known that projects in the Middle East have a track record for having the most significant program and cost overruns in the world. The Kingdom’s Giga projects are likely not going to be immune from this trend, and their size and scale, coupled with external factors (e.g., supply chain disruptions and labor and materials shortages), necessarily increase the potential for delays, disruption and spiraling costs. The fact that the Kingdom has several Giga projects underway in parallel creates a perfect storm for labor and material shortages, which may be compounded by unexpected disruptions from economic and political events.

It will be key for employers and contractors to be realistic about project scheduling from the outset, but when delays do inevitably arise, both parties must proactively commit to operating the contractual claims provisions in good faith. In the Middle East, the prompt operation of claims provisions for additional time and cost has too often been viewed by both parties as an aggressive tactic. Yet if both parties embrace the claims provisions as a necessary and proactive mechanism to nip project challenges in the bud (rather than allowing them to fester and poison the project), both parties (and the project) will benefit.

Allowing the project engineer to act as a truly independent and neutral initial project-level arbiter of contractor claims will help to empower employers to drive their project forward equitably, rather than polluting the parties’ relations and squeezing contractors to the overall detriment of the project. Contractors also have a heavy responsibility to keep accurate and complete project records, without which an engineer cannot justify awarding additional time and costs. Giga projects could also benefit from fast-track contractual dispute resolution options, including the use of independent dispute boards and expert determination (ideally established at the outset of the project), to determine time and cost disputes swiftly and cost effectively, when the project is proceeding, giving parties greater certainty over emerging risks.

Risk #2: Design changes

In short, Giga projects are inherently more vulnerable to variations of work than smaller projects, due to their scale and complexity, the integration of the latest innovative technologies and long project durations. An under-cooked design is an obvious risk to time and costs, but when a Giga project attempts to push the boundaries of emerging technology, often in multiple directions all at once, it is almost inevitable that parties will discover design and implementation issues as the project is being constructed. This is because the Giga project is a very large test case for the technology itself often across multiple facets at the same time. The Mukaab project discussed above, for example, will reportedly use giant projections to create the “world’s first immersive experiential destination” and will presumably require deployment of digital technology in a manner and scale not previously attempted, increasing the risk of changes due to scope modifications or design development issues. At a basic level, parties will need to ensure their contracts have unambiguous variation provisions, contractors must be fully compliant with notification provisions to avoid variation claims becoming time barred, and employers will need to inject a healthy dose of realism into their budgets. Parties will especially need to carry required levels of project contingency funds to account for costly and reasonably foreseeable design development costs that are “part and parcel” of a futuristic concept design based on untested technology (but will have to be mature by the time of completion). Perhaps a more fundamental issue to be aware of is where ultimate liability for the associated costs of design and its development lies, especially where novel and innovative concepts are in play.

Risk #3: Defects in the works

A “never before” structure such as the 2-kilometer tall “Rise Tower” in the Kingdom’s North Pole Project presents unique design risks (e.g., geotechnical risks, such as the risk of sinkage due to the sheer weight of the structure; seismic loading risks presented by earthquake and severe weather events; selection of appropriate materials, including external cladding, to mitigate fire-safety risks, etc.). It is in all of the stakeholders’ interests to avoid such fundamental design defects, which in the best case could cause chronic project delays (if discovered during construction), and in the worst case (if discovered after completion) could risk catastrophic failure of the structure. In addition to such design risks, the sheer scale of Giga projects, combined with shortages of skilled and unskilled labor and typically ambitious project delivery timeframes, increases the risk of poor workmanship, leading to construction defects. When the stakes are so high, the risk of defects should be mitigated through contractual quality control mechanisms that enable early detection of defects, such as through more stringent notification, inspection and testing mechanisms as the works progress. In this regard, other forms of contract not traditionally used in the Middle East go further in terms of protective measures and mechanisms designed to provide early warning of potential defects and procedures for remediation and resolution. For example, the New Engineering Contract (NEC) suite commonly used in the UK obliges both a contractor and supervisor to notify each other of defects as soon as either becomes aware of them. Further, failure by the supervisor to notify the contractor of a defect does not relieve the contractor from its obligation to correct it. Accordingly, the two stakeholders who are best placed



to detect and manage defects share responsibility for doing so. Another example, the Joint Contracts Tribunal (JCT) suite, also commonly used in the UK, goes further, providing a right for the employer to issue instructions requiring the opening up of any work for inspection or tests of materials or goods or executed work (with costs to be borne by the employer unless the inspection reveals non-conforming materials, goods or work). Such mechanisms are not part of the Fédération Internationale des Ingénieurs-Conseil (FIDIC) contract forms, which are popular in the Middle East, but, arguably, are worth considering for adoption when constructing “never before” Giga projects. Even so, contractual mechanisms that aim to discover and correct defects remain a sub-optimal after-the-fact solution for all parties. In projects as significant as “Rise Tower,” for example, excellent and proactive project management will be key to avoiding defects in the first place. Serious design flaws and gaps will ideally be identified and resolved before ground is broken and designs will be “frozen” for a reasonable period to allow a thorough multi-stakeholder analysis (for example, by utilizing collaboration and data exchange tools often available in Building Information Modeling (BIM) models to look for possible clash detection issues or input errors).

