

BLOCKCHAIN FOR CONSTRUCTION

Can the industry effectively deploy the technology for projects and people

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BLOCKCHAIN SOLUTIONS

Distributed ledger technologies offer effective ways to fix the construction industry's productivity and contract problems

There is no question that blockchain is at the peak of its hype cycle. For the past two years, it has been the most discussed of all new digital technologies. And as more and more solutions are being identified in which blockchain is being piloted, the principles behind distributed technologies are entering the mainstream.

Proponents of blockchain say that it offers a secure, tamper-free platform for data exchange that is ultra-efficient, and which cannot be corrupted.

For the construction industry, they say, blockchain will enable instant data sharing with project parties, and that blockchain-supported 'smart contracts' will reduce payment delays.

Blockchain also offers opportunities when it comes to building information modeling (BIM). Any changes made to the BIM model can be tracked and registered using a blockchain platform, while building information can be stored on a secure ledger as a permanent, secure dataset.

But lately, blockchain has faced something of a backlash and the risk now is that a negative over-reaction will prevent the technology being fully explored. This would be disappointing because while the technology is certainly not the panacea promised by its promoters, neither is it the overhyped fad that its detractors say it is.

The reality is that while the technology has been overhyped in terms of what it offers, it still has many features that can improve the way construction operates in the UAE.

As a matter of fact, blockchain will be a suitable technology in some cases, but not in others. For everyone seeking to improve the way that the construction industry functions, the correct approach is to use blockchain where it is appropriate.

Dubai is one of the leading cities when it comes to blockchain technology. The government is driving adoption and implementation through strategic initiatives such as the Dubai Blockchain Platform. Industries such as trade, finance and supply chain have shown affinity towards these initiatives. The construction sector is yet to pick up on these opportunities, but has much to gain when it does.

In the seventh research report of the MEED Mashreq Construction Partnership, we examine the key features of blockchain and how it can be applied properly in the UAE construction sector. The report includes commentary from industry experts as well as MEED's independent analysis and some pertinent case studies.

It is our hope that this report will help you understand the opportunities and risks presented by blockchain and that it can help inform your decision-making on blockchain solutions.



EXECUTIVE SUMMARY

- Majority of blockchain use cases remain in the financial sector, notably to enable cryptocurrencies such as Bitcoin. However, industries such as healthcare and energy are beginning to recognise the potential of blockchain technology and are adopting it in their processes
- The construction sector can benefit from the tamper-proof aspect of blockchain technology. Smart contracts can help regulate construction transactions by releasing payments only once work is complete. Blockchain also promotes a circular building information modelling (BIM) economy and allows consensus-driven collaboration with accountability
- Considerable investment will be required to ensure that all of the personnel involved in construction projects are trained and well-equipped to use blockchain technology. The cost implications of this should also not be overlooked
- Legislation and contracts will need to be revised in order to ensure they address the revised risk profile associated with the application of blockchain on projects. There needs to be clarity on which party will ultimately be held responsible in the event of incorrect, incomplete or inaccurate data causing a design defect or other flaw in the project
- Challenges in adopting blockchain linger in the form of wary public perception, lack of awareness, little to no regulatory framework and the complexity of the technology itself. Furthermore, the immense amount of computational power required for mining and scalability issues prevents blockchain from reaching its full capacity
- Dubai is well-known for its blockchain drive and has implemented blockchain practices across several of its government processes. Entities such as Dubai Land Department have adopted blockchain technology in their day-to-day real-estate transactions
- Universities and training institutes need to rework their curriculum to accommodate blockchain studies to ensure there is proper education and reskilling to support the growth of the technology. There is a growing need for IT architects, developers and cryptographers through to database analysts and product marketers

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BLOCKCHAIN FOR CONSTRUCTION

The transparent and tamper-proof structure of distributed ledger technology makes blockchain a logical fit for the contractual construction sector

In a world that is being transformed by digital data technology, the built environment is the last bastion of traditional analogue processes.

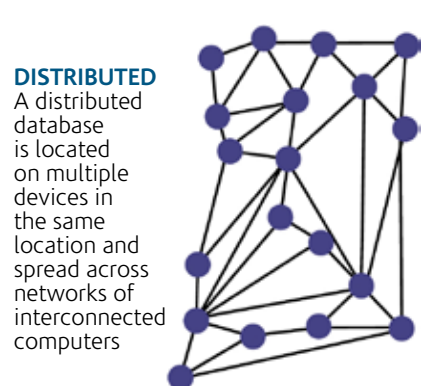
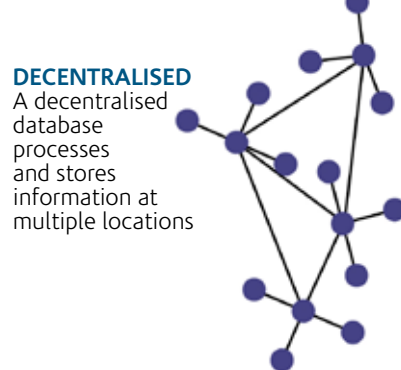
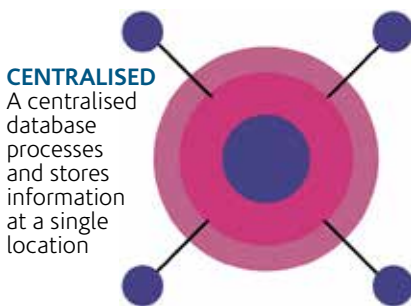
Even there, we are seeing significant early steps into digital transformation.

There are many factors contributing to the slow pace of innovation in our buildings and infrastructure. These range from the organisational silos of different aspects of our built environment, through to asset security, public safety and data privacy issues.

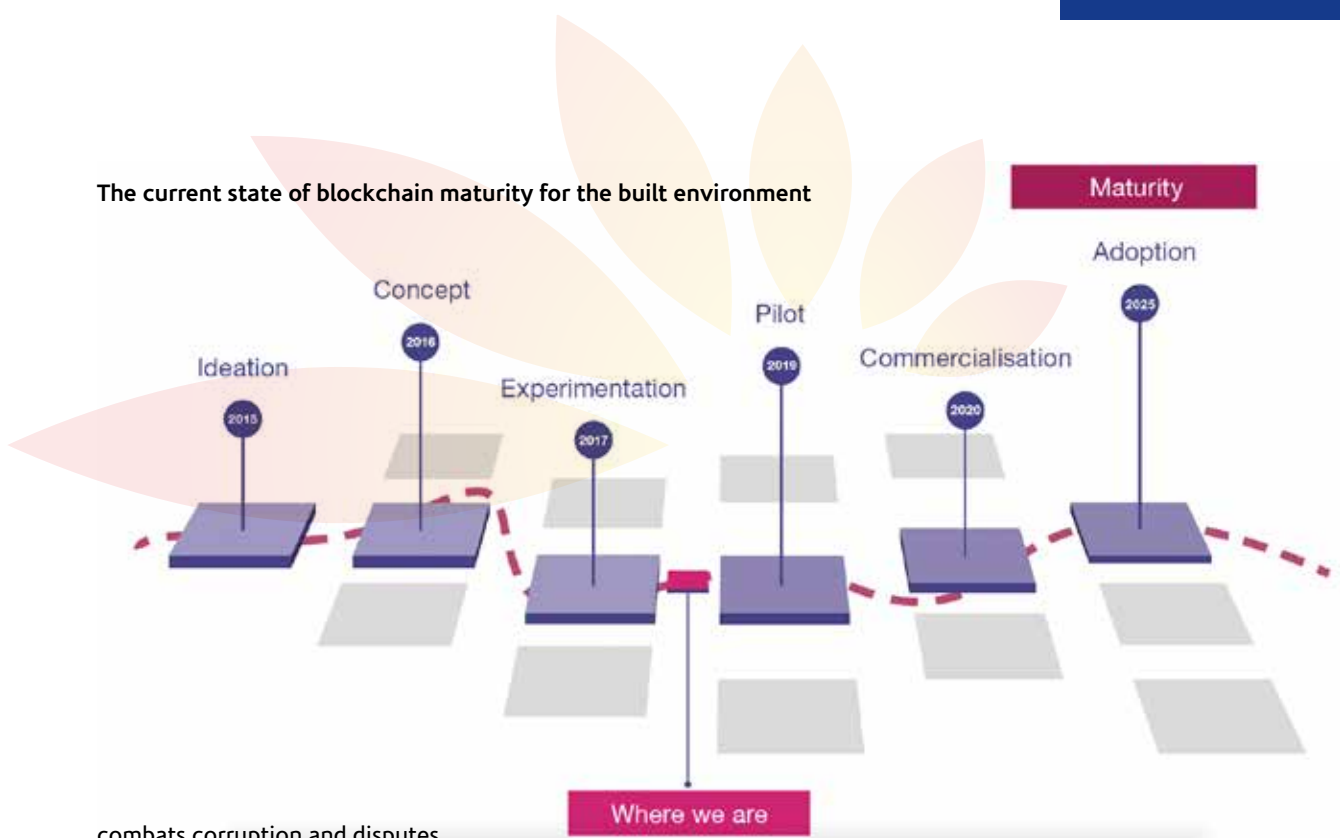
Set against these barriers, what digital solution can enable complex data transactions, where openness, transparency, honesty and immutability are the basic foundations?

