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Smart contracts and payment in UK construction: the legal framework.

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Smart contracts and payment in UK construction: the legal framework

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Abstract
This chapter critically evaluates the way in which the existing United Kingdom (UK) construction payment regime will function with – and assist – payment mechanisms which utilise smart contracts. Blockchain is one of several new developments in the increasingly technologically developing UK construction industry. Whilst the law translates real world actions into legal obligations to pay and then assists in turning those obligations into payment, the blockchain with smart contract will automate that process, providing security and removing any intermediation which could stop or slow the process down illegitimately. Coupled with the use of smart contracts, therefore, blockchain technology has the potential to facilitate a solution to the payment and cash flow issue in UK. To achieve the added functionality described and thereby make it a useful tool for payment in construction, however, the developments would need to coexist with the existing legal framework. There are important points in the detail of that which should be more fully understood by users of the blockchain/smart contract systems, and which are explored in this chapter.

Keywords: Blockchain**,** Smart contracts, payment, law, Housing Grants Construction and Regeneration Act, legal frameworks, Oracle problem

1. Introduction

For lawyers, blockchain technology represents an opportunity – but it remains somewhat unknown (see e.g., Low and Mik 2020). For the construction industry, the practice of combining human ingenuity and technology has a long history. The desire to achieve efficiency in the industry has led to a call to embrace recent and emerging technological developments. Blockchain is the latest of these. The UK Government's recent guidance on sourcing and contracting public works, projects and programme (the Construction Playbook) published in December 2020 has a whole chapter addressing modern methods of Construction. A recent report by McKinsey & co identifies seven areas of construction technology ripe for growth in the industry (McKinsey, 2020). These include BIM and Electronic management, robotics and technology infrastructure (such as wireless connectivity, construction drones, electric vehicle docking areas etc.). These opportunities provide ways to gather, assess and present the information at the core of construction management. Nevertheless, longstanding issues remain; in particular, the problem of cash flow.

The problem of facilitating cashflow has been in the industry for decades and it is rightly the focus of work done by the Construction Blockchain group to see how technology can facilitate it (CBC, 2020). The interaction of that technology with the legislative solution is identified within the CBC white paper on cashflow. The white paper concludes at para 4.4.1 on this point that:

"Strict application of legal concepts will prevent, or at least reduce, improper implementation and inadequate execution of those concepts and process failures, e.g., failure to issue pay less notices on time will prevent inappropriate withholding or deduction at the time payment is due. "

It is therefore helpful to explore how the regime imposed by law will interact with a smart contract which facilitates payment. While 'strict application' is required, this does not necessarily mean that the system is rigid. A more general observation on the white paper is that it takes a very cautious approach to what could be achieved by deploying blockchain technology with a smart contract to aid the payment process, soon. This hesitation can be gleaned from the description of what is possible in the short term - automation of interparty payments, acceleration of payment and automation of the accounting process - and what is not. There is a sense in which this perspective of the white paper is connected to the very definition of smart contracts adopted (CBC, 2020, p.17).

In this chapter, we take the view that both at this nascent stage of development or in future, the 'smart contract' will likely have legal implications for the parties involved in construction transactions and therefore should be conceptualised as such. Conceiving the 'smart contract' as more than just an 'application' (see CBC, 2020, p.17), will allow for a discussion of content and how that is 'translated' into computer codes for the purposes of the smart contract.

There is scope for scepticism about the application of legal rules and indeed much of the discussion of smart contracts has, rightfully, focussed on the revolutionary possibilities of the decentralised nature of the information held. However, there is a key distinction relevant to construction where – if the smart contract (or system of smart contracts) operates as it should - then there is a mark on the physical world. No matter how distributed and decentralised the activity on the blockchain is, the outcome will end up in one place. The legal framework provides some certainty to the sort of questions which lawyers will set out to their clients to quantify and manage risk.

One of the challenges of implementation in smart contracts is the so called 'oracle problem' where the quality of the inputs into the blockchain from the outside world drive the acceptability of the outputs generated through the smart contract process (Low and Mik 2020, p.26), "garbage in/garbage out" being the axiom (see e.g., the discussion with industry in Mason (2017) p. 16). That is also significant in terms of the process of changing work done into an obligation to pay, and then into actual payment. The UK payment legislation discussed below can help in understanding that process.