Risk #4: Change of law

The Kingdom’s multiple Giga projects are being developed during a period of time when the Kingdom is experiencing a significant legislation and policy boom, aimed at creating legal certainty and thereby attracting foreign investment. By the close of 2023, the Kingdom’s landmark corporate law and civil transactions law will both have entered into force, with amendments bound to follow in the ordinary course. Alongside these significant changes, Giga projects such as NEOM, Red Sea Global and AIUla are developing their own bespoke regulations, including for environmental and heritage protections, in line with international best practices. Projects such as the NEOM Green Hydrogen Project may foreseeably be impacted by new health, safety and security regulations, but the specific outlines of such regulations may be more difficult to predict given the nascent nature of the green hydrogen industry globally, and the evolving nature of

international best practice regulations in that specific area. For Giga projects, which have immense scopes and long schedule durations, the risk of potential adverse impacts due to a change in law is also heightened simply because a longer project duration normally makes a project more vulnerable to changing regulations. It follows that change in law risks should be a top priority for parties when negotiating infrastructure contracts in the Kingdom, to ensure that parties clearly allocate who will be responsible for the costs arising from changes in law, and to address funding for possible cost overruns due to a change in law condition. When a long-term public-private partnership arrangement is contemplated for one of these projects, such advanced planning is particularly important given the significant impact a change in law may have on a private partner’s costs over a significant period. Where the risk is project-specific, a government party may fairly be requested to bear the costs of a change in law, while a private partner should be obliged to assume a duty to reasonably mitigate any cost impacts.

Risk #5: Economic and policy risks

Because the Kingdom’s Giga projects are heavily funded by PIF, fluctuations in the Kingdom’s oil prices will necessarily impact its infrastructure spending budgets. While funds may seem abundant and even endless at this time, unpredictable regional instability and market volatility could impact the smooth execution of the Kingdom’s Giga Project Program. Government priorities may shift or be forced to adapt to changing circumstances. Contractors may also suffer from inflationary pressures arising from rising materials costs, particularly as demand outweighs supply. It follows that contractors and employers must proactively anticipate the risks of changing circumstances, paying close attention to contractual provisions concerning suspension of works, price escalation, force majeure, termination and dispute resolution. If a Giga project stalls or is cancelled, these provisions will come sharply into focus.

Conclusion

The Kingdom's Giga projects will provide an exciting showcase of the latest in technology and design, and given their sheer scale, the construction industry will be watching their development for years to come. While such projects are subject to the same core legal, regulatory and contractual risks that have the potential to plague any capital project, the stakes are considerably higher for Giga projects given the project values involved and their innovative nature. There is a unique opportunity for construction industry innovators to overcome and proactively manage such risks, with a growing appetite in the Kingdom to challenge conventional methodologies and mindsets and embrace a more collaborative approach to avoiding and resolving disputes. It will also be critical for parties to thoroughly negotiate contractual risks at the outset, going into Giga projects with eyes wide open.

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AI and construction: Building faster and better with fewer disputes?

Artificial intelligence (AI) has recently been making the headlines as a tool of the future, with the potential to help businesses be more productive and complete certain activities currently performed by humans. In particular, AI large language and generative AI models, such as ChatGPT from OpenAI, have been gaining considerable traction. Such tools are capable of generating almost instantaneous results that often accurately predict or reproduce human-like responses. They have the potential to be a useful work companion for construction companies and construction practitioners.

AI is defined by the European Parliament ¹ as being “the ability of a machine to display human-like capabilities such as reasoning, learning, planning and creativity”. This goes beyond the automation of tasks that boomed during the Industrial Revolution. Artificial Intelligence has slowly become part of our lives, through the use of DeepL translation tools, for example, or some of the options on our smartphones. Indeed, if you have ever tried searching for a keyword in your phone’s library pictures, the relevant picture will have been selected by the phone’s AI and displayed in an instant.

