

Building the Future: Tech Trends in Construction

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There are few aspects of our daily life which does not involve or in some way interface with some form of digitalisation or technology. As the world continues to accelerate into the digital age, the construction industry in the Middle East is also having to adapt to this changing landscape.

Middle Eastern countries have always been at the forefront of innovation in the sector. By way of example, Building Information Modeling (commonly known as 'BIM') was first mandated for use in the UAE back in 2013, with Dubai also the site of the world's largest 3D constructed building. Coupled with what is a healthy regional appetite for large scale and complex construction and infrastructure projects (Neom and the vast Red Sea Project in Saudi Arabia to name but two examples) this has led to an increasing desire and indeed a growing need to move towards a more innovative, technology driven and digitalised sector. This view has in recent months only been reaffirmed by the ongoing Covid-19 pandemic, which has brought under greater scrutiny the importance of addressing some of the inherent inefficiencies that exist within the industry, with a view to mitigating the broad economic impact of the pandemic. Inefficiencies which may, in part at least, be addressed by leveraging some of the prevailing technology trends in order to help reduce project risks and strengthen the framework through which such projects are procured and executed.

In this article we will briefly examine some of the key technology trends in the construction industry and

explain how such technology may be used to help address some of the issues traditionally encountered on construction projects in the region.

Building Information Modeling and Digital Twin Technology

Access to accurate real-time data relating to the status of a construction project has always been something which employers, contractors, consultants and other project stakeholders have recognised as an important and valuable tool. Ensuring that they have the most up-to-date information can help mitigate against the risk of project delays, cost overruns and defects.

BIM has been in the industry 'toolbox' for many years however has not been widely used in the Middle East when compared to Europe or the United States. This may in part be because the industry here has generally been less willing to adopt what are perceived as non-traditional solutions to traditional construction and infrastructure projects.

To recap, BIM is an intelligent, collaborative 3D modelling software which allows users to replicate various elements of a construction project. This includes representing building terrain and utilities and incorporating computer-aided designs and technical specifications to enable architects, engineers and other construction professionals to visualise the physical and functional characteristics of a project.

BIM can therefore help designers and contractors foresee potential design and construction issues before they occur on site thereby mitigating against the risk of clashes and defects arising. In addition, by analysing and optimising equipment and material requirements for projects, BIM can help reduce costs and wastage, enhance coordination and further ensure that a project is completed and commissioned on time, within budget and in accordance with the employer's original specifications and requirements.

Digital Twin Technology is another example of technology being used to facilitate collaboration and optimise project outputs. Originally used in the aerospace sector it has gradually been introduced and used in other sectors, including notably within the wider global construction industry.

By using equipment such as sensors and drones, this technology can replicate in a digital format, every aspect of a project down to the smallest of details, including for example the individual materials and other components that are to comprise the completed works. It therefore provides to employers, designers, contractors and other members of the project team the ability to examine various scenarios in the design and construction of different types of developments (from a simple wind turbine to a complex power plant), enabling parties to perfect the design and construction requirements well in advance.

Modular Construction

Modular construction involves the building and assembly of components for a building or development off-site, under controlled factory conditions. In recent years it has proved increasingly popular amongst developers and contractors given that it can help increase productivity, consolidate costs and considerably reduce the time required for completion of a construction project.

By streamlining the procurement process, it is estimated that modular construction may, depending on the nature of the project, facilitate up to 90% of the construction activity offsite, can reduce costs by up to 50% and even halve the time required to complete works. The lack of on-site construction activity can also improve safety due to the reduced worker presence and thus reduced potential for accidents occurring on

site. The environmental benefits must also not be overlooked given the reduced carbon footprint of (amongst other things) having fewer people travelling to and from the site, with fewer quantities of equipment, plant and other machinery having to be supplied and transported. Modular Construction can therefore further mitigate the time, cost and environmental consequences of expensive, lengthy and fragmented procurement processes.

Although its use in the UAE has generally been limited to the construction of low-rise buildings, plans are afoot for the development of a new high-rise modular constructed, residential and commercial tower on Al Maryah Island in Abu Dhabi. A sign perhaps of the changing times, a shift in attitude and possibly the gradual realisation and appreciation within the industry of the potential benefits of utilising such alternative construction methodologies.

Blockchain and Smart Contracts

Blockchain is a digitalised tracking system comprised of information including agreements, financial transactions and other data stored chronologically across a network of computers in the form of 'blocks'. It is usually decentralised and therefore often is not stored in any single location or managed by any individual user. Each block is date and time stamped, and encrypted with details of the owner. Once published it cannot be changed other than by the owner. It is therefore an immutable and traceable record of everything that has taken place on a particular transaction or project as it cannot be deleted, modified or manipulated.