2. Methodology

Using payment legislation, relevant case law and academic literature, a legal doctrinal research approach is used to critically examine the extent to which the combination of smart contract and blockchain technologies on one hand and the existing statutory payment system in the UK construction industry on the other can facilitate and indeed address some of the bottlenecks around that process. The basic tenets of this methodology have been described in detail elsewhere (Mante, 2021). Also identified are ways in which the legal framework is relevant to the payment issues in construction contracts – both in terms of how it might create obligatory force and in terms of the sort of issues which might need to be determined in setting up the contract.

The chapter begins by identifying the emerging legal context of smart contracts and related issues. From a legal perspective, discussions around the introduction of new technologies such as smart contracts will involve what they are, the extent to which such technologies will comply, or indeed conform to the existing legal framework or operate around it. Then there is the question of how the use of the technology will interact with various aspects of the law. The origins and the importance of the underlying policy surrounding the legal framework for payment in the UK are identified. The relevance of this approach is to underscore the need to maintain the logic underpinning the legal policy even when the 'form' of the payment arrangement is facilitated by technology. Finally, the chapter attempts to examine how the current legal framework would apply to the processes and operation of a smart contract for payment in a construction contract. This will focus on how the framework would apply to smart contract payment mechanisms for work done and highlight possible issues which the use of the technology might give rise to.

3. Legal Framework and Issues

The combined features of the blockchain and smart contracts (with the ability to self-execute agreements when certain agreed conditions are met (Cuccuru,2017)) have made the technologies potentially effective substitutes to interventions by human experts. The idea of the smart contract is viewed differently by different people. Three dominant views are gleanable from the literature.

The first set of definitions conceptualise smart contracts by their form and function. An example of this category of definitions is seen at page 17 of the CBC Whitepaper. Citing the Ethereum Foundation (2018), the report describes smart contracts as "applications that run exactly as programmed without any possibility of downtime, censorship, fraud

or third-party interference". Missing from this definition is any reference to a contract. This definition, like others in the same category, emphasises the form of the concept (computer programme, application, computer code etc.), the absence of human intervention and the self-executing elements of smart contracts. The input is often viewed as a set of instructions, and conditions; not necessarily as something legal.

The second set of definitions leave readers in no doubt that the smart contract is a legal instrument. The English Law Commission's perspective falls under this category. It defines smart contract as 'a legally binding contract in which some or all of the contractual obligations are recorded in or performed automatically by a computer programme deployed on a distributed ledger' (Law Commission, 2020). This definition, like many others, highlights the legally binding nature of smart contracts and the contractual obligations they embody (Raskin, 2017).

There are other definitions which straddle the two categories of definitions described above. Temte (2019) defines smart contracts as "a set of promises, specified in digital form, including protocols within which the parties perform on these promises." Ng defines smart contracts as self-executing contracts the terms of which are directly written into a line of code (Ng,2017).[1]

The last set of definitions highlights the nature, creation (reducing the terms into a computer code) and the execution of the contract (Werbach and Cornell,2017). Ng's definition notes that once terms are incorporated into lines of code, the terms of the contract are automatically executed by computer transaction protocols based on conditions agreed by consensus and incorporated into the computer programme. These are referred to as "oracles," mutually agreed real-time data providers used to confirm triggering events (CFTC,2018).[2] There is a need for agreement of what these oracles will be since one of the key parts in terms of giving the smart contract credible operation is an agreement (a contract) between those who are using it. It is the mutual agreement which gives force to the oracle – taking the 'real world' information 'into' the smart contract operation.

The implication of the above views on smart contract is significant. Those of the view that smart contracts are not necessarily equivalent to legal contracts tend to play down discussions about the validity or otherwise of smart contracts within the context of the legal system. That way, the argument as to the legal status of the contracts is reduced to general compliance with the wider legal framework and not the legal status of the terms themselves. In this chapter, it is argued that given the role that smart contracts may play in the short and medium term in the construction industry, it is vital that they are conceptualised from the onset as legal agreements to allow for a thorough examination of their legal status. This will also encourage conversation around how legal language in the form of a contract in a natural language may be translated into a computer code.

If the 'smart contracts' are legal agreements in substance, then there are a number of questions which need to be addressed. Some of these are highlighted in table A, along with some observations which flow generally from the literature.

[For the sake of formatting, Table A is at the end of this document]

For the construction lawyer, the issues in the table will not be the only legal issues that need attention. For those engaged in the actual design and construction work, the key question is: "when will I get paid?"