Although AI is increasingly used in new technology sectors, the construction sector – and more specifically, the project and contract management discipline – has thus far resisted automation. For the most part, work continues to be designed and performed by humans on the ground, and contracts are reviewed and negotiated by humans in offices. However, the benefits of AI progression become apparent when it can be seen to save man hours on a project or when it can highlight potential risks and/or opportunities. AI can perform an overall high-level assessment more quickly than humans and point out potential inconsistencies, assuming it is provided with the correct input data and search parameters.

Construction companies have started developing their own AI projects to enhance efficiency, some of them even making public their use of AI to promote its benefits on project performance. For example, tools using AI have been developed to analyze productivity on site; perform geotechnical analyses; detect and perform an automated assessment of the status of safety equipment on roads

and construction sites; or improve surveillance of the construction sites through satellite data. ² SprinkIA, ³ a tool dedicated to assisting with the design of sprinkler networks, is another example of the use of AI in support of construction works.

These examples of technological innovation beg the question: can AI help us build better and faster, and minimise disputes?

In this article, which is based on the authors’ experience and prospective thoughts, we identify tasks where AI could benefit (or already benefits) employers and contractors in three critical stages: (i) at the tender stage, (ii) during the life of the project, and (iii) in the claims or disputes stage.

The benefits of AI at the tender stage

During the tender stage, (i) a contractor will review the tender documents made available by an employer to prepare a bid and then (ii) an employer will analyze the bids before selecting a preferred bidder. The tender stage is often a time-consuming and resource-heavy exercise. It usually involves going through lengthy technical, commercial and legal documents that set out the scope of the works to be constructed. The tender documents sometimes contain a design that may or may not be binding but needs considering, irrespectively.

AI assisted review of tender documents for conflicts and gaps

AI could assist with the review of tender documents by determining and evaluating all the requirements

1 <https://www.europarl.europa.eu/news/en/headlines/society/20200827STO85804/what-is-artificial-intelligence-and-how-is-it-used>

2 <https://leonard.vinci.com/parcours-ia-embarquement-de-la-nouvelle-promo-saison-4/>

3 <https://www.theagilityeffect.com/en/article/ai-a-new-partner-for-fire-protection-in-buildings/>

that must be complied with (it is not rare nowadays to find up to 10,000 different requirements that must be considered by bidding contractors on some of the mega infrastructure projects) and identifying potential risks and inconsistencies in the contractual documents (including in the employer's requirements).

During the tender phase, bidding contractors may try to negotiate some contract terms with the employer. The contract can be bespoke or an existing standard industry form or template (such as FIDIC, NEC, Alliance, IChemE) and will require careful consideration by all parties to assess where the risks lie.

Where the contract is bespoke, the employer's legal team developing the tender documents and the contractor's team assessing whether it will submit a bid will need to read the various contract documents carefully to understand the contractual matrix, the risk apportionment and how the various liabilities and caps are organized. And the bidding team must then repeat this task for dozens of contracts at the same time. For example, the contract may provide that the design is the employer's responsibility but the tender document may specify that the design is for information purposes only and all design matters must be verified by the contractor. This discrepancy can lead to potential uncertainty for the contractor regarding the extent to which they are in charge of the design. The answer may have an initial impact on the risks and therefore the tender price but can also lead to difficulties down the line when the project is underway, which may ultimately give rise to claims.

AI tools could be used to review all of the contract documents and identify discrepancies, grey areas or even areas not addressed. This analysis could factor in issues seen in previous projects to identify the likely outcome of not addressing such inconsistencies.

According to the authors' experience, the standard form of contract is rarely based on default contract language (despite the guidelines issued by FIDIC regarding appropriate contractual modifications). When submitting a contract for negotiation, the employer will often have amended certain terms to shift risks to the contractor,

sometimes modifying the essential form of contract (for example, the authors have seen instances in which a heavily modified FIDIC Red Book contract can take on the characteristics of a FIDIC Yellow Book contract).

AI tools could be trained, based on previous contracts, to identify amendments, identify the associated risks and whether such risks are borne by the contractor or the employer. One could imagine AI trained with the company's risk policy on the various main risks and accepted thresholds. The AI could then compare the contract against the company's policy and issue a report on the various risk apportionments in the contract. This would enable the legal teams to focus on the main risks for the company.



Construction contracts are usually lengthy and may sometimes include obscure or ambiguous language, and even formulae to calculate price increases. AI could help draft provisions (several AI-based tools already exist) that are protective of one party while choosing wording that would limit any interpretation required when a dispute arises.