Enter distributed ledger and blockchain, which promise permanent and secure transaction methodologies.

Blockchain is one type of distributed ledger technology (DLT) and was introduced to the world with great fanfare about 10 years ago, as the underlying technology of the cryptocurrency Bitcoin. The technology has the potential to deliver a trustable communications network that



The current state of blockchain maturity for the built environment



combats corruption and disputes through consensus.

The fundamental ingredients of a successful blockchain network are that it requires organisational decentralisation and many network nodes in different locations. These need not belong to the same organisation.

Blockchain for construction

Despite the technology having been around since 2009, it is only in recent years that it has gathered significant traction with early adopters, and it is still some consider-

able distance from achieving critical mass.

Insurance companies are already starting to use the technology with flight delay insurance products that utilise a public blockchain to store and automatically process pay-outs for flight delays.

The UK's HM Land Registry is also testing blockchain to research digital land registers in its 'Digital Street' project.

A UK Law Society paper titled '*Capturing Technological Innovation in Legal Services*', stated that Bitcoin/blockchain has the potential for "radical disruption and a reinvention of established legal processes".

SMART CONTRACTS:

FAST SETTLEMENT

The fact that smart contracts are executed by computer coding and connected to a global blockchain means digital tasks can be performed in a secure and decentralised system, without additional delays being introduced by intermediaries.

HIGH ACCURACY

Actions are very accurate because they are carried out by computer coding, which almost entirely eliminates the possibility of error.

LOWER RISK

Smart contracts are more secure than traditional agreements that require centralised counterparties. They are virtually unhackable, immutable and impossible to manipulate.

TRUSTLESS

There are no intermediaries involved in smart contract settlements, which removes the need for trust. However, the creators of the smart contract coding need to be reliable, unless an organisation has the expertise to review and check for errors.

LINKING THE DIGITAL TO THE PHYSICAL

When a project moves to the construction phase, smart sensors added to components during production allow them to be tracked from the manufacturer to the site, ensuring that the number of real-life items installed during construction matches the number of objects in the building information model (BIM). When a building is being demolished, this data would be useful for knowing exactly what materials can and cannot be recycled.

POLLING DATA

However, before irreversibly triggering events like entries or an asset transfer on an immutable decentralised ledger, a system needs to be in place that ensures that a single malfunctioning sensor is not a point of failure. Usually this is done by applying the concept of decentralisation to these so-called 'oracles' as well. Instead of relying on a single source of information, it is recommended that many independent sources are polled to prevent manipulation and false data being used.

Overview

The biggest challenges to implementing blockchain networks in the construction industry are the perception that it will add costs to a project and that it will take too long to implement. This has contributed to a reluctance to trial new blockchain cases, which creates in turn a further barrier as uptake will only follow once pilot projects are shown to have been implemented successfully.

Industry outlook

One important characteristic of the construction industry is the extremely high level of disaggregation and fragmentation within its supply chains.

In the UK, small construction businesses spend an average of 130 hours a year, at a cost of about £1,500 per business, chasing payment. This incurs £180m in debt interest charges, money that could be used for investment and growth, at a time when the industry needs both capacity and innovation.

Blockchain-enabled smart contracts use coding that executes an agreement's terms automatically, once predefined conditions are met, eliminating the need for a middleman.

Smart contracts are one of the biggest, most interesting and potentially most disruptive aspects of

blockchain technology. Three key properties distinguish smart contracts from other types of software:

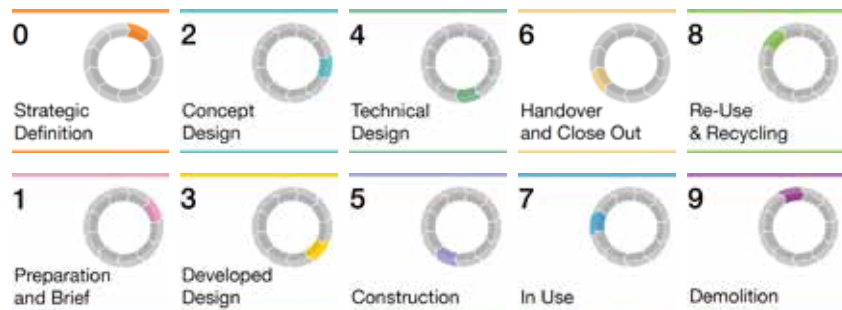
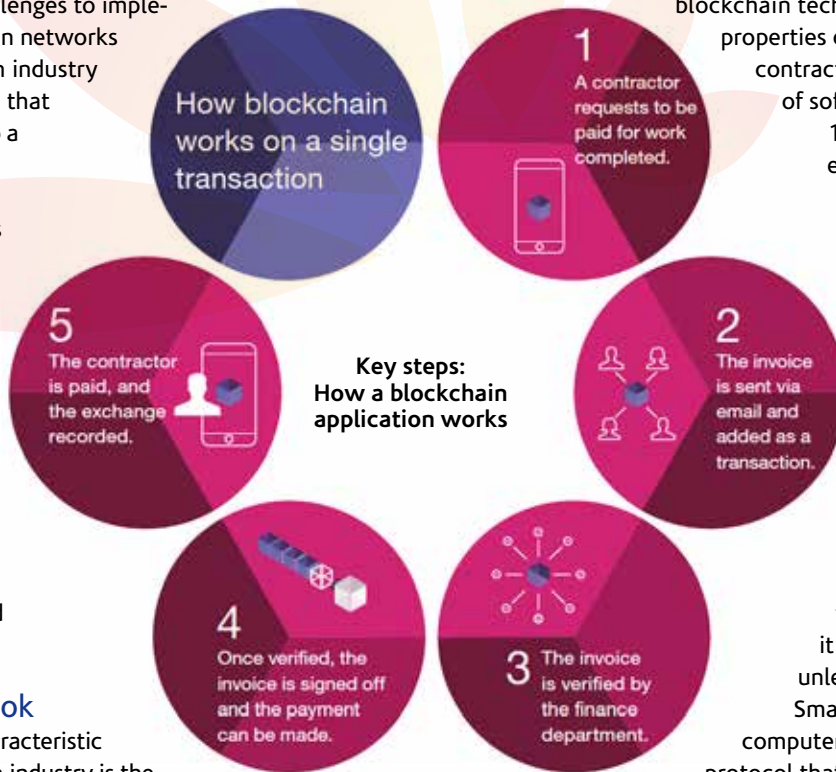
1. They are recorded on a blockchain, which gives them security, immutability and censorship resistance
2. The smart contract itself controls the recording and transfer of assets on a blockchain
3. A network of nodes executes the smart contract; it cannot be changed unless users agree

Smart contracts are "a computerised transaction protocol that executes the terms of a contract," says smart contract pioneer Nick

Szabo. "The general objectives are to satisfy common contractual conditions (such as payment terms, liens, confidentiality and even enforcement), minimise exceptions both malicious and accidental, and reduce the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitrations and enforcement costs, and other transaction costs."