4. Cashflow as the lifeblood of the industry

The background to the current UK legal position in terms of construction cashflow is well known and the importance acknowledged in exercises such as the CBC white paper. It is not proposed to reiterate that here beyond setting out the necessary information for

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1 Tsui S. Ng, "Blockchain and Beyond: Smart Contracts," Bus. L. Today (September 2017) (Am. Bar Assoc.)). This definition was endorsed in the American case Rensel v. Centra Tech Inc., 17-24500-CIV, 2018 WL 4410110, at 10 (S.D. Fla. June 14, 2018). See also Kevin Werbach & Nicolas Cornell, Contracts Ex Machina, 67 Duke L.J. 313, 319 (2017).

2 "A Primer on Smart Contracts," U.S. Commodity Futures Trading Commission, Lab CFTC, Nov. 27, 2018, available at cftc.gov/PressRoom/PressReleases/7847-18.

what follows since the origin and reasons for the legal framework for construction payment in the UK are important in understanding how it might operate on or alongside a smart contract.

The need for some reform to promote cashflow was recognised by Sir Michael Latham (Latham, 1994) and others who produced several reports on the state of the UK construction industry in the early 1990s. These reports were produced as joint efforts of the industry and government. At the core of the problems underlying the industry was said to be an adversarial culture. This exacerbated structural problems where lack of cashflow was a major issue in the industry (although that diagnosis goes back decades with the phrase "cashflow is the lifeblood of the industry" being immortalised in construction law by Lord Denning in the early 1970s.[3])

The recommendations in the reports became the basis of a legislative response culminating in the passing of the Housing Grants, Construction and Regeneration Act 1996, later amended by the Local Democracy, Economic Development and Construction Act 2009. Part II of the 1996 Act (as amended) responded directly to the two key challenges facing the industry, namely costly dispute resolution and cashflow problems. The first saw the emergence of the process of construction adjudication, which has now become the primary means of speedy resolution of construction disputes in the UK. The second set of rules established a statutory payment system. This essentially set the standard for payment for construction works falling under the Act and also provides default rules – the Scheme for Construction Contracts[4] - which apply in situations where the parties fail to agree a payment arrangement which is compliant with the Act. The Act sets the scope of its application by defining 'construction contracts' and 'construction operation' and specifically excludes certain types of contracts from its purview (Sections 104-106).

On payment, the Act establishes entitlement to instalment, stage, or other periodic payments for works which take over 45 days (Section 109). The literature tends to emphasise instalment payments specifically, but it is clear from the language of the Act as applied that the law envisages a flexible system where parties can agree different periodic payment arrangements.

Section 109(2) provides that the parties are free to agree (i) the amounts of the payments; (ii) the intervals at which they become due and (iii) the circumstances in which, they become due. The start of the payment period is marked by an established 'due date.' This sets a baseline of 5 days for the provision of a notice by the payer of what is considered due. If the payer fails to do so, then there is provision that an earlier application for payment by the payee can stand in its stead. There is then an obligation on the payee to pay the sum in the payment notice by the final date for payment (contractually agreed) unless they serve a further notice within a time from that final date.

The parties can – by agreement - make provision for the detail within this mechanism, but it must be an 'adequate mechanism'.[5] The Act provides for a further consequence of non-payment, which is, allowing for the suspension of works by the contractor if they are not paid. The Act also provides that if the relevant notices are not served then payment of the amounts set out in the notices, should be made.[6] This means that if a payer does not engage in the process, they suffer the consequence of having to pay a sum claimed, even if it is not an accurate reflection of the work done (and then having to undertake further proceedings to correct any inaccuracies, without the benefit of holding onto the cash).

The operation of these provisions is to highlight issues quickly and then allow for their resolution – potentially by construction adjudication if not capable of amicable negotia-

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[3] Gilbert-Ash (Northern) Ltd v Modern Engineering (Bristol) Ltd (1973) 71 L.G.R. 162 , 167

[4] The Scheme for Construction Contracts (England and Wales) Regulations 1998/649 (there is an equivalent set for Scotland)

[5] S110(1)

[6] S110B and the subject of a number of cases on the 'smash and grab' adjudications which arise as a result.

tion. The notices serve in a way as "oracles" into the parties' decision-making processes – setting out and explaining the inputs for decision making. The process has fall-back options if a party does not comply: it continues without their input.