For example, some of the authors have encountered a situation on a project where a clause provided for a complex formula. This formula was interpreted differently by the project manager, the claim manager and the scheduler within the same company. This difference in interpretation inevitably led to a dispute to be resolved in arbitration. AI could help identify efficient or unambiguous clauses from previous contracts that were used successfully and replicate them on new contracts, thereby achieving institutional consistency across contracts.

AI to identify potential changes in applicable law

Another practical issue that arises during contract negotiations but carries over during the life of the project is the monitoring of legal changes in the applicable law governing the project. Often, a contract clause will address the apportionment of changes in legislation. However, to assess the impact of these changes, one needs to be aware of the upcoming changes and those recently enacted. The legal and regulatory watch is a very time-consuming activity that a company may entrust to a local law firm if it is unfamiliar with the applicable law. However, such activity comes at a cost as it implies constant monitoring of legal changes, an assessment of the impact of changes and possibly a translation of the legal provision so that it can be understood by the company's legal team. Giving AI

access to the relevant legislative resources could enable it to analyze and monitor relevant legal changes and provide an assessment of their impact directly in the language spoken by the legal team, and/or suggest suitable clauses.

For example, several existing AI tools, such as LegiGPT⁴ (an AI-enabled tool capable of drafting clauses or even entire agreements and answering legal questions under French law), Doctrine⁵ (the most comprehensive database for French court decisions, which can monitor specific keywords and decisions) or Leeway⁶ (an AI platform aimed at helping smaller companies draft contracts and enabling all parties to monitor project performance) appear to present the possibility of such capabilities. Other tools exist for common law resources.⁷

Of course, a caveat needs to be made regarding the use of AI for legal research. A recent U.S. case shed light on AI's shortcomings in that respect when a ChatGPT AI model invented a non-existent case law on which a law firm relied.⁸ Artificial intelligence should be viewed as a tool but its results still need to be checked by human intelligence.

Properly deployed, AI may lead to more balanced or more carefully reviewed contracts, which, in turn, may help limit issues arising while the project is in progress by eliminating gaps or inconsistencies in the underlying contract documents. In addition to being a useful tool at the tender stage, AI could prove useful for project management and claim preparation stages.

4 <https://legigpt.fr/>

5 <https://www.doctrine.fr/>

6 <https://www.getleeway.com/>

7 AI-powered legal case search engines, such as Westlaw Edge, Co-Counsel and Lexis+ AI are currently available tools that can be used to analyze legal cases, texts and provide relevant legal guidance, precedents, cases and statutes. Existing generative AI tools that are embedded in these search engines can check case citations in legal filings for accuracy and treatment.

8 <https://news.sky.com/story/lawyers-fined-after-citing-bogus-cases-from-chatgpt-research-12908318#:~:text=OpenAI's%20ChatGPT%20has%20wowed%20users,to%20completely%20making%20things%20up.&text=Two%20New%20York%20lawyers%20have,cite%20citations%20generated%20by%20ChatGPT>