Circular BIM

The operational, maintenance and record-keeping benefits that blockchain can provide for BIM models will allow



Eight questions to ask before choosing a blockchain solution



them to become the main digital source of information for buildings in the circular economy, thereby creating BIM models that can be used and updated throughout a building's lifecycle, from design and construction, to operation and demolition.

This would mean that post-handover, the BIM model would no longer simply be an 'as-built' but a real-time 'as-is' model. Live BIM models would not just have pre-set data, they could use sensors to collect information, such as performance and energy usage data, from the buildings as they are operating. This would be recorded in blockchain as a permanent, secure dataset.

This allows live performance optimisation for BIM components, as well as live energy usage optimisation, either at the whole building level, selected floors or individual devices. Devices could even be switched off via a BIM model to optimise energy usage and reduce costs.

The technology has the potential to record the lifecycle usage of each element, enabling predictive maintenance and automated replacement part purchasing.

Even as early as the material production stage, blockchain can start preparing for the end of the building's life. Each element can be ear-marked for recycling, repurposing or reuse before it is even installed. During its lifecycle, the blockchain would accumulate data on a building's energy usage and efficiency, performance and sustainability record, including its carbon footprint.

This opens up the tantalising prospect of selling the recycling value of your building before it has been built, and using the revenue to fund the construction. A brave new world awaits.

Knowledge of blockchain is lacking in the construction industry and there is a risk involved in exploring a new technology without fully understanding the problems that it can solve. In addition, blockchain technologies still face questions about their scalability, making them slower and more inefficient than traditional databases.

To determine whether blockchain is the right choice for the construction sector, we must ask: What are the high-value, blockchain-specific applications? Can we get away with a traditional database? And what problem are we trying to solve with blockchain that we could not solve with traditional databases?

Regional adoption

The Gulf is in a good position with its early exploration of blockchain implementation. Dubai launched its Blockchain Strategy in 2016 with the intention of becoming the first blockchain powered city by 2020. The UAE recently started its first government-endorsed blockchain platform as part of an initiative to go paperless by 2021.

The government has also announced its intention to offer a standardised definition of blockchain and artificial intelligence at the federal level.

ABOUT THE AUTHOR



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MOVING PAST THE HYPE

As distributed ledger technology matures, businesses consider what problems need to be solved and whether blockchain is the right solution for them

It has been more than a decade since the concept of blockchain emerged. Over the years, it has generated enough hype to make people stand up and notice its potential, perhaps even convincing them to take a few steps.

"Blockchain and distributed ledger technology are definitely worth the attention," says Balint Penzes, author of the report, 'Blockchain Technology in the Construction Industry' for UK-based Institution of Civil Engineers (ICE).

"Blockchain adds accountability to data, which has so far been the barrier preventing many business processes from going entirely automated and digital," says Penzes.

So why isn't blockchain more commonly used?

"Blockchain is a young technology that is still maturing," says Mary Ames, director of strategy at Dubai communication and brand consultants Xische & Co.

"While blockchain has taken the world by storm in recent years, there are only a handful of proven deployments outside of the cryptocurrency market," she says. "Most sectors are still in wait-and-see mode."

Grey cloud or silver lining?

The challenge lies in helping the construction industry see the benefits that blockchain can provide to the entire

sector. But the technology's early association with Bitcoin and the cryptocurrency's underground history is still in the minds of many people.

"We must be careful to ensure that the distinction between cryptocurrency and blockchain is understood," says Prakash Senghani, digital project delivery lead for construction services at US engineering firm Aecom. "The promise of democratising data means that you can make the transaction process more efficient by removing an authentication layer. For currencies, this was banks."

It is, however, important for firms to establish that blockchain is the right tool for their business. Adopting the technology because others are doing so is not sound reasoning.

"Today, blockchain bears an uncanny resemblance with cloud computing in its early days, when understanding and awareness was limited and techno-speak was abundant," says Aaron D'cruz, CMO and co-founder of Perth's Build-Sort, a collaboration and big data platform provider for the construction industry.

He went on to say, "Taking a page out of the cloud's rise to mass adoption, blockchain providers must properly communicate its benefits and create seamless onboarding and user experiences that mimic interactions with everyday software."



Is it for construction?

Ames notes that, unlike other emerging technologies such as artificial intelligence, blockchain implementation is comparatively straightforward.

“If your IT department is not up to the challenge, there are companies that are ready to build smart contracts (the ‘websites’ of blockchain) according to industry-specific requirements,” she says.

“However, just because you can build a blockchain does not mean you should. Blockchain is at its best when there are multiple parties involved in a process or transaction, who do not have a built-in reason to trust each other.”

In an industry plagued by issues surrounding payments, deadlines and transparency, blockchain provides a tamper-proof means of verification once the terms of the contract are met.

“In the Middle East, there is a general lack of trust between various stakeholders in construction, which impacts productivity greatly,” says Senghani. “Tools that can help alleviate this mistrust through transparency, providence and collaboration can only be a positive thing.”

Senghani says that construction has become very commoditised and therefore very transactional, not just in terms of payments, but also in terms of ensuring safety,

“... With the introduction of new technology systems that create new types of user experience, real time data and economic growth, the traditional way of evaluating benefits needs to be updated”

checking quality and assessing sustainability credentials.

“In all of these areas – and more – there is an opportunity for blockchain-enabled tools to make the process of validating these transactions more efficient and improving trust in the data,” he says.

From a project management point of view, using blockchain to store, validate and retrieve compliance information relating to safety, quality and sustainability makes the whole process more efficient and transparent, leading to a ‘single source of truth’ working environment.

Blockchain is also being explored for potential applications in a wide range of support services. Ames highlights that for the construction industry, the application of blockchain-backed digital currencies for remittances will have a profound impact. With digital currency and a cryptographically secure digital wallet, workers will be able to send money home more easily and without the usual fees. For labourers who remit most of their salary, cryptocurrency may soon become the preferred payment method.

Is the sector ready?

While some large construction firms are enthusiastic about blockchain’s offerings, many are still cautious and want to see how its development plays out.

“This is an encouraging, natural and expected part of mass technology adoption,” says D’cruz. “Industry and government bodies alike have already published a large number of reports and research, taking a deep dive into the use of blockchain in construction. In them exists a common thread of blockchain being a clear route to higher productivity and efficiency.”

“Blockchain can add a great level of trust and transparency to the construction industry,” says Penzes. “However, all of these benefits will be realised only if blockchain is applied across the whole supply chain of a construction project, driven by a dedicated alliance of industry leaders, authorities and clients.”

Penzes says that the first step for the industry is to understand blockchain technology and its potential, specifically for capital construction projects. He suggests organisations reach out to institutions like ICE, where the necessary knowledge and unique industry experience is available.

He went on to say, “Companies also have to recognise that inevitably, they must invest time and effort into development and encourage their project and commercial managers, digital engineers and BIM managers to learn and discover this new innovative technology. In this way, construction industry professionals can translate the specific processes of this emerging technology for their own business, and also support its implementation.”