The processes imposed by the 1996 Act are generally considered to have been successful and this can be seen from the fact that

(i) they have remained in place for over twenty years
(ii) the key concepts underpinning the process have remained largely unchanged in spite of the opportunity for reforms in 2009; and
(iii) the solution adopted in the 1996 Act has been the foundation for reforms which are at least similar in structure in other jurisdictions.[7]

On the basis of the above, it can be said that these rules are accepted by the industry and treated seriously. However, some of the challenges the payment system was created to address still remain.

In terms of the interaction of this framework with smart contracts, the first point of significance to note is that this solution is not prescriptive. It would have been possible for the Act to mandate specific processes or outcomes (such as is seen in the building regulations) or to prescribe more flexible duties on the parties – but in further detail (as in the Construction, Design and Management regulations 2015).[8] However, for payment, the solution is not a wholly regulatory one. Rather than prescribe specific processes, the Act preserves some freedom of contract for the parties and allows them to decide how to implement the requirements. In introducing the Bill which became the Act, the Minister speaking explained the aims as follows:

> "There is a multiplicity of possible payment arrangements for construction contracts. It is not for Government to decide that one is better than another....
> However, Parliament can legislate to ensure that contracts are clear about what payments become due and when. We can ensure that information about payment is available to the payee. We can agree arrangements which expose unreasonable grounds for withholding payment and which can be challenged before an adjudicator. That is the basis of what we propose."[9]

The legislative regime is flexible in allowing parties to work out the detail of what they propose within constraints and in allowing the approach to evolve as the industry and technology evolve. The framework is therefore potentially operable with a smart contract mechanism. As noted above, the CBC consider compliance with the legal framework will be beneficial.

The operationalisation of that aim is worth considering both in terms of understanding these benefits and – through that understanding – gaining insights into how the smart contract may be operated within the legal framework.

5. Does the 1996 Act apply to smart contracts in construction?

Even while maintaining contractual agreements, there is scope for parties to agree to be bound by the law of any jurisdiction – and to cherry pick particular legal rules for particular contractual issues. Indeed, since smart contracts can provide significant gains in contract management and efficiency, they may even facilitate this sort of segmentation in future. In theory, therefore, what is to prevent parties from simply disapplying the Act by agreeing that their contract and smart contract will be governed by the law of another jurisdiction?

In answering this question, the starting point is whether (or in what circumstances) the 1996 Act is at all relevant for governing smart contracts (as envisaged here). The legal answer is clear. It is. The parties cannot decide that the Act does not apply by agree-

[7] The operation of these different systems is set out well in Pickavance (2015), part II (albeit it needs an update)

[8] The distinction was discussed, albeit in a different context by Judith Hackitt in her review of the Building Regulations following the Grenfell Tower fire (Hackitt, 2017 pp 6 -8)

[9] Housing Grants, Construction and Regeneration Bill [Lords] HC Deb 07 May 1996 vol 277 cc45-122 at col. 53

ing that a contract should be bound by the laws of a different legal system. In *Motacus Constructions Ltd v Paolo Castelli SpA*[10], there was an argument about whether the Act applied to a contract for construction works in England, but under a contract which was said to be governed by the law of France. In reaching their decision, the court was keen to ensure that the policy of ensuring a quick adjudication decision and the ensuing cash-flow could not be thwarted by a party simply agreeing to contract under the law of a different jurisdiction. It is suggested that the reasoning on that point would apply equally to the payment provisions (although there are some interesting questions around how valuation might work in different jurisdictions). The courts held that the Act governed 'construction operations' in the UK. They noted that the legislation is itself clear that the scope of the Act is over *all* works in the UK – not just those which have an agreement to be governed by the law of one of the UK jurisdictions (see section 107(4) of the Act). Rather than looking at the abstract agreement of the parties as to the 'location' of the contract, the court looked at where the work was being done. That real world impact was in the UK and so it was the UK framework which applied.

This demonstrates the point made above; at the point of delivery, a construction project needs to be about the creation of a physical thing and that will be in a physical place. The process of creation will also have to happen in that place for at least some of that period (albeit modular construction techniques may decrease the length of time in which that is to happen). Without getting too metaphysical and conceptual on the way in which laws apply, the country or region which governs the site where the project is being built will have an interest in it. The general laws of that state will apply to that building and the people who are working there. The question is how the particular features of the more complex regime of the 1996 Act will apply as it sits – consciously – on the border between regulation and freedom of contract.