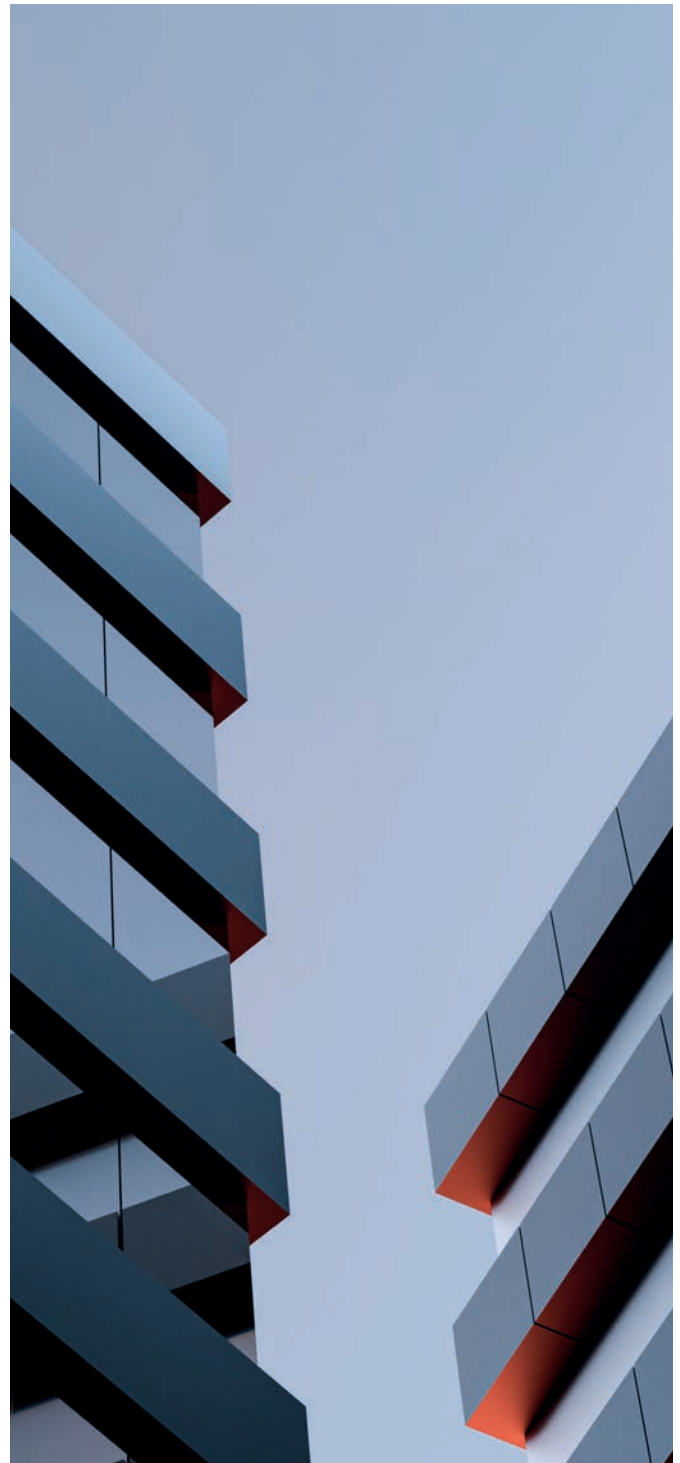
The benefits of AI for the duration of the project

Large construction projects are complex, spread over several years and involve many employees to see the work through to completion. Although science fiction novels for decades have raised the possibility of intelligent robots performing tasks too dangerous for humans, AI will not be capable of carrying out major portions of the physical work for the foreseeable future. Some tasks required to ensure the smooth running of construction work that may benefit from AI include large-scale, repetitive data handling.

AI assisted review of project information and workflows

An apparent prerequisite for the usefulness of AI on a live construction project would be a single, shared project database for the storage of all relevant information (contractual documents, technical documents, correspondence, progress reports, planning details and invoices, for example), that is accessible to AI. Despite the prevalence of web-based project management, information-sharing platforms and servers set up internally by company contractors, the authors regularly encounter projects where information is stored locally by the person in charge of a specific activity. The input and sharing of information often require a human element. Having everything recorded automatically on a server would enable AI to process data as it is uploaded, which would speed up analysis.

The real-time analysis of project data by AI could have several benefits. One obvious area for improved efficiency is that of progress reporting/planning. Tracking progress requires inputting data on the progress of various factors, including design elements, procurement and the quantity of work performed. Developers of some of the leading project information platforms have recently announced the introduction of developmental (or beta) versions of AI-powered workflow management tools designed to automate time-intensive, manual processes in order to reduce the total project time spent searching for relevant data by an estimated 18 percent.



AI and BIM

Another benefit of the application of AI within the construction industry could be in combination with building information modeling (BIM). BIM is a useful tool for generating and sharing information that can be used to assess progress, review design and track changes and the impact of events on a project schedule. Pictures of the worksite can be uploaded on a platform and AI can derive the work or design progress by analyzing the images. For example, BIMtoBuild offers a tool using AI to monitor, through BIM, the progress of works on site and facilitates project management in real time. Similarly, OpenSpace is dedicated to construction site monitoring and progress tracking through reality capture software.

An AI tool set up at project inception could serve the advantage of acting as the project “memory”. Large-scale, complex construction projects take place over the course of several years. It is not uncommon for people either to leave the company or relocate to another project over time, risking the loss of project “memory”, consistent project narrative and an understanding of how preceding activities and decisions impact current progress issues. An AI tool could prepare a chronological timeline of the work and identify relevant events and supporting documents, which could eliminate “learning curve” productivity losses during times of personnel change.

AI assisted project scheduling

When it comes to making claims for an extension of time and/or additional costs, AI could benefit both parties. On a construction project, a multitude of events occur at the same time, each of which may have a delay and/or cost impact. However, it may take time before the contract manager is informed of an event giving rise to a claim or its substantiating project records. By having access to contract documents, correspondence, progress reports and project schedules, an AI tool could swiftly identify delayed events. This would enable parties to assess their entitlement, submit a claim in due time and begin negotiations within the contractual time limit. There are already examples of construction scheduling consulting firms in the United Kingdom and elsewhere that are using AI machine learning algorithms, in some cases trained on a database of hundreds of thousands of projects, to map the progress of infrastructure projects with the goal of avoiding costly errors and supply gaps.



