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Smart contracts: a key enabler for corporate digitalisation

Smart contracts - computer protocols allowing the automated processing of legal terms - have the potential to significantly alter the commercial, legal and regulatory landscape. The advent of the blockchain has been hailed as providing the tamper-proof environment necessary for smart contracts to really take off, allowing for the use of smart contracts to facilitate complex commercial arrangements involving multiple parties. However, there are of course challenges involved. Bernadette Jew and Peter Reeves of Gilbert + Tobin, and George Samman of Sammantics consultancy, analyse the opportunities smart contracts could bring, the challenges that need to be addressed, and how smart contracts could enable corporate digitisation.

Smart contracts will dramatically change our commercial, legal and regulatory landscape - not just for 'digital' companies, but also for the broader corporate environment. Up until now, we have technologies for automating commercial operations and processes - but the automated processing of legal terms has been far more challenging. Parties to a contractual agreement need a tamper-proof environment that they can trust, before they will allow computers to 'self-execute' any legal terms.

Blockchain is now able to provide that tamper-proof environment of trust - and as a result, smart contracts are emerging as one of the key building blocks for digitisation of the corporate environment. Smart contracts involve more than just converting legal terms into computer programs - they generate a digital record of each 'change of state' throughout the life of a contract. This is a key difference between smart contracts and real world traditional contracts.

Smart contracts are particularly useful for complex, multi-party commercial arrangements. They can automate the processing of those legal terms that are prescriptive and deterministic - including the financial calculations around cost and revenue allocations. They provide far greater transparency, simplicity and traceability, with lower administration costs. Also, they can significantly reduce the risk of disputes, since a smart contract can be linked to real-world source

data - enabling the parties to readily verify the accuracy of the outcomes.

There will still be legal terms that can't be automated, because they are not prescriptive or deterministic - and any disputes around those terms still need to be resolved via traditional legal processes and institutions.

In the world of blockchain and smart contracts, there are opportunities to move away from the traditional structures and constitutions for multi-party arrangements (and the intermediaries that have played a coordination role) and to create new consortiums, transacting in entirely new ways. However, this is not without its challenges:

- We need to create new rules for participation and operation of these multi-party arrangements - incorporating new commercial arrangements (reflecting new ways of transacting), new governance and contractual frameworks, and the development of a rules-based engine on the blockchain to implement these arrangements. All of this needs to be consistent with the broader real-world commercial and contractual arrangements of the multi-party consortium.
- This also requires us to align smart contracts with the real-world contractual intentions of the parties - bringing an entirely fresh approach to the overall contractual framework.

Over the past 12 months significant progress has been made in relation to the systems, processes and governance frameworks required to address these challenges.

Delivering business benefits

Smart contracts will be critical to the digitisation of our corporate environment:

- Smart contracts involve more than just converting commercial arrangements and legal terms into computer programs - they also generate a digital record of each 'change of state' throughout the life of a contract. This creates transparency, traceability and auditability of commercial and contractual activities, and it is a key difference between smart contracts and real world traditional contracts.
- At a practical level, smart contracts provide the logic on the blockchain - since the blockchain itself is just a ledger or electronic record (with variations on the blockchain model being called 'shared ledgers' or 'distributed ledgers'). Smart contracts execute the processes required to effect changes on the blockchain ledger - and some of those processes may be based on agreed legal terms.
- Smart contracts can also provide the 'communications layer' on the blockchain, facilitating communications with external sources of real-time data.

In this environment of trust, smart contracts can be 'self-executing' and 'self-enforcing':

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- Participants can trust the results of this automated processing - which could never happen in a traditional environment without a central gatekeeper to manage the database.
- The environment of 'trust' on a blockchain is achieved through consensus mechanisms and hashing algorithms. Participants on a blockchain ledger can validate every row in every record on the blockchain ledger, without the need for a central validator. This makes the blockchain ledger tamper-proof - immune to risks of fraud and corruption. It also makes the blockchain ledger an ideal platform for the automated execution of contractual terms.

Smart contracts can deliver significant business benefits, particularly in the case of multi-party arrangements with multiple sources of data and complex financial calculations around cost and revenue allocations. They can deliver significant reductions in the associated operational and administration costs, as well as far greater transparency, simplicity and traceability of commercial operations and financial outcomes, and significant reductions in the risk of disputes, since the smart contract can be linked to real-world source data - enabling the parties to readily verify the accuracy of the outcomes. By way of example:

- Smart contracts can be linked to real-time data feeds - with automated processing based on the occurrence of pre-defined conditions. In practice, this means that a smart contract can be programmed to automatically process changes on the blockchain, based on trigger events arising from the data feeds. The data can be obtained from external databases, or generated by IoT devices that are embedded in the end-to-end processes - and this might comprise of data regarding financial markets, supply chain activities, environmental conditions, performance

monitoring, and maintenance activities, etc. Flexibility can be built into the smart contract by requiring human intervention (e.g. a signature) at certain points along the way where appropriate, e.g. a human signature of approval could be required prior to the smart contract triggering enforcement/ termination consequences.

- Smart contracts can significantly reduce the risk component of pricing, by enhancing the transparency and traceability (and associated value) of assets that are recorded on the blockchain (e.g. by recording/ processing information over the life of the asset in relation to ownership, financing, maintenance, performance, spare parts, associated payment streams, asset securitisation, etc).
- Links to real-time data can significantly remove the potential for contractual disputes. For example, where a joint venture is accompanied by complex calculations in relation to cost and revenue allocations of the joint venture participants or consortium participants, then those calculations can be automated on the basis of direct links to real-time production data, enhancing the quality of the source data available to process those calculations; and providing greater traceability and confidence in relation to the accuracy of the calculations and financial outcomes.