The Act defines when these features will apply. Not all activity carried out by a smart contract will necessarily be caught but some will. Payment for *design* work can happen without being in any particular 'place' and so poses a particular test for the application of the Act. For payment, there is a significant issue that payment or value can be automatically transferred anywhere (or indeed to some sort of conception of 'nowhere') and more generally, the generation of intellectual property, such as design (although then the question becomes over how it is protected – an issue for others to consider) can occur virtually anywhere.

5.1 Court's approach

The courts in the UK[11] have tended to approach the assessment of when the Act applies in an expansive way justified by reference to the clear policy aims of the 1996 Act. The technical term for this is to take a 'purposive' approach[12] to interpretation: that is to read the language of the legislation in the context of what purpose the legislation is trying to achieve. So, for example, The House of Lords[13] Judicial Committee criticized 'over literal'[14] attempts to interpret the legislation in *Melville Dundas v Wimpey Homes* - and said that the Act "was intended to have practical application to a wide variety of contractual relationships." [15]

In the case of the 1996 Act, that clarity of purpose has translated into a clear idea of how the legislation should operate. Going back to the initial cases on the Act, the courts have been less concerned about the formal detail of the way the process works, in fa-

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10 [2021] EWHC 356 (TCC) (22 February 2021)

11 That is, of the three jurisdictions: Scotland, Northern Ireland and England and Wales which make it up.

12 see e.g., S&T v Grove Developments Ltd 2018 EWCA 2448 at para 108 per Jackson LJ

13 then the UK's highest court

14 Melville Dundas Limited (in receivership) and others (Respondents) v. George Wimpey UK Limited and others (Appellants) (Scotland) 2007 UKHL 18 Para. 9

15 Ibid.

vour of what is referred to as 'rough justice'[16] and a spirit that the ethos of the Act is to get parties to 'pay now, argue later'.[17] The need for cashflow is paramount. While many of the discussions have focused specifically on the adjudication process (the 'argue later' part of the equation); the 'pay now' part is integral to the conception of the law. This means that even novel approaches such as those facilitated by smart contracts are likely to be approached in the same way – where they can be said to fall under the Act.

5.2 Definition of construction contract

The Act applies to 'construction contracts'. These are widely defined (with some exceptions) to mean contracts for the 'carrying out of construction operations'[18] or arranging for others to do those. As noted above, these operations must happen in the UK.

This clearly locates the subject matter of the contract in the physical realm – and therefore subject to the law. However, the Act also makes clear that more intellectual work such as design, surveying and advice on building, engineering or decoration are also 'construction contracts', where this is in 'relation to' construction operations.[19]

This then means that even activities on the intellectual plane are caught where they 'relate to' physical works. In terms of what the 'relationship' must be, there does not appear to be any specific case law on this provision. However, it has been said (more generally) that

> "the words 'in relation to' invariably are words of connection. But there can, in my opinion, be no set meaning as to the ambit and reach of that phrase. It will depend on the particular context, be it statutory or contractual, in which those words appear. As always, context is all"[20]

Applying this to the 1996 Act and the wider interpretation given by the courts to its application, it is difficult to identify design work which would be sufficiently closely linked to a particular construction project such that payment might be made but not somehow 'relate to' it. Therefore, it should be considered that design work for at least an identifiable construction project would likely be considered to 'relate to' it and to fall within the Act.

6. Applying the Act to Smart Contracts

If the Act applies, then the way in which a smart contract might operate with it are discussed as follows.

6.1 Instalment payments?

The Act prescribes payment in stages where work is done over a period of more than 45 days.[21]

This is a sensible approach to take and ensures cashflow. In terms of the intellectual work being done in contract management and the contractual arrangements, there may be some scope for doubt about the extent of work being done by particular smart contracts if that has led to a segmentation of tasks into smaller components. However, the courts are likely to look at the arrangement as a whole to see what is being done and achieved. Framework agreements are for example already something which exist. In that case, each 'call off' is treated as a separate contract. It might be that a similar approach is taken here – each segment of work is treated differently. That might mean that even if the Act applies – there is no right to installment payments. That gives rise to three observations.