The benefits of AI when disputes arise

When disputes arise on a project that cannot be resolved through negotiations, AI may have a role in the dispute resolution process, regardless of whether the forum is in adjudication, court proceeding or arbitration.

E-discovery and document review

AI is already a commonly used tool during the dispute resolution process, primarily as a labor-saving device during the initial document review phase, which then continues during the arbitration procedure – especially where a document production phase takes place. Construction disputes are complex and usually involve large numbers of documents detailing technical issues, delays and/or quantum matters. Reviewing all of the documents exchanged between parties during the document production phase is costly, both in terms of time and human resources. AI assistance is already employed by attorneys to review large numbers of documents, identify those that are relevant and look for the proverbial “smoking gun” document that could make or break a case.

Trial preparation

AI tools can be trained to review witness statements or expert evidence to identify discrepancies in the information available within documents that are part of the proceedings. Such discrepancies can be a big help to lawyers when preparing their cross-examination of fact witnesses and expert witnesses. However, fortunately for current trial attorneys, AI is not yet at a stage where it can conduct actual cross-examinations of fact witnesses and expert witnesses. It still requires a human lawyer to sense when a witness is not comfortable answering questions and press for an answer helpful to the party’s case.

Transcription and translation services

Transcription of hearings is becoming increasingly automated, as voice-recognition and speech-conversion technologies become more sophisticated and accurate. Similarly, AI translations from foreign languages are regularly carried out by machines, with human translators being responsible for reviewing auto-translated text.



Use of AI by a tribunal in the decision-making process

One of the considerations that can be raised by a party during the dispute phase is a potential bias from the person(s) in charge of deciding the dispute (this being separate from the topic of conflicts of interest). Or that the person(s) in charge of deciding the dispute may not have sufficient time to process all the details of the parties' submissions. For example, the timeframe for adjudications can sometimes be short when the number of documents to be analyzed, the number of issues and their level of technical complexity are taken into account. AI would help the adjudicator to focus on the salient factors in dispute, thus expediting the decision-making process.

There are some limited guidelines on the correct use of AI in judicial or arbitral proceedings. One example is the *European ethical Charter on the use of Artificial Intelligence in judicial systems and their environment* produced by the European Commission for the Efficiency of Justice in late 2018.

The purpose would not be for AI to render the decision in the adjudicator's or arbitrator's stead. As mentioned previously, deciding a dispute also requires taking into account subjective or human elements, which AI cannot do.

To avoid the assistance of AI in adjudication or arbitration procedures being challenged by the losing party, its use must be agreed upon by all parties and regulated by the arbitral institutions. It is in the interest of all users of arbitration procedures to regulate the use of AI in the applicable arbitration rules. The employment of AI could be addressed in the terms of reference and procedural orders drawn up by arbitral tribunals.

Finally, because most arbitral institutions rely on the confidentiality of any arbitral proceedings, any use of generative AI would need to occur in a manner that would uphold the principle of confidentiality.

Conclusion

As the technology improves, AI will undoubtedly play a greater role in construction projects by helping parties to be more efficient, saving man hours and identifying potential challenges more efficiently. However, AI is only a tool. It will not replace humans on the ground or their critical and creative thinking, essential in a construction project to identify optimal solutions. Access to available project data is the key to AI's usefulness. Thus, one of the issues currently faced by employers and construction companies is whether to integrate the cost of AI tools at the start of a project as part of their information and document management infrastructure. Such technological innovation and integration naturally come at a cost to be shared between the contractor and employer as a joint investment in the project.

So, will AI help us build better and faster? Most likely. Will it do so on its own? Doubtful.

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An interview with international arbitration lawyer Timothy Cooke

Michael Chee, senior associate in Reed Smith's Singapore office, sat down with Timothy Cooke, who leads the firm's international arbitration practice in Asia, to quiz him on his practice and the technical innovations that will soon change how lawyers prepare and argue construction disputes.



Can you describe your practice? What kind of cases cross your desk?

I am an English-qualified barrister by training and have been conducting litigation, arbitration and mediation for 24 years. My main area of practice is international commercial arbitration. I mostly act as counsel for clients in arbitration in Singapore and London but also sit as arbitrator from time to time.

Most of my cases concern disputes over investments of one sort or another in Asia, or investments from Asian clients into other parts of the world. Some of these disputes relate to the construction of traditional and renewable energy infrastructure, power projects, plant and machinery, shipbuilding and cases involving the aviation industry.