ENABLING A NEW REALITY

As distributed ledger moves into the mainstream, blockchain technology can achieve its true potential by addressing key challenges

Blockchain technology has been compared to the revolution that introduced the Internet. Today, it is the 'next big thing', with the promise of tamper-proof, decentralised data at its core.

Cryptography is used to protect the data from breaches. The technology is ideal for any industry with multiple, distributed stakeholders.

However, as with any new technology, blockchain comes with its share of challenges. It is moving beyond the incubation phase, but remains largely in the domain of proof-of-concept projects and small-scale deployments.

Constant dialogue and research backed by a clear regulatory framework provides a way forward to make blockchain a successful reality.

Perception	Blockchain is still widely misunderstood and some still associate it with its dark web origins. As it becomes more established, a wider audience will come to understand what blockchain offers beyond cryptocurrency
Security	The bigger the blockchain, the greater the security. The unavoidable security flaw of '51 per cent attack' can be addressed through a larger blockchain network, where the likelihood of a single person or group obtaining enough computing power to overwhelm all the other participants is removed. Weaker security at points where platform connects with third-party apps can be solved by prioritising security systems from day one
Permissions	Permissionless, public blockchain allows broader access, open-innovation and better computing power, but faces transaction volume constraints Public blockchains may not work for business organisations for privacy reasons Permissioned or private blockchains satisfy enterprise requirements – fast transactions, higher resilience and privacy, but face computing restraints due to reduced participation in the network
Energy	Increasing system efficiency to reduce computing power necessary for mining and utilising renewable sources such as solar energy could tackle the energy consumption
Regulations	Governments are stepping to provide a framework that both manages the technology but at the same time allows room for innovation
Awareness	Blockchain involves entirely new vocabulary and organisations are lacking sufficient knowledge and skills for the technology. Businesses need to recognise whether it is the right solution for their problems. Courses and training programmes can be introduced at universities and institutes to driven education and awareness in the field
Scalability	Current use cases work best with a small number of users or participants. As user numbers increase, transactions will take longer to process. Investments should drive research and development to develop a better, efficient blockchain architecture
Collaboration	Blockchain is a team sport. Solutions require a network of parties to agree to use the network, identify business governance processes and integrate their systems with their network. Only then can the true potential of blockchain be realised



IMPLEMENTING A BLOCKCHAIN

Implementation of blockchain on construction projects can be adopted to suit requirements, enhancing existing processes and improving trust

Construction projects typically involve a project owner, architect and design team, engineers, general contractor, subcontractors and suppliers.

Blockchain technology can be deployed across various steps in the project cycle.

The first step of the project is design. Project modelling shows what the finished project will look like and sets out a clear path.

Once this is complete, smart contracts can be drawn up between, for example, the owner and general contractor or the contractor and sub-contractors.

A project owner holds a blockchain-enabled 'project wallet'. The project funds can be stored in this wallet and used to pay the value chain participants. Individual blocks in the project wallet are linked with payments for each step of the project model. This helps to generate the budget and establish accountability.

Funds are allocated at the start of the project. This provides payment assurances for all parties involved. Plus, it streamlines payments and processing into product delivery. Since the payments are tied directly to work, it is hard to deny payment.

Blockchain can act as the link between technologies such as building information modelling (BIM) and internet

of things (IoT). Materials and processes detailed in the BIM model can be tagged and tracked through IoT-enabled sensors. BIM models can be updated with real-time data transmitted from disparate IoT devices across a building, secured using a blockchain network.

Once contractors complete the steps required, they submit for evaluation. An inspector surveys the work and if it is approved, funding is released. This helps draw up any and all responsibilities. Since payments to contractors would depend upon the work completed, it helps establish accountability and prove who needs to be paid.

Subcontractors or contractors can draw up a similar process for materials. Payments can be scheduled for the receipt and agreement of supplies, transport and finally for delivery with due inspection of goods.

Blockchain can also help keep track of worker details such as skills, reputation, payments and on-site attendance. Furthermore, a blockchain network of skilled workers and companies can assist clients in hiring the right personnel for a project through reputation and accreditation checks.

Beyond the construction phase, information concerning the project can be stored on the blockchain, useful for operations and maintenance, end of lifecycle for a structure and recycling.

BLOCKCHAIN IN THE REAL WORLD



ZAKARIA HALTOUT
Managing Director - UAE
SAP

Enterprises should take it step by step

Blockchain in the Middle East continues to advance from trial and error to major business breakthroughs in delivering greater accuracy, transparency and speed.

The Middle East is already reaching a 'tipping point' in its blockchain adoption – take for instance the UAE's Blockchain Strategy 2021 outlining how the UAE government can carry out half of its transactions on blockchain to save time, effort and resources, and to enhance citizen and customer experiences.

The first step in bringing blockchain to an organisation is defining the business challenges that the technology can solve. Many chief innovation officers (CIOs) are starting with a business model canvas, involving aspects such as whether the organisation can incorporate blockchain in-house or if it needs multiple parties, how it can enhance customer experiences, and how blockchain can drive additional revenue.

From there, the organisation can identify specific use cases for blockchain to transform the business models. For example, pharmaceutical companies can emphasise product authenticity, manufacturers can improve supply chain traceability of parts, banking and finance firms can enable digital payments, and government agencies can promote digital identity and records management.

CIOs should work with lines of business to draw a detailed journey map of the use cases, identify the blockchain platform and protocols, and consider blockchain partners that have the ability to deliver these use cases. From there, organisations can build a proof of concept, see how the use case works out and change if needed, then scale up to wider usage.

Integrating blockchain with enterprise resource planning (ERP) software is vital for creating fast, reliable and repeatable end-to-end processes. Ideally, organisations should integrate blockchain and ERP on the cloud to optimise operations, revenue, costs and scalability.

According to a recent YouGov survey of IT decision-makers, 83 per cent of respondents based in Saudi Arabia and 76 per cent in the UAE agree that the cloud is 'important' for integrating all future technologies.



LOUAY DAHMASH
Head
Autodesk Middle East

Multiple parties can work together

Blockchain or distributed ledger technology (DLT) was first proposed as a research project in 1991, so it is already in its twenties and like most millennials, it has shown great potential. It started as an attempt to keep financial transactions immune from malicious activities and with the launch of Bitcoin in 2009, blockchain for the first time became a practically viable technology.

While its development in the cryptocurrency world is still viewed with caution, DLT can be a game changer for nearly every sector where there is a transaction or exchange of information involved.

Construction sector

The construction industry is often cited as one of the world's most fragmented, high-impact sectors due to the serial nature of workflow and opaque supply chain.

If we look at what blockchain is good at, it mainly boils down to its core value of being a trusted ledger that cannot be altered, allowing traceability and accountability. A technology like that can be influential in an environment like construction where there are multiple different parties involved.

Especially in the Middle East, where projects are of a great magnitude, schemes such as Louvre Abu Dhabi and the Museum of the Future often involve teams based in different countries. Managing such an extended supply chain, along with construction industry-based challenges such as delays and accidents, requires keeping serious track of the work in progress, schedule, cost and payments, and other resources.

Construction today is truly being revolutionised through smart payments, supply chain management and building information modelling (BIM), giving it transparency, traceability and a platform for collaboration.

To enable such benefits in construction processes, Autodesk recently acquired Assemble Systems. We are connecting project data from design through construction, creating the cloud-enabled tools necessary to make the critical preconstruction phase of a project more predictable and profitable.

A CITY'S DRIVE FOR CHANGE

Dubai has set ambitious targets to achieve a world-first of shifting all government transactions to a blockchain platform by 2020

The UAE government has been leading the blockchain charge since 2016, and was one of the first governments in the world to develop a blockchain strategy to streamline processes and secure data.