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[16] See for example Pentland Investments Ltd v Aitken Turnbull Architects Ltd 2018 SLT (Sh Ct) 284 at para. 36 (although the origins of the phrase in the context of adjudication go back to Lord Howie in the debates on the then Bill in Parliament, and beyond)

[17] Commonly referred to in case law, the phrase appears to have been coined by Robert Fenwick Elliott see Fenwick Elliot (2016)

[18] S105 of the 1996 Act

[19] S104(2)

[20] Re National Crime Agency [2020] EWHC 268 (Admin) at ~~[ ]~~para. 50

[21] S109(1)

1. If payment is made automatically for each 'micro task' then there is no need for installments.
2. Payment not being made for each microtask might give rise to the courts interpreting a broader set of micro-arrangements as one 'contract'. Again, the fixed physical location of the works can anchor the otherwise distributed work and smart contractual arrangements
3. More philosophically, the policy goal of payment by instalments are enshrined in legislation. The lesson of this is the 'good' that this approach has. One reason to have the lower time limit is/was to avoid the administrative difficulty of processing multiple payments. Smart contracts allow that more detailed, granular approach.

6.2 Payment Cycle

Even if there is no right to installment payments, the Act still makes provision for a payment process. [22]

There are three key parts to this. There is the need, firstly, for a process which is intelligible (an 'adequate mechanism' in the legislation[23]); secondly there is detail on how the information is to be presented and thirdly there are remedies if the process is not followed.

6.2.1 "Adequate mechanism"

The Act provides for an adequate mechanism for payment to be agreed by the parties.[24] The precise latitude given for this mechanism is unclear. If the model in the Scheme is taken as indicative[25], then significant detail is required. However, the courts have been seemingly happy to leave this to parties. To some extent this is in line with the general freedom of contract approach facilitated by the Act. The principal guidance can be seen in the case of *Bennett (Construction) Limited v CIMC MBS Limited (formerly Verbus Systems Ltd)*[26] which said:

> "As previously noted, in relation to payment provisions, the purpose of the Act was to provide for certain minimum, mandatory standards so as to achieve certainty and regular cash flow. Save in perhaps exceptional circumstances, it was not designed to delete a workable payment regime which the parties had agreed and replace it with an entirely different payment regime based on a radically changed set of parameters. It seems to me that that could only happen where the regime which had been agreed was so deficient that wholesale replacement was the only viable option. That is plainly not this case."

So, it appears that 'adequate' is broadly synonymous with 'workable' in this situation. It had been made clear in *Maxi Construction v Morton Rolls* that the mechanism had to both specify what was due, and when it was due.[27]

The main challenge for smart contracts therefore is having a sufficiently certain and clear process that it can be explained to a judge or other decision maker satisfactorily. Beyond that, there is significant latitude. More broadly, the process is important as a means of ensuring transparency and mandating communication on this point. This is done through the notice provisions.

6.2.2 "Notice provisions"

[22] Sections 109 to 114

[23] S110(1)

[24] Ibid.

[25] See n. 4 above.

[26] 2019 EWCA Civ 1515

[27] .[2001] ScotCS 199, discussed in paras. 20 – 30.

The sequence of notices is set out above. The requirements for the notices are that those which are seeking payment need to set out:

1. The sum due and
2. The basis on which that sum is calculated.[28]

If a lesser sum is to be paid, the notice must provide information as to the grounds on which that deduction is based, and the basis for calculation.

These provisions are important as they indicate the nature of the notices as being somewhat analogous to the 'oracles' in a smart contract: they take the situation on site and turn it into a legal obligation to pay. In this context, it is notable that the judge who gave the lead judgement in *S&T v Grove* compared one of the key sections to a 'philosopher's stone' (albeit unfavourably)[29] – the echoes of the oracle problem are within that framing -what is the alchemy which leads from construction operations to payment?-

In terms of translating those requirements into action, there are various legal issues. These include understanding what constitutes a notice (what form does it take, whether and how documents can be incorporated into it and so on) and about how clear it should be. The bottom line comes from the Court of Appeal decision in *S&T v Grove*. In that case, an earlier decision of the UK House of Lords about the interpretation of documents[30] was applied and the key question was said to be "how a reasonable recipient would have understood the notice."[31]

These provisions therefore operate in the following way:

Firstly, they show the need for clarity. It is necessary to assess understanding on an objective basis, rather than making assumptions about what parties understand. Some degree of empathy is needed. This helps with building trust. This builds on the opportunity of the blockchain in building trust between parties: fostering the transparency which is critical to it.