Have there been any recent developments or new trends in Asia's construction industry?

Fossil fuels are still the predominant energy source in South East Asia, making up about 83% of the energy mix in 2020. However, the region's policies show an eagerness and commitment to transition towards clean energy. For example, Vietnam announced its Power Development Plan 8 (a commitment to boost wind and gas energy while reducing coal reliance) and Malaysia launched its National Energy Transition Roadmap in July 2023 to scale up its renewable energy capacity. Despite its small geographical footprint, Singapore announced a Green Plan 2023 to advance the national agenda on sustainable development. The plan covers measures such as solar panel deployment including on rooftops, reservoirs and other open spaces in order to increase Singapore's renewable energy capacity.¹ These plans anticipate potentially large-scale construction projects across Asia, for which legal services will be required both concerning the negotiation and drafting of contracts, as well as their ongoing administration. We are already seeing a substantial number of disputes involving renewables projects across Asia, including in India, Vietnam, Cambodia, Singapore and Indonesia.

Have there been any interesting developments in arbitration in South East Asia?

Looking more broadly, the competition between arbitral institutions continues apace at both a regional and global level. For example, arbitral institutions such as the HKIAC and SIAC enjoy increasing global popularity thanks, in part, to the arbitration ecosystems that have developed around modern arbitration laws in Hong Kong and Singapore and support from their respective legislatures and judiciaries. Both institutions compare favorably with well-established arbitration centers such as the LCIA and the ICC. More recently, institutions in the Middle East, such as the DIAC and the ADGM Arbitration Centre (to name just two), are enjoying a surge in popularity, and it remains to be seen whether they, too, will develop a strong foothold in the international arbitration conscience.

One way in which such institutions seek to attract users to adopt their rules in commercial contracts is to revise their arbitration rules to establish or adopt novel procedures and case management tools. For example, the SIAC has recently announced a public consultation on the seventh draft of its arbitration rules.² This draft is more than merely an iterative update of its last edition, which dates from 2016. The next edition has been substantially redrafted to enhance clarity and to introduce several new features such as a so-called "streamlined procedure" aimed at determining disputes on a documents-only basis within a three-month period. The rules also incorporate the SIAC Gateway, the center's recently adopted technology that incorporates a document management and case filing platform for increased efficiency.

1 <https://www.cnbc.com/2023/10/17/southeast-asia-looks-to-renewable-power-for-energy-security.html>

2 <https://siac.org.sg/siac-announces-public-consultation-on-the-draft-7th-edition-of-the-siac-arbitration-rules>



How do you see the legal industry being affected or disrupted by technology innovation?

A hallmark of construction disputes is the voluminous documentation (technical or correspondence) that must be digested and deployed by the legal team. While such documentation is often the key to resolving disputes over variations and delays, it is both time-consuming and costly for lawyers to wade through rafts of paper to identify information that will be determinative. In my opinion, building information modeling (BIM) and artificial intelligence (AI) will both play key roles in disrupting the legal industry and law firms who invest in these technologies will have a significant competitive advantage.

Can you explain how BIM and AI will be deployed by construction lawyers to the advantage of their clients?

BIM is aimed at improving collaboration among stakeholders and transparency of information resulting in better project management, governance and record keeping. When used with a common data environment, it can also track the history and status of changes and variations to the BIM data. BIM data can therefore be used as a reliable record of changes to the construction design that have transpired that can be used to supplement and inform the document review exercise so as to help lawyers to narrow the focus of their searches when grappling with voluminous documentation.