With a vision to become a paperless government, the UAE government aims to process 50 per cent of government transactions on blockchain platforms by 2021, saving AED11bn in transactions and documents, AED398m in printed documents and AED77m in work hours annually – as per the official UAE government web portal.

Spearheading this drive is Dubai, known for its trail-blazing attitude when it comes to technology. The Dubai Blockchain Strategy aims to have all government transactions carried out via blockchain by 2020.

“Both of these initiatives are powerful as they propose and implement solutions which streamline important day-to-day processes, such as transactions with the government and payment of utilities,” says Balint Penzes, author of the report *'Blockchain Technology in the Construction Industry'* by the Institution of Civil Engineers (ICE). “This will remove bureaucracy and achieve greater efficiencies across the entire governmental and legal system.”

Setting the benchmark

In October 2018, the Dubai government launched the Dubai Blockchain Platform, the first government-endorsed blockchain platform as-a-service (PaaS) in the UAE. The platform conforms to the Information Security Regulation (ISR) standards issued by the Dubai government. It is powered by IBM's mainframe technology, LinuxONE, which is capable of running more than 6.2 billion web transactions a day.

The Dubai Pay Blockchain Settlement and Reconciliation System, officially launched on 23 September 2018, was one of the first projects to migrate onto the Dubai Blockchain Platform. Through this service, a process that used to take entities approximately 45 days to reconcile and settle payments with other government entities, banks and financial institutions, is now reduced to real-time.

Dubai-based Landmark Group and HSBC Bank completed a first-of-its-kind transaction in June 2019 that connected two independently built blockchain platforms.



The transaction involved a shipment from Bee Dee Industries in Hong Kong to Babyshop, a Landmark Group retail brand.

A Letter of Credit was issued by HSBC using the Voltron trade platform and Landmark Group's ReChainMe platform enabled connectivity with its logistics partners at both ends of the trading corridor. Participants along the supply chain could view documents and track progress of the shipment in real-time, thereby reducing the overall time to complete the transaction by up to 12 days, a 40 per cent reduction in time taken.

Dubai Chamber of Commerce and Industry (DCCI) signed a memorandum of understanding (MoU) on 1 July 2019 with the International Chamber of Commerce (ICC) and Perlin, making it the first chamber of commerce in the world to offer blockchain solutions.

Under the terms of the MoU, DCCI has exclusive rights to provide Perlin's Centre of Future Trade blockchain trade solutions to businesses in the Middle East and Africa region.

The blockchain trade solutions will support DCCI's Digital Silk Road platform, a Dubai 10X initiative.

Dubai Future Foundation established a Global Blockchain Council (GBC) in Dubai in 2016. GBC includes 46 members, all of which are potential key players in the blockchain industry, such as Mashreq, Microsoft, Du, SAP, IBM, Cisco, Emirates NBD, TECOM, Dubai Holding, Dubai Multi Commodities Centre, Smart Dubai Office and Infosys, among others.

Dubai and blockchain

This was followed by the launch of Dubai Future Council for Blockchain, under the 'Dubai Future Councils' initiative, in May 2019.

The Dubai government also encourages community interaction through a dedicated blockchain centre, launched on 15 May 2018, which offers Bitcoin classes, workshops, hackathons and use-case-focused events for experts and enthusiasts.

Fintech

"All industries are seeing rapid displacement and disruption," says Raja al-Mazrouei, executive vice-president of FinTech Hive at Dubai International Financial Centre (DIFC). "The financial services industry, with its large commercial and investment banks and fund managers, is no exception."

DIFC's blockchain activities include supporting regional fintech startups through accelerator programmes, committing to the Global Blockchain Council in Dubai, and DIFC Courts' partnership with Smart Dubai to create the world's first blockchain court.

FinTech Hive in DIFC is a collaborative workspace that conducts regular events and workshops such as FinTalks, allowing people to connect with other FinTech, Islamic FinTech, RegTech and InsurTech enthusiasts, to keep up-to-date on the latest industry technology trends and developments.

"Talent is essential for blockchain industry growth," says Al-Mazrouei. "Greater access to quality training is critical, and the academy at the DIFC aims to deepen the pool of financial services professionals in the UAE by equipping them with skills that drive the future of the industry."

DIFC has also partnered with institutions to offer knowledge-sharing initiatives and programmes for working professionals and post-graduates.

On 15 July 2019, Etisalat Digital, in partnership with First Abu Dhabi Bank (FAB) and Dubai-based Avanza Innovations announced the launch of a nationwide digital platform. UAE Trade Connect will enable banks, enterprises and governments to collectively benefit from digital innovations such as blockchain, robotics, artificial intelligence and machine learning.

Seven major UAE banks have joined the nationwide platform – Mashreq, Emirates NBD, Commercial Bank of Dubai, National Bank of Fujairah, RAKBANK, Commercial Bank International and Abu Dhabi Islamic Bank. The platform is open to all UAE banks.

Real estate

The significance of secure transactions in the real estate sector make it a suitable use case for blockchain. Dubai

Land Department (DLD) recognised this early on and is one of the first government entities in the world to introduce blockchain technology in its service offerings.

Mureed Mustafa, director of operations at Emirates Real Estate Solutions (ERES), says: "With the real estate industry undergoing a digital transformation, blockchain is having an instrumental effect on the industry, from property purchasing to due diligence to title management." ERES is a joint venture company between Emaratech Software and Systems and DLD, and is the technical arm of DLD.

Some of the solutions provided by DLD include title deed verification, Ejari static registry access, a listing engine, rental dispute centre verdict static registry and e-mortgage transaction verifications.

"Blockchain processes have become fundamental to our day-to-day operations and an indispensable element of our government," says Mustafa.

"They not only reduce costs, eliminate fraud by maintaining the integrity and quality of available data, and save working hours, but will also result in a better, consumer-friendly market and end prices."

Catching up

Ankit Uppal, associate director for digital and innovation - emerging technology at KPMG Lower Gulf, says that blockchain technology is not particularly prominent within the construction industry in the Middle East.

"There are use-cases being tested globally to target key pain areas in the sector, for instance a highly fragmented, scattered and complex supply chain," he says. "The use-cases include provenance and supply chain management using blockchain."

"Another trend related to the construction and real estate sector is initial coin offerings (ICOs) as well as acceptance of cryptocurrency as a means of payment from the end customer."

Blockchain is still at a nascent stage, and Uppal foresees more adoption of such technology by organisations across sectors in the Middle East in the next three to five years.

"The competitive advantage that we have from this region is that the strategy comes from the top and we need to show our commitment to Dubai's vision," says Maria Papadaki, assistant professor at the British University in Dubai and managing director at the Dubai Centre for Risk and Innovation.

"Ultimately, this makes us lucky to have a direction where it does not exist in other countries," she says.

"I do believe that we live in an environment where blockchain can evolve and advance effectively in the next 10 years. It is up to us to know how effectively we collaborate, what ethics and trust we have among us."



REGULATING BLOCKCHAIN

As with any new technology in the market, blockchain brings its fair share of challenges as industries venture into uncharted territory

Blockchain is fast building a reputation as a robust, transparent and trustworthy technology, explaining why, on the hype curve, it is seen as game-changing for the management of transactions.

For the construction sector, blockchain is helping to solve a number of key industry issues, driving greater efficiency, transparency, collaboration and accountability across all stakeholders in construction projects.

It should be noted that blockchain technology does not come without its challenges, particularly in relation to how project risk has traditionally been apportioned in the construction industry and how that risk is managed (eg, contractually, through insurance).

Regulatory

The current legal framework of the UAE does not specifically address the application of blockchain in the construction sector.