Smart contracts are not contractual agreements

Smart contracts are not contractual agreements - they are really no more than 'smart transactions.' It is a misnomer to assume that smart contracts will replace traditional legal agreements.

- There is no such thing as a digital utopia, in which everything can be converted into code, solving the ambiguities and uncertainties of traditional legal frameworks.
- There will always be issues that are left unsaid or remain vague in contractual

agreements - partly because of the practicalities of getting the contract done, and partly because the parties may deliberately prefer this approach. Complexity, ambiguity and uncertainty are an inevitable part of commercial life (for better or worse).

Smart contracts are only suitable for those parts of the contractual agreement that are deterministic and prescriptive, and readily able to be converted into digital code.

By comparison, a contractual agreement can be far broader in scope. A contractual agreement is about the intentions of the parties, and those intentions can encompass matters such as:

- the rules for working together as a consortium on a private blockchain, or participating in services infrastructure that utilises a blockchain;
- the rules for managing decision making around ongoing changes (e.g. regulatory changes; technology changes on the blockchain platform, etc);
- how to ascertain the intentions of the parties in the event of coding errors in the smart contract (addressing the problems arising in the recent DAO case); and
- the rules around enforcement in the case of disputes.

Furthermore, those intentions of the parties can be manifest in many different ways: in writing, verbally, by conduct, by smart contract coding on the blockchain ledger, or by any combination of these.

There is now recognition that real world contractual agreements and dispute resolution processes are going to remain relevant in a digital world. There will still be legal terms that can't be automated, because they are not prescriptive or deterministic - and any disputes around those terms will still need to be resolved via traditional legal processes and institutions.

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In response to this challenge, private shared ledgers have emerged over the past 12 months as the preferred model for corporate enterprise - in preference to the 'all-comers' public blockchain model. With private shared ledgers, participants do not need the blockchain technology to completely control all interactions. Instead, the participants can develop a mix of technology controls and real-world contractual arrangements (including consortium frameworks and real-world governance and dispute mechanisms).

Challenges

As previously mentioned, blockchain and smart contracts provide opportunities to transact in entirely new ways. However, this is not without its challenges:

- We need to create new rules for participation and operation of these multi-party arrangements, as discussed earlier.
- The consortium framework can inevitably leverage some of the elements of traditional participation and market rules (such as regulatory regimes) - but it needs to be supplemented or overlaid by operating rules for the new shared ledger environment.
- It requires a 'bottom up' approach to establishing new consortium frameworks, designed specifically for the shared ledger environment. In essence, we need to create a centralised decision making process for the decentralised shared ledger.

Ensuring consistency across the contractual framework

Challenges also arise as to how best to align smart contracts with the real-world contractual intentions of the parties - bringing an entirely fresh approach to the overall contractual framework. In other words, how do we resolve inconsistencies between (i) the code in a smart contract; and (ii) the actual intentions of the parties, based on their 'real-world' contractual agreement. The code in the smart contract may not reflect the true intentions of the parties, whether because of coding errors or inadvertent inconsistencies.

Just because the parties wish to leverage

the benefits of converting legal terms into smart contracts, this does not mean that they should be required to live or die by the code. Smart contracts still need to be interpreted in the context of the broader, 'real-world' contractual agreement between the parties - although ideally, there should be systems and processes for ensuring that they are as consistent as possible from the outset. This requires:

1. Transaction validity: checking that the contract code matches the real-world contract, i.e. ensuring that they are consistent, and that there are no coding errors. The parties need to agree on transaction validity through a process which involves each of them independently running the same contract code and validation logic.
2. Transaction uniqueness - no double-spend: ensuring that the inputs are valid, and that there is no duplication or double-spend. This role is generally performed by an independent third party.

Over the past 12 months, various technology vendors have been working on innovative and pragmatic initiatives to solve these challenges:

- developing technical solutions for tying real-world legal contracts to smart contracts through hashing; and
- developing smart contracts which are 'hashed' (enabling automated processing on the blockchain that can't be tampered with).

New ways of transacting

The combination of blockchain and smart contracts will enable us to move away from traditional structures and constitutions (and the intermediaries that have played a coordination role) and to create new consortiums, transacting in entirely new ways. It is creating a new kind of trust, enabling organisations to deal with each other directly - 'peer-to-peer' - without intermediaries. This is leading to opportunities for collaboration across multiple organisations and across broad industry groups. Consortium members can collaborate and share information in ways that have not previously

been viable, sharing information with each other (and with regulators) where appropriate, while at the same time restricting the 'permissions' for access to confidential information.

All of this has the potential to create more efficient markets and reduce transaction, processing and reporting costs. It enables new approaches to corporate innovation - providing a platform for corporations to work together and innovate in a collaborative and agile way, driven by the goal of disrupting before they are disrupted.

This is going to require the design and execution of new consortium frameworks - ensuring alignment across the business processes, the operating rules, the governance framework, the smart contracts and the real-world contractual agreements. In many instances, the business processes will need to be entirely reconstructed so as to work in the digital environment of blockchain and smart contracts.

Conclusion

We are inevitably heading towards digitisation of the corporate world, and smart contracts will be a critical component of that digitisation. Blockchain and smart contracts have the potential to drive new ways of transacting and new commercial arrangements - particularly for complex, multi-party arrangements - and to deliver significant business benefits.

The challenges are less about the new technologies and more about the need to create new commercial and contractual frameworks to support the new ways of transacting on the blockchain and private shared ledgers. We need to create coherent new frameworks to support commercial operations - new consortium frameworks, new rules for participation and operation (as embedded in the rules engine on the blockchain), new governance frameworks and new contractual frameworks that ensure alignment across the mix of smart contracts and real-world contractual agreements.