That need for objective clarity also helps with assuring the credibility of the process – and of the relationship. This can be seen in the following example: One of the opportunities of the technology is that the participants can potentially remain anonymous, or at least have their identities shielded behind another entity. This could limit the confidence which others might have in contracting with that party. However, in many cases the confidence which is needed to contract is not over the identity of the other as such, but confidence that they will do what they should. This transparency over payment is a good way of building this trust. To a significant extent it does not matter who is carrying out an obligation; as long as they are. Thus, the payment mechanism provides a useful means of demonstrating how some of the flexibility of blockchains and smart contracts can be enhanced.

6.2.3 "Remedies"

Rights under the payment provisions of the Act would, of course, have less benefit if they could not be enforced. The concerns about moving the legal framework away from the UK, and of anonymity, or small work package sizes will tend to be judged in the context of both parties needing to be reasonably confident that they will achieve what they want from the contract. One outcome might be the provision of some form of assurance, such as payment deposits or bonds, or so on (see Bailey (2014)). These all have a cost.

The Act provides two routes which assist in addressing this challenge by providing some level of assurance as a baseline, which acts to enforce the obligation to pay which arises as set out above.

These routes are:

(i) a fast-track dispute resolution process, construction adjudication. A detailed examination of this point is beyond the scope of this chapter. It suffices to state that this en-

[28] S110A (2)

[29] S&T v Grove Developments Ltd 2018 EWCA 2448 at Para. 92

[30] *Mannai Investment Co Ltd v Eagle Star Life Assurance Co Ltd [1997] AC 749 (in particular 768 A – D)*

[31] S&T v Grove Developments Ltd 2018 EWCA at para 50

gagement with a third party to verify information is a useful step in meeting the oracle problem and that the blockchain more generally may provide useful opportunities in developing and supporting construction dispute resolution. As with the payment provisions discussed, the adjudication process has a degree of flexibility built in and so could be adapted to deal with disputes arising from smart contract operation.

(ii) The second remedy is the right to suspend works where a party is not paid, under s112 of the Act. This is essentially, a self-help remedy. Combined with the right to instalment payments it provides a real world, factual remedy if there is non-payment. This right is enshrined in the 1996 Act (and it might be that similar rights exist in Scots law, as a matter of course)[32].

The right to suspend works – with consequences for not doing so and rights to claim the costs of this –is often overlooked and subject to relatively little discussion in the case law.[33] That might be because the other remedies for enforcing payment operate effectively within the current regime. However, this may be an important tool to complement smart contracts as it has a real-world consequence to non-payment, whether that is a party 'downing tools' on site – or simply withdrawing their intellectual engagement. It may prove difficult – on occasion – to enforce some rights against parties sitting on a blockchain: but the self-help remedy of suspension takes some of the power away from them. If that were combined with an effective form of adjudication, there would be teeth to the ability to recover payment.

This remedy also aligns with the likely incentives for delivery of a construction project. The paying party is most likely to be the one who wishes to avoid their obligation (that is, to pay) – but they are also the party who has the greatest interest in the real-world outcome of successful delivery of the project. Suspension can prevent that outcome – and so encourages payment to facilitate it.

The provision of these remedies – and these mechanisms to reach these remedies – provides parties with an incentive to comply. It shifts the balance of power somewhat by making it easier to enforce and to do so in the real world where the enforcement has consequences. By way of example, it is entirely possible for the parties who intend to use the blockchain and smart contract to facilitate payment to incorporate a process that incentivises early or timely payment. This could be in the form of a built-in discount system that rewards a conscientious payer and discourages any behaviour that frustrates the smooth running of the automated payment system. In other words, there could be further research into how smart contracts and blockchains could drive an incentive system which promotes desired behaviour and entrenches trust. Another example would be the use of the smart contract to adjust the payment process to make timely payment a default position provided agreed criteria are met and against which non-payment is to be justified rather than payment actively claimed.

7. Conclusion

The Act is likely to be applied to some construction operations facilitated by smart contracts – if not all. That means that steps should be taken, when designing and writing a smart contract, to ensure that there is payment by instalments, that the mechanism by which payment is made is clear, sufficient, and operational – within the confines of adequacy under the Act - and that notifications are generated which are intelligible and which provide for the level of detail needed by the Act.