In the UAE, the risk allocation between parties on construction projects is generally distributed and governed by the relevant underlying construction contract entered

into between the parties. This is in line with the principle of 'freedom of contract' which generally prevails, subject to certain mandatory provisions of UAE law contained within (among other legislation) the UAE Civil Code.

Legislation – including the UAE Civil Code – and contracts in general, such as the well-known standard form suite of contracts of the International Federation of Consulting Engineers (Fidic), will need to be comprehensively reviewed and updated in order to ensure they address the revised risk profile associated with the application of blockchain on projects.

For example, there needs to be clarity on which party will ultimately be held responsible in the event of incorrect, incomplete or inaccurate data causing a design defect or other flaw in the project.

Furthermore, given the scope for disputes to arise between parties regarding the use of blockchain, judges presiding over such matters in the local UAE courts will need to be trained in order to ensure that they are able to readily understand, interpret and opine on the legal and contractual nuances that arise as a consequence of this emerging technology.

Regulations

This will ensure that industry stakeholders have confidence that the courts are indeed able to ultimately render a fair and equitable judgment in what is a potentially complex and highly technical legal area.

Personnel

The implementation of blockchain will require a concerted effort from all stakeholders throughout the construction project supply chain. Considerable investment will be required to ensure that all of the personnel involved in construction projects are trained and well-equipped to use the technology. The cost implications of this should also not be overlooked.

Data protection

Blockchain raises a number of key data protection issues. Construction will need to carefully consider these issues in determining how it can effectively exploit the benefits of blockchain while complying with data protection regulatory requirements.

This is particularly important based on the amount of personal data the construction industry manages and in particular the amount of sensitive personal data (eg, relating to health and safety). This is becoming increasingly relevant in the Middle East as the issuance of data protection regulations modelled, to a greater or lesser extent, on European data protection regulations, gathers pace.

Blockchain challenges current data protection laws based around managing data in centralised databases with controlled access points, controlled geographical transfers and clearly defined users.

Data protection regulation identifies certain parties (either data controllers or data processors depending on the roles they are performing) as responsible for meeting data protection regulatory requirements and penalises them for failing to do this. Blockchain challenges this structure.

There are a number of aspects of blockchain that are aligned with current data protection regulations. For example, concepts allowing data subjects control of their



information and who it is shared with (data sovereignty); and the ability to move data easily between databases (data portability). Added to this is the security of blockchain technology's encryption model.

Where blockchain technology falls out of alignment with current data protection regulations, is in the inherently transnational aspects of blockchain technology, which spreads out across nodes located in various jurisdictions (possibly jurisdictions lacking the safeguards required by current data protection regulation).

Additionally, a key data protection regulatory principle is the right of data minimisation. Data controllers are obliged to limit the personal data collected. They also have to allow data to be amended where inaccurate, and deleted (the data protection right to be forgotten).

These concepts do not translate well to blockchain technology. Data remains perpetually on a blockchain as it continuously expands, accumulating further data. It cannot be deleted or amended, although inaccurate data can be corrected through adding new, accurate data.

Some of the tensions between current data protection regulations and blockchain technology can be managed through the type of technology adopted.

Widely accessible blockchains with wide, unchecked user bases (known as public, permissionless) pose the most data protection regulatory challenges.

“Smart contracts have the potential to reduce the delay, bureaucracy and the multiple intermediaries that managing the project manually brings, resulting in ‘speed of thought’ contracting”



“With the growth of complex structures such as public private partnerships in the Middle East, the effective management of projects and payments becomes even more important”

There are other types of blockchain technology, though, that are much more limited in scope (known as private, permissioned). These are limited geographically (eg, with all nodes within a certain jurisdiction avoiding data transfer issues) and come with greater user controls (eg, users are approved to join the blockchain).

Additionally, the removal of personal data from the blockchain itself and holding it externally within traditional databases with links into the blockchain has been proposed as a means of ensuring that the innovation that blockchain technology brings will not fall foul of current regulatory restrictions.

Smart contracting

Construction projects consist of multiple milestones, each triggering payment and other obligations. Smart contracts have the potential to reduce the delay, bureaucracy with its related costs, and the multiple intermediaries that managing the project manually brings, resulting in “speed of thought” contracting. It can also take advantage of the immutable project record held on the blockchain ledgers to help provide project transparency and accuracy.

With the growth of complex structures such as public private partnerships in the Middle East, the effective management of projects and payments becomes even more important.

It is particularly important for the many SMEs that form part of the construction ecosystem, that rely on regular, on-time payments and face the risk of insolvency through late payment. However, time will tell how the construction industry embraces such automation as fit for purpose and applies it to the complex, multi-party approval process required before a payment milestone is met. Payers may be reluctant to relinquish such control to technology.

In addition, while a very simple contract can be automated (with the contract entirely coded and stored, verified and executed on a blockchain), it is currently challenging to use smart contracting for more complex contracts that may incorporate features of contract law that are difficult to code (like good faith).

Smart contracts are also not fit for purpose for contracts that may be subject to change and revision, as many construction contracts are. You cannot revise a smart contract without re-coding it.

Smart contracts would also challenge the way in which contract disputes are managed, with courts having to completely rethink the way contracts are interpreted.

Cybersecurity

Finally, despite apparent security benefits with blockchain’s decentralised structure and its application of encryption, security concerns have also been raised and blockchains are, unfortunately, far from immune to hackers!

ABOUT THE AUTHORS



Martin Hayward (top) is the head of technology, media and telecommunications, **Euan Lloyd** (middle) is the senior counsel and **Leith al-Ali** (bottom) is a senior associate at Al-Tamimi & Company



ENHANCING DIGITAL SECURITY

As construction sites adopt BIM and IoT innovations, blockchain can reduce the risk associated with connected devices and improve safety

From Expo 2020 Dubai and the planned Neom City in Saudi Arabia to one of the world's largest metro networks in Riyadh, the construction sector in the Middle East continues to see strong investment in a variety of projects.

Across these construction sites, the architecture, engineering and construction ecosystem is rapidly adopting internet of things (IoT) solutions to transform operations; optimise costs, productivity and efficiency; and enhance worker safety.

For example, construction workers can use wearable sensors and smartphone apps to monitor safety and prevent accidents. Project managers can benefit from technologies such as real-time Big Data analytics, automated concrete pouring and building information modelling (BIM) to determine project timelines and identify any design clashes before they happen. One of the more exciting technologies entering the regional construction

market is blockchain. This distributed ledger technology – in which data is securely verified at every step of a process – is seeing practical use cases in BIM, smart contracts for stakeholders, digital procurement and supply chain, and identity verification of staff working on site.

Enhanced security

The biggest promise of blockchain in construction is that it will reduce the risk presented by IoT devices and ensure that the integration of operational technology with information technology can be done securely.

Construction sites that adopt the IoT expose their networks to cyber-threats. These are not abstract academic discussions. In fact, construction sites worldwide are facing the reality of cyber-threats.

For example, one research team recently hacked radio frequency controllers used to move cranes and large machinery on construction sites. Such hacking activities,

if done by someone with malicious intent, could lead to massive damage and safety risks.

In IoT deployments, blockchain can enable the decentralisation of network security decision-making, allowing device networks to protect themselves. Devices can communicate with one another to reach an agreement on what is normal network traffic and flag anything that is unusual.

Blockchain can especially reduce the risk of distributed denial of service (DDoS) attacks, which can affect multiple devices at once. With blockchain, an outage in one device should not impact the others, stopping attacks in their tracks. This is crucial for maintaining critical national infrastructure – from stoplights to utilities providers – and the wider smart cities that are connecting every aspect of our daily urban lives.

The merging of blockchain and the IoT can also address the issue of oversight. In businesses, for instance, transactions made by multiple sources can be administered through an immutable and transparent record, where data and physical goods are tracked throughout the supply chain. In the event of an erroneous decision or system overload, the blockchain record should be able to identify the point – say, a device or a sensor – where something went wrong, and the business could take immediate action.