Construction projects often involve vast amounts of data- from design development through to construction and post-completion. Timely reporting and data input can provide stakeholders with an accurate, real time insight into site operations. Although there are few examples of it being used in the construction industry within the region, blockchain is considered to potentially be one method by which traditional project inefficiencies may be overcome. For example, within the context of large scale infrastructure projects, where there are often multiple, complex and fragmented supply chains, the use of blockchain can help streamline how participants track, manage, record, interpret and exchange the vast amount of information, documentation and other data that is produced. This can ensure that a transparent, secure, digital record of all interactions is maintained for stakeholders to refer to and against which each participant can be held to account

Blockchain-based smart contracts may be another effective use of this technology. Smart contracts are automated contracts which, amongst other things, can cut down the time and cost required to prepare documents that may otherwise require multiple intermediaries to draft and complete.

The UAE Government has long recognised the potential advantages of using blockchain, aiming to adopt blockchain technology in 50% of government transactions. Having launched the Emirates Blockchain Strategy 2021 and Dubai Blockchain Strategy, it is seeking to leverage the use of blockchain with the aim of alleviating some of the traditional time, cost and security inefficiencies encountered when executing transactions. Given the UAE's inspired approach to innovation, it may only be a matter of time before we see technology such as this being used more widely within the public sector procurement of construction and infrastructure projects in the UAE and the wider region.

Robotics

Robotics is the use of automation technology. A potentially significant development in an industry (and region) which has always been heavily reliant on manual labour.

The Covid-19 pandemic may prove to be the catalyst for change and greater adoption of automation technology in the construction industry. The availability of robotics may be a potentially significant tool in a world where contractors are now having to contend with the increased challenge of balancing the health risks of having numerous labourers on site, the need to ensure adequate social distancing and adherence to other stringent government Covid protocols, with the overarching need to ensure projects complete on time and within budget.

Although not yet widely used in the Middle East, robots have proved a useful tool for undertaking traditionally repetitive, conventionally worker-operated tasks such as drilling, brick laying, rebar tying and other manual-intensive operations. Robotics can therefore potentially help make the construction process safer, faster and more cost effective. Yet there are challenges to their wider use and adoption. The complex, unpredictable and obstacle-riddled nature of a construction site and a robot's inability to adapt to real-time variables to further production and productivity, without compromising on safety or quality, is something which few automation technologies have so far been able to overcome. In addition, the large-scale automation of tasks, which would otherwise usually be undertaken by comparatively cheap manual labour may in certain jurisdictions lead to some resistance. This is because, in regions such as the Middle East, there is a significant reliance on such blue-collar workers and the valuable economic and cultural contributions they make, such that any large-scale redundancy of such roles may have broader political and economic ramifications for the region.

Drones

Drone technology is arguably one of the more well-known and prominent forms of technology currently being used in the construction industry. It has proved to be a valuable monitoring and analytical tool providing project teams with real-time data and aerial insights as to the status of a project for the purposes of surveying and tracking progress.

Drone technology can be equipped with an array of useful equipment including radio frequency identification which can allow the project team to track the site location of components used, such as pipes, plates and other metal products. Drones can also be equipped with cameras, infrared and thermal sensors, as well as GPS units further enhancing their ability to capture accurate, real time data regarding the construction site which can be collated on digital software, analysed and interpreted. This further strengthens the integrity of site surveying and the inspection process, allowing issues to be identified and resolved in good time.

In the UAE the use of drones is well regulated. However this is not the case in other jurisdictions within the region. Parties intending to use such equipment and technology must therefore ensure they check and adhere to applicable local laws and regulations, with the necessary approvals obtained where needed, prior to using such equipment and technology on a construction site.

Conclusion

As existing forms of technology continue to be developed and improved, and newer technologies emerge, there is no doubt that with time the construction industry in the Middle East will increasingly recognise the importance of leveraging the use of such technology in order to enhance internal business and external project capabilities. Covid-19 has arguably only further accelerated this drive towards innovation and the further adoption of such technology.

It is important that parties at all stages in the construction supply chain ensure their respective contracts

are drafted in a manner which clearly addresses any commercial and legal risks that may arise from the use of such technology. Moreover, authorities and regulators across the region will need to adapt and be responsive to the evolving need to enact clear and robust legislation and regulatory frameworks, so that any industry benefits derived from the adoption of such technology is not overshadowed by the legal (and therefore also the commercial) uncertainties that the market may perceive as emanating from their use in a particular jurisdiction.

Al Tamimi & Company's Construction and Infrastructure team regularly advises on all elements of the construction procurement process. For further information please contact [Leith Al-Ali](#).