

Blockchain boost for ‘smart’ contracts

Lampros Stougiannos of **Dentons Canada LLP** warns that the rapidly developing uptake of digital technologies across industries, including BIM in construction, allied to a more collaborative approach to project execution, will force changes to contracts. Throw blockchain into the mix, and ‘smart contracts’ are not far off.

KEY POINTS

- New technologies are being rapidly deployed within the construction industry
- BIM (building information modeling) software is being used not only to enable 3D modeling of a project, but also as a platform for collaboration amongst project participants and for information storage/exchange
- Blockchain renders digital information more secure, traceable and incorruptible
- The increased adoption of BIM, as well as collaborative construction execution practices, will require changes to construction contracts
- The combination of BIM and Blockchain technology, together with the desire for greater collaboration and transparency among project participants, could spur the development of ‘smart’ construction contracts

While the global construction industry has been criticized for being too slow to innovate, the last several years have seen it embrace new technologies, leading to the adoption of new processes which are having a significant impact on the execution of construction projects.

These technologies can be divided into two broad categories: software and hardware.

On the hardware front, technologies such as autonomous vehicles and robotics (ie drones), modular construction, 3D printing, and ‘wearables’ such as augmented reality glasses and exoskeletons are changing the way projects are monitored, constructed and operated.

Developments in the software used for planning,

designing, executing and operating construction projects have been equally impressive. The use of this software has led to greater efficiency and precision in project execution and has facilitated collaboration amongst project participants. BIM (building information modeling) software – widely used in both Canada and the UK – is likely the best-known example of this. Through its data-driven approach to project design, management and delivery, the use of BIM has been shown to simplify the exchange of information and documentation among project participants, reduce costs and increase the chances that projects will be delivered on time and on budget.

BIM and the future of project collaboration

Construction projects are complicated and risky endeavors. They can be less so when parties involved in the project are well informed of one another’s activities and where collaboration is fostered. Information management, transparency and trust among project participants are therefore keys to ensuring the success of a construction project. BIM can play an important role in this context.

A BIM model is intended to be far more complex than a CAD-based 3D model, enabling not only the graphical representation of construction drawings that were traditionally paper-based, but also the integration within the model of a variety of datasets from multiple sources. The model can, for instance, capture pricing information for components of a construction project: from the largest and most complex piece of equipment down to the smallest screw. Once compiled, the model can be continuously updated during the execution of works and serve as a repository of project information afterwards: useful for managing everything from change order pricing to life-cycle costs. BIM can

therefore serve as a 'single source of truth' for all project participants, from initial planning and design, to execution, operation and demolition.

However, important issues remain with the increased use of BIM platforms in construction projects, including the need to ensure the incorruptibility of information stored on the model and the identity of the one making changes to it – an issue commonly referred to as 'traceability'.

In this regard, Blockchain may have a role to play.

Blockchain as a foundation for BIM

Blockchain is a database technology that ensures secure exchanges and storage of any information uploaded to a database. Blockchain achieves this by gathering all information into immutable and time-stamped digital 'blocks'. These informational blocks then link together and are constantly verified on a peer-to-peer basis by other computers forming part of the same database. Thus, the Blockchain database is, by design, self-verifying. In other words, there is no need for any third-party intermediaries to verify any of the information stored on the database, nor any of the changes (or transactions) executed within that database. Information stored on it, including any change made to the database, can also be accessed relatively easily. Furthermore, once a block of information is added to the Blockchain, it cannot be altered without database users knowing about it.

At present, Blockchain technology is mainly used to enable cryptocurrency transactions (eg Bitcoin), given how critical it is to be able to securely and immutably store and transfer ownership of these currencies, which exist only in the digital realm. However, thanks to increased use of and interest in the technology, its potential applications are being expanded and theorised at a remarkable rate.

The development and use of BIM will likely continue to progress to a point where it is commonplace for all project participants to collaborate on project design, execution and operation within a single and unified BIM model. BIM software platforms will be used not only to generate 3D and 4D project models, but also to compile within the platform all project information and documentation, including pricing information, change orders and payment information. However, if project participants are to effectively collaborate within BIM platforms, they will need to trust the information contained within the relevant project database.

By combining BIM and Blockchain, information contained in the BIM platform could be gathered, maintained, updated and archived within a reliable, transparent and incorruptible database. The incorruptibility of information stored on the BIM platform would be guaranteed and parties could confidently, securely and sequentially trace and maintain a record of every single decision, action or change made during the design and execution of a project. This should, in theory, drive more trust and collaboration among project participants and increase the benefits of BIM outlined above.