Blockchain could also help reduce operational costs since it eliminates intermediaries or middlemen.

The Middle East construction sector may be hesitant about investing in emerging technologies when the status quo has worked relatively well for decades. The good news is that IoT and blockchain are seeing more practical use cases worldwide that can be localised, lowering costs.

The region is also seeing an increase in channel partners and system integrators that can develop digital roadmaps and find ways for firms to show quick return on investments on IoT and blockchain projects.

“In IoT deployments, blockchain enables the decentralisation of network security decision-making, allowing device networks to protect themselves and flag any unusual network traffic”

Potential benefits of blockchain for IoT



Track connected devices in the network



Authenticate users and devices



Maintain data securely



Remove single point of failure



Build trust between IoT processes



Reduce cost by eliminating intermediaries

With \$465bn worth of Middle East construction project contract awards between 1 January 2019 and 30 June 2019, according to regional projects tracker MEED Projects, 2019 is set to be a vital year for construction firms to ensure that their sites and operating processes are secure.

As IoT and blockchain become more mainstream, combining these two technologies could hold the promise of safer and more secure construction work-sites across the region.

ABOUT THE AUTHOR



Fabio Picoli is the managing director – GCC at Trend Micro



AN ACADEMIC PERSPECTIVE

Surge in blockchain training courses is fuelled by demand for workforce with the skills to implement the technology

As companies start to recognise the benefits of blockchain, there is a growing demand for training courses that can equip the workforce with the skills to successfully implement the technology.

“There are many good online courses available now, so for example a backend developer can likely pick up the necessary knowledge in a few months,” says economist and independent blockchain consultant, Oliver Beige. “I would still start with a core team that has in-depth experience, however, and not just picked something up quickly.”

Institutions such as University of California at Berkeley (UC Berkeley), Oxford University and Massachusetts Institute of Technology (MIT) have identified the grow-

ing need for both qualified blockchain developers and business experts to effectively market the product.

Mastering the art

MIT offers two courses on cryptocurrency engineering and design, plus an applied blockchain certification course – as part of its professional certification programmes – featuring hands-on experience with simulations and exercises with blockchain. The course is geared toward C-suite executives and decision-makers in a wide variety of industries, including finance, law, education and government.

Stanford University has a course called Bitcoin Engineering that teaches developers how to create bitcoin-enabled applications.

Meanwhile, speciality schools such as California-based Blockchain University and London-based education start-up B9lab, which launched an online Certified Ethereum Developer Training programme in 2016, offer training to students and professionals alike.

The student-run Blockchain at Berkeley association at UC Berkeley was launched in October 2016 and debuted the world's first undergraduate university-accredited blockchain course, Blockchain Fundamentals, taught to about 50 students.

The online course covers various consensus mechanisms (like Bitcoin's Proof of Work or Ethereum's Proof of Stake), the concept of tokenomics and the challenges of scaling decentralised networks. Having a technical background is not a prerequisite to sign up for the course.

"Training people in the field of blockchain is no different than teaching people about any new topic," says Liam Digregorio, executive vice-president of external partnerships and business development at Blockchain at Berkeley.

"Education has to be at the forefront of people's minds if we want the technology to be adopted and grow with its user base," he says. "Unfortunately, universities have been slow to implement blockchain-related courses, but slowly we are seeing an emerging trend of students demanding the curriculum and universities making it a priority."

Oxford's Blockchain Strategy programme at its Saïd Business School was introduced in 2018 and has already seen more than 3,000 executives trained in the six-week-long online course.

Understanding possibilities

"Training in this case is different from, say, what computer scientists do," says Nir Vulkan, associate professor of business economics at Saïd Business School.

"It is not about writing code, but about understanding the possibilities and limitations of this new technology so that students can make informed choices about how this is likely to affect their business and the businesses they interact with."

"BUiD was the first university in the UAE, and the third in the world, to issue digital masters and doctoral degrees using blockchain technology"

The average age of executives signing up for the programme is 40, while key partners backing the course include UBS and Morgan Stanley.

The school also offers an online short programme in financial technologies or FinTech.

Vulkan says that the programmes have gained traction in the Middle East, as well as in the US and Europe.

"Regulators [in the Middle East] are keen on blockchain and its possibilities, especially in finance," he says. "A lot of executives from the region have signed up for the online programmes."

"Blockchain is relatively new and a lot of research needs to be done in order to say that somebody is fully trained in implementing and designing blockchain technology," says Maria Papadaki, assistant professor at the British University in Dubai (BUiD) and managing director at the Dubai Centre for Risk and Innovation.

"I know there are many people running to fill the gap in education but we [BUiD] try to be more careful about how we train and what we train," she says.

"For blockchain, we need to understand first the difference between Bitcoins and technology. We focus on the technology."

Digital degrees

BUiD was the first university in the UAE, and the third in the world, to issue digital masters and doctoral degrees using blockchain technology.

The graduates' degrees can be validated using the verification platform on BUiD's website from anywhere in the world, without having to approach the university or other authorities for authentication purposes. This is a shift away from the usual approach, which requires degrees to be authenticated with stamps or ministry signatures.

In April 2019, BUiD signed a memorandum of understanding with the University of Nicosia (UNIC) and Dubai Blockchain Centre to promote collaboration in the research and development of blockchain.

Papadaki explains: "Why with the University of Nicosia? Because it is considered the leading university in the world on the topic of blockchain technology. Their work [dates] back in 2013, when it was the first university to accept Bitcoins as a tuition fee.

"In 2014, they became the first in the world to introduce an MSc in blockchain. By 2017 all of their graduates received a digital degree on a blockchain platform."

BUiD is currently in the process of getting the necessary approvals for an MBA with concentration on blockchain technology, and is submitting a proposal to the UAE Ministry of Education for an MSc programme specialised in blockchain with the University of Nicosia.

ENERGY LESSONS

Blockchain finds application in the energy sector, offering lessons on traceability and verification for the construction sector

The pace of technology adoption in the energy sector has always been slower than in many other industries. It has fallen behind sectors that have been proactively seeking and integrating new technologies such as artificial intelligence and blockchain to drive development forward.

However, the energy landscape is dramatically changing. Renewable energy, decentralisation and microgrids are transforming the sector, and the way we produce, transport, distribute and consume energy.

Blockchain holds the power to revolutionise the energy space, driving decentralisation and increasing connectivity. There are a number of inefficiencies and issues that blight the energy market – lack of trust and transparency is rife within the sector, and incorrect and hidden costs are abundant. Some of these problems are common in the construction sector.

Blockchain brings traceability to counteract this. It can also track energy production and consumption, verify energy sources and reduce costs using energy trading with a distributed ledger to support decentralisation.

Energy trading

Peer-to-peer energy trading is gaining steady momentum in the energy sector. However, there is still a long way to go to scale it up, devolving the power away from the UK's big six energy suppliers: British Gas, EDF Energy, E.ON, npower, ScottishPower, and Scottish and Southern Energy.

“With renewable energy generation plentiful in the domestic and non-domestic markets, distribution becomes more efficient and flexible. The decentralised, localised blockchain system provides a reliable, low-cost platform for creating, verifying and logging transactions in real time”

With renewable energy generation plentiful in the domestic and non-domestic markets, distribution becomes more efficient and flexible. The decentralised, localised blockchain system provides a reliable, low-cost platform for creating, verifying, logging and settling energy transactions in real time. It also cuts costs by facilitating a trusted transfer of value without the involvement of traditional intermediaries.