Doing so is a formal requirement and a strength. The process reinforces the aims of transparency and trust which are so important to the blockchain being taken up as a useful tool. That is done because it focuses on construction operations – actions in a physical, centralised place – and builds from there. By creating a mechanism which is intelligible to the parties involved, it allows for understanding and transparency – assuring the credibility of the payment mechanism. By providing for means of enforcement, which

[32] Scottish Law Commission (2018) Report on Review of Contract Law: Formation, Interpretation, Remedies for Breach, and Penalty Clauses, Ch. 11

[33] COD Hyde Limited v Space Change Management Limited [2016] EWHC 820 (Ch) is a rare example – and see discussion in paras. 43 to 51

again operate in terms of a particular place, it means that there is a reason to comply: which reinforces the whole edifice. The incentives of the contract shift by requiring the parties to consider and justify their decisions. That brings benefits to the whole project – and helps facilitate the use of the smart contract.

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Table A

Stage of contracting process	Questions	Problems	Challenges	Examples of solutions
Agreement of contract	• When is the smart contract agreed? • How does it interact with the broader concept of agreement in law? • How is consideration (where relevant) conceptualised? • What type of contract are they – Unilateral? • Is acceptance by performance/conduct only?	• They are traditionally considered to be essentials of a contract, offer/acceptance, and relevant intention to create a legal relationship. • There needs to be parties to the contract who have legal capacity to enter into a	• There are issues with anonymity of parties in the blockchain and a full understanding of the subject matter of the contract will need to be conveyed.	• There are existing rules for the giving of legal personality to incorporeal entities, such as the creation of limited companies. Alternatively, certain individuals need to be given delegated authority.

		contract.		
Form of contract	• Is the smart contract distinct from the traditional written contract, or part of it? • How are implied terms of performance incorporated? • What provisions and protocols govern the use of the smart contract	• The Law Commission of England and Wales envisages that Smart contracts may take on at least three different forms - it may be a normal contract in a written human language with automated performance; it may be a hybrid or a fully/completely	• Smart contracts are seen as automated and self-executing therefore distinct from the parties' agreement. That means that there is no questioning of the contents or context.	• It is important to be clear on the distinction between the traditional contract and the smart contract and the means of interactions between them. There is no reason to consider them separately however, they should be seen as part of the same 'contract' -with the smart contract being the more prescriptively operation part.

		coded contract. The emphasis on payment is an example of an instance where only an element of the contract may be coded.		
Operation of contracts	• What values apply to the interpretation of the underlying code of a smart contract? • How are errors dealt with? • What happens if the smart contract facilitates a breach of contract?	• The automation of the contract should in theory prevent breaches but that is only as good as the performance specifications put in the contract and	• The 'oracle problem' is an issue: 'garbage in/garbage out' as discussed elsewhere in the paper. • The transparency of the block-	• This clearly points to the need for pre-planning and certainty at the outset. • Mechanisms should be put in place to deal with change and to change the operation of

	• How are security breaches occasioned by third parties addressed? • How are variations to be handled?	the nature of the real-world inputs made.	chain as a means of storing information is helpful but it can mean that it requires technical specialism to work out from where a problem has arisen	the smart contract. • Dispute and conflict resolution mechanisms are important but need to be something which the parties accept.
Termination of contract	• How is a smart contract brought to an end? • What are the consequences of this and how are they quantified?	• An end date ought to be easy enough to code into a smart contract. However, if there is an unexpected ending	• The automation of the smart contract means that issues can arise without necessarily	•

		to a project as a result of changing circumstances this can be difficult to unwind. In particular, even if provision is made for unwinding, it may not always be done in a way which satisfies the parties at the time.	being highlighted to the users (an inversion of the traditional 'transparency' feature of the blockchain). This can make unwinding errors difficult. • Kill mechanisms need to be considered carefully – the interaction of	

			their use with rules around repudiatory breach should be done with care.	
Enforcement of obligations	• How are smart contracts enforced? • What rules of private international law apply?	• The decentralised nature of the blockchain may mean that there are issues with the identification of parties and assets which presents a challenge to the ultimate enforcement of these obliga-	• The credibility of the process is important in achieving engagement with by both parties. That should include safeguards in terms of enforce-	• Alternative means of assurance to traditional mechanisms for payment might be required. • Alternatively, parties may assume the risk in return for other benefits of the blockchain. • As noted above, the dispute resolution process

		tions	ment – such as access to insurance or other 'real world' protec-tions	should be clear and accepted.