The ability of Blockchain to track all changes made to the information contained within the relevant project/BIM database will have additional benefits and consequences, some of which are clear, while others are less so. Blockchain can, for instance, help contributors to the BIM model maintain copyright over their contributions and ensure accountability of contributors in the event something goes wrong. Furthermore, since Blockchain can be used as a basis for the development of smart contracts, combining BIM and Blockchain could give rise to self-executing construction agreements.

The rise of the 'smart' construction contract

Rather than being written on paper, the terms and provisions of a smart contract are set out within source code and computer protocols. Contractual provisions within a smart contract can be partially or fully self-executing and self-enforcing, removing the need for intermediaries and, at least in theory, rendering unnecessary methods of encouraging or forcing parties to comply with their obligations, such as demand letters or court proceedings. In other words, traditional contractual processes that required human intervention and oversight can be partially or fully automated.

While smart contracts have theoretically been possible since the development of the modern computer, one of the main restrictions to their development and increased adoption has related to ensuring data accuracy. Indeed, any party to a smart contract needs to 'trust' it, in the same way, or perhaps more so, than a party 'trusts' the provisions set forth in a paper-based contract. Parties must also have confidence that the information contained in the smart contract, together with the actions taken by the smart contract, are securely logged and executed, and that they are traceable and unalterable.

With Blockchain, these concerns are for the most part addressed, since the technology ensures the secure, traceable and incorruptible exchanges and storage of any information (ie any transaction) uploaded to its database. The development of Blockchain should therefore allow smart contracts to thrive.

Significant portions of a construction contract can be embedded within the BIM model and secured by Blockchain. While it is unlikely that the entirety of a construction contract could be coded into software such as BIM, a 'smart' construction contract would combine traditional construction contract provisions with digital self-executing ones.

A smart construction contract could:

- ♦ by leveraging Blockchain, resolve a variety of legal issues (liability, IP, etc) created by parties' increased reliance on BIM;
- ♦ include all project participants as parties, particularly to the extent they will have access and contribute to the project's BIM model, in a multi-party arrangement similar to alliance or integrated project delivery models;
- ♦ connect to a project bank account, confirm to project participants that sufficient funds are available for them to be paid assuming they comply with their obligations, and automatically release payments to them once those obligations are met; and
- ♦ automatically and securely transmit data regarding the project and its progress to relevant stakeholders and third parties, such as lenders, insurers and governmental authorities.

In the context of the construction contract, the possibility of automating some of the contractual processes that traditionally were set out on paper and which relied on the interventions of multiple project participants is worth discussing and exploring.

A practical example: payment procedures

Payment delays are long-standing and just as much a problem in the Canadian construction industry as in the UK's. In many jurisdictions, the issue has become so significant as to require specific prompt payment legislation to be adopted to force project participants to pay one another within a reasonable period of time.

Innovation enabling prompt payment could instead come from the industry through its

use of automated payment processes made possible by smart contracts and supported by BIM. The payment claim procedure for any particular project could reside entirely within its associated BIM platform built upon a Blockchain database architecture. For example, once a supplier is ready to ship a component to the project site, it would log this action in the BIM software. The smart contract would be connected both to the BIM database and to a project bank account. The contract would verify the availability of funds to pay for the supply and confirm this with the supplier. Once delivered to the site, the project manager would confirm having received the component within BIM and, *automatically*, funds would be transferred from the project account to the supplier, alleviating wait times and delays.

Conclusion

Just a few years ago, it would have been difficult to imagine that perhaps, due to the combination of BIM, Blockchain and smart contracts, construction contracts could one day exist – at least in part – within a software application whose information is stored on a completely secure and unalterable information database, and whose provisions self-execute. Such is the pace of technological development.

Obviously, any automation of construction contracts will require careful consideration. Can digital systems ever be trusted enough by the parties using them to allow for self-enforcing contractual provisions that require little or no human intervention? What are the archiving risks associated with using digital information and will the information even be accessible 10, 20 or 30 years after its creation given how quickly file formats change? Will courts recognize the enforceability of smart contracts?

Change is definitely on its way. As Tracey Summerell and Mark Macaulay's article highlighted ('Smart contracting technology is ready for use' (2019) 30 CL 9, pp 21-23), a shift in culture is also needed and further consideration of the legal issues underpinning smart contracts. Construction industry stakeholders need to familiarize themselves with these technologies and consider the opportunities they provide for greater reliability of information, increased efficiency in project implementation, fewer disputes, and lower costs. **CL**