Steering choices

Blockchain is ultimately digital freedom, leading to greater trust of digital ownership. EnergiMine's blockchain platform uses tokenisation to incentivise end consumers to adopt energy saving and 'green' behaviours with the digital currency EnergiToken or ETK.

Hosting the EnergiToken rewards-based platform on blockchain enables visibility of transactions and security for tokens on the wallet storage.

The ETK platform takes the same profit-motive principles of blockchain technology to positively steer energy consumption choices. For example, a consumer may choose to purchase an electric vehicle simply because it is better for the environment. That is great. Many choose to do so. But to really get a large number of consumers motivated to purchase an electric vehicle instead of a traditional fossil-fuel vehicle, there has to be a little extra financial push in the right direction.

Consider the same choice, but now with the possibility of being rewarded with ETK, which can then be used as a currency for the purchase of electricity, fuelling the newly acquired electric vehicle. How many more consumers might finally be motivated to commit to a more environmentally beneficial option?

By utilising blockchain in the energy industry, companies can make a significant step change towards improved business processes. It is crucial for organisations to fully understand the potential for blockchain to solve issues and deliver real value long-term.

More user cases are needed, however, to prove blockchain's commercial viability to the energy industry and to drive mainstream adoption.

By **Jennifer Xhufi**, marketing manager at EnergiMine

SECURING FINANCE

Blockchain-based smart contracts, with their self-executing nature and automated tasks, are the answer to improving efficiency and transparency

While blockchain is more commonly known as the technology that powers Bitcoin, various industries' stakeholders are beginning to realise that blockchain-based smart contracts, with their self-executing nature and automated tasks, are their answers to improving efficiency and transparency in core business operations.

There are several examples of how blockchain in finance may transform the construction industry. Blockchain can revolutionise construction financing and potentially truly democratise access to the real estate market.

Fractionalisation of real estate

Financing through fractionalisation of real estate projects allows for companies to fundraise with a wider pool of investors. Tokenising assets enables real estate companies to make their illiquid assets liquid through token sales. Since building on the blockchain facilitates transactions without the need for trusted third parties, this can also help to reduce risks and improve governance and processes within the fundraising body.

Apart from institutional investors or affluent buyers who do not have credit issues when acquiring properties or land assets, the real estate market is accessed, by most, through housing mortgages. Global trends of rising costs of living, inflation and increasing land prices leading to higher housing prices have prevented many from getting on the property ladder at an early stage in life.

For buyers and investors, democratising access to the real estate market can be achieved, as fractionalisation allows for ownership through smaller stake investments. This solves the affordability problem and potentially creates a virtuous loop where more real estate and construction projects have access to funding through tokenisation, and more people have affordable access to ownership, which was not previously available.

Cross-border payments and foreign investments are also made more efficient and seamless with the use of blockchain networks and cryptocurrency. Stablecoins can facilitate more efficient cross-border remittances through mitigating short-term volatility risks and providing the on/off ramp utility for assets.

Smart contracts

Smart contracts can also be built into the progress of the construction project, which allows for payments to be triggered as each phase of construction is completed. This helps mitigate risks for buyers, especially when investing in a foreign country, and reduces the need to place trust in a developer or company's reputation to see the project to completion.

Long-term financing of a project in the construction industry is based on the strength of the developers' balance sheets and the projected cash flow of the project. Allowing for smart transactions through smart contracts creates a win-win situation as this helps protect the investor while enabling the company to be financed further as the project build progresses.

This can also be applied to supply chain management. The supply chain of a construction project includes the main contractor, sub-contractors, consultants, architects, logistics and specialist suppliers. Building smart contracts into the supply chain management improves contractual performance, reduces financial risks to the project, speeds up efficiency and cuts out the unnecessary middleman. Payments can be automatically arranged to suppliers as different stages of delivery are completed.

Smart contracts can also help to increase integrity in the provenance of materials. Should there be inferior grade materials dispatched instead of those agreed upon, the smart contract can determine and thereafter execute shipping and payment only when the authentication of materials is validated.

The use of a distributed autonomous organisation, defined by smart contracts can also help in the continuous lifetime of the project, through the project building management, for instance.

These applications, when applied to the construction industry, help to foster trust among the various stakeholders and present a good opportunity for those left out in the real estate ownership and investment space to find a viable entry point. The second order effects of this revolution could go beyond democratising the real estate market to jumpstart or reboot communities.

By **Nicole Lim**, ambassador at Dragonchain

TAKE IT STEP BY STEP

Supporting blockchain development with planned legislation can drive effective implementation across industries



For blockchain to flourish, it is important to think beyond Bitcoin. The technology offers significant scope in most industries that require a degree of verification and transparency, and follow step-by-step processes.

The applications of smart contracts are essentially limitless and could extend to almost any field of business in which contract law would normally apply, such as construction.

It is important to remember, however, that smart contracts are not a substitute for diligence. At the end of the day, smart contracts are essentially made up of what a user puts into them and will still require input from lawyers.

Nonetheless, smart contracts remain one of the most exciting ways that blockchain technology has already extended beyond the cryptocurrency space and into the broader business world.

Blockchain addresses some of the common challenges facing the construction sector – accountability, transparency and payments. However, this solution would work best if all stakeholders in the supply chain agree to be a part of the decentralised blockchain network.

Companies need to recognise whether this is the best solution for the challenges they are facing on internal and external operations. There may easily be other tech-

nologies, such as cloud computing, which could instead be a better solution to a construction challenge.

Investments are pivotal to blockchain, both in terms of capital and talent. Firms need to prepare for this and ensure they estimate return on investment (ROI) to avoid running disastrously over-budget.

Having said that, blockchain can advance technologies that the industry is already benefiting from, building information modelling (BIM) being one of them. The potential of a circular BIM model is enormous and will reduce many of the challenges, particularly in the operations and maintenance phase.

Organisations such as the Construction Blockchain Consortium in the UK and the Foundation for International Blockchain and Real Estate Expertise (FIBREE) in Amsterdam, are bringing together industry experts to share knowledge and initiate discussions around blockchain.

The Middle East construction sector can also benefit from a dedicated blockchain organisation, which can bring together industry and technology experts from around the region.

Companies need to remember the fundamental of blockchain – a decentralised, open network. This can only be realised through collaboration and working in tandem with various stakeholders. Innovation cannot be achieved in silos and requires communication.



ABOUT MEED

MEED has been integral to delivering business information, news, intelligence and analysis on the Middle East economies and activities for over 60 years. Attracting a key senior management audience through its content and activities, MEED is a media brand, publication and data business that covers a spectrum of services which inform, engage, connect and ultimately support our subscribers and partners in their business development and strategic growth.

Recently acquired by GlobalData Plc, MEED is now part of one of the largest data and insights solution providers in the world with the capacity to build global communities for our clients.

Our purpose is to support the region's companies make better and more timely decisions through our innovative data solutions and grow through our comprehensive and world-class marketing solutions.

To find out more email: info@meed.com

ABOUT MASHREQ

Established in 1967, Mashreq is the oldest bank in the UAE, with award-winning financial solutions and services. Throughout its 50 years' history, Mashreq has differentiated itself through innovative financial solutions, making it possible for its customers to achieve their aspirations.

Today, Mashreq has a significant presence in 11 countries outside the UAE, with 21 overseas branches and offices across Europe, the US, Asia and Africa.

Mashreq launched its new Vision and Mission recently, outlining its commitment towards its clients, colleagues and the community. In line with its vision to be the region's most progressive bank, Mashreq leverages its leadership position in the banking industry to enable innovative possibilities and solutions for its customers across corporate, retail, international, treasury and Islamic banking.

Mashreq is proud to be the first financial institution in the UAE to be awarded the Gallup Great Workplace Award for four consecutive years from 2014-17. Mashreq also continues to invest in recruiting, training and developing future generations of UAE national bankers.

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