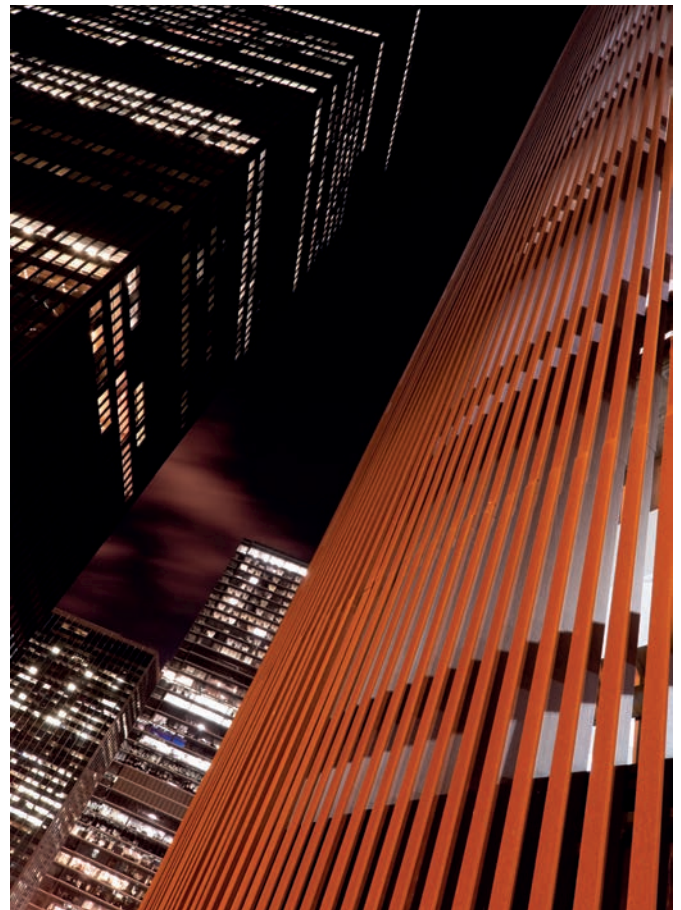
AI has the potential radically to overhaul how we practice law and, in the context of large-scale disputes involving complex projects, could revolutionize our workflows and how we deliver legal services to clients. There is huge potential for AI models to assist in the processing and analysis of hundreds of thousands of construction documents to aid a merits analysis or marshal evidence to advance or defend a claim. We are not there yet, but the extraordinary, exponential rate at which AI models are learning means that this reality is just around the corner. As a result, Reed Smith is trialing a range of AI tools to ensure that we can exploit their potential by integrating them into our workflow.

Are you seeing construction clients adopt automation for their contract management and what are the benefits and risks of this approach?

While clients are certainly talking about “smart contracts,” they still remain cautious about adopting them. That said, I expect to see a greater uptake in the coming years. Obviously, a common characteristic of construction disputes is the complicated nature of construction contracts involving numerous conditions and processes (variations, payments, extensions of time, etc.). This requires close attention and management by all parties to the contract to ensure that they are each on top of and compliant with these processes. It also necessitates an experienced contracts manager or administrator role within larger construction firms. It follows that a possible solution to reduce the costs, complications and potential disputes that may arise from improper contract administration is the “smart contract”. A smart contract is essentially a form of executing code that is designed to run automatically when certain criteria are met. An example of such an application is the security of the payment process, which can be automated through blockchain technology. One advantage of doing so could be to reduce the length of progress payment cycles and the number of disputes that arise. Such smart contracts are not without their challenges, however. For example, one potential issue that has been identified is that when an error in the code arises, which party should assume the risk of that error?

In your opinion, will new technologies in construction potentially reduce the number of disputes?

Yes. I would expect that the number of disputes arising from incomplete, improper or unreliable project records will be reduced. This is because technology will help contractors, engineers and developers to keep more accurate project records. An example might be use of GPS tracking systems to more accurately record when and where resources are deployed on a project site.. Even where parties do end up in a dispute, these technologies should save time and costs, as parties will be able to focus on arguing the merits of their cases, as opposed to disputing the accuracy and reliability of the evidential record.



Can you tell us about the app you developed for Reed Smith in 2021/2022?

Thanks to lockdowns imposed by Covid, I developed and coded the Reed Smith Arbitration Pricing Calculator mobile app³ to help clients, lawyers and arbitrators estimate the maximum costs of arbitrating at over 40 arbitral institutions around the world. The idea behind this free and easy-to-use app is to estimate the costs of the most popular arbitral institutions without getting tripped up by currency conversions or the intricacies of the various institutions' costs schedules.

Scan or click the QR code to find out more.



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³ Timothy won Innovator of the Year for developing the Reed Smith Arbitration Pricing Calculator at the ALM Law.Com Legalweek Leaders in Tech Law Awards 2023. The app was shortlisted for "Most Innovative Use of Technology" at the Lawyer Awards 2022 and for the "Best Innovation" award at the Global Arbitration Review Awards 2022.

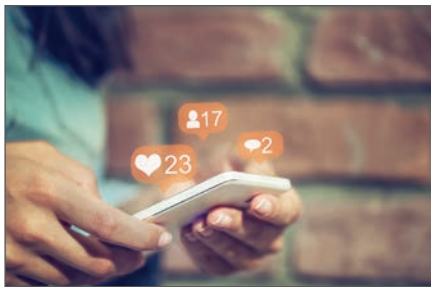


Thought leadership



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Have a question?

If you have questions or would like additional information on the materials covered in this newsletter, please contact one of the authors* – listed below – or the Reed Smith lawyer with whom you regularly work.



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