

DEMYSTIFYING SMART CONTRACTS

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1. Introduction

There is little doubt that smart contracting is on the rise and that its increasing practical importance is also reflected by the rapidly growing number of related legal literature.² Having said that, the notion ‘smart contract’ remains nonetheless to some extent a buzzword and with the

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 - 2 The following contributions are dealing exclusively or at least partly with the legal aspects of smart contracts: J.G. Allen, ‘Wrapped and Stacked: ‘Smart Contracts’ and the Interaction of Natural and Formal Language’, 14. *European Review of Contract Law* (ERCL) 2018, p. 307-343 (hereinafter: Allen 2018); A. Börding, T. Jülicher, C. Röttgen & M. von Schönfeld, ‘Neue Herausforderungen der Digitalisierung für das deutsche Zivilrecht: Praxis und Rechtsdogmatik’, *Computer und Recht (CR)* 2017, p. 134-140 (hereinafter: Börding et al 2017); S. Bourque & S. Fung Ling Tsui, *A Lawyer’s Introduction to Smart Contracts*, Lask: Scientia Nobilitat 2014, p. 4-23 (hereinafter: Bourque & Fung Ling Tsui 2014); C. Buchleitner & T. Rabl, ‘Blockchain und Smart Contracts’, *ecolex* 2017, p. 4-14 (hereinafter: Buchleitner & Rabl 2017); A.J. Casey & A. Niblett, ‘Self-Driving Contracts’, 43. *Journal of Corporation Law* 2017, p. 1-33; p. Catchlove, ‘Smart Contracts: A New Era of Contract Use’, ssrn.com/abstract=3090226; A. Djazayeri, ‘Rechtliche Herausforderungen durch Smart Contracts’, *jurisPR-BKR* 12/2016, no. 1 (hereinafter: Djazayeri 2016); M. Durovic & A.U. Janssen, ‘The Formation of Blockchain-based Smart Contracts in the Light of Contract Law’, *European Review of Private Law (ERPL)* 2018, p. 753-772 (hereinafter: Durovic & Janssen 2018); M. Fries & B.P. Paal (eds.), *Smart Contracts*, Tübingen: Mohr Siebeck 2019; M. Fries, ‘Schadensersatz ex machina’, *Neue Juristische Wochenschrift (NJW)* 2019, p. 901-905 (hereinafter: Fries 2019); N. Guggenberger, ‘The Potential of Blockchain for the Conclusion of Contracts’, in: R. Schulze, D. Staudenmayer & S. Lohsse (eds.), *Contracts for the Supply of Digital Content: Regulatory Challenges and Gaps*, Baden-Baden: Nomos 2017, p. 83-97 (hereinafter: Guggenberger 2017); J. I-H Hsiao, ‘Smart Contract on the Blockchain-Paradigm Shift for Contract Law’, 14. *US-China Law Review* 2017, p. 685-694 (hereinafter: Hsiao 2017); C. Jacobs & C. Lange-Hausstein, ‘Blockchain und Smart Contracts: zivil- und aufsichtsrechtliche Bedingungen’, *IT-Rechts-Berater (ITBR)* 2017, p. 10-15 (hereinafter: Jacobs & Lange-Hausstein 2017); M. Jünemann & A. Kast, ‘Rechtsfragen beim Einsatz der Blockchain’, *Kreditwesen* 2017, p. 531-536;

increasing interest also myths, half-truths and misunderstandings (hereinafter only 'myths') about them are gaining momentum. These myths give smart contracts either overly positive or negative attributes—often depending on whether someone is a 'smart contract believer' or not. Needless to say, those myths are neither helpful nor desirable: they are the source of unrealistic expectations or create ungrounded scepticism and complicate or even avoid that we are asking the right (legal) questions about smart contracts. Therefore, this contribution deals with some of the most popular myths about smart contracts and attempts to 'demystify' them to obtain an unbiased view on this fairly new legal phenomenon. What is needed is an unemotional perspective on smart contracting which reveals not only

M. Kaulartz & J. Heckmann, 'Smart Contracts – Anwendung der Blockchain-Technologie', *Computer und Recht (CR)* 2016, p. 618-624 (hereinafter: Kaulartz & Heckmann 2016); M. Kaulartz, 'Herausforderungen bei der Gestaltung von Smart Contracts', *Zeitschrift zum Innovations- und Technikrecht (InTeR)* 2016, p. 201-206 (hereinafter: Kaulartz 2016a); M. Kaulartz, 'Die Blockchain-Technologie: Hintergründe zur Distributed Ledger Technology und zu Blockchain', *Computer und Recht (CR)* 2016, p. 474-480 (hereinafter: Kaulartz 2016b); M. van der Linden, 'Het recht geketend: Smart contracts: dé oplossing voor gezeur, gedoe en onzekerheid?', *Tijdschrift voor Internetrecht (TvI)* 2018, p. 59-63; E. Mik, 'Smart Contracts: Terminology, Technical Limitations and Real World Complexity', *Journal of Law, Innovation and Technology (JLIT)* 2017, p. 269-300 (hereinafter: Mik 2017); R. O'Shields, 'Smart Contracts: Legal Agreements for the Blockchain', 21. *North Carolina Banking Institute* 2017, p. 177-194 (hereinafter: O'Shields 2017); p. Paech, 'The Governance of Blockchain Financial Networks', 80. *Modern Law Review* 2017, p. 1072-1100 (hereinafter: Paech 2017); M.L. Perugini & p. Dal Checco, 'Smart Contracts: A Preliminary Evaluation', ssrn.com/abstract=2729548; M. Raskin, 'The Law and Legality of Smart Contracts', 1. *Georgetown Technology Review* 2017 p. 305-341 (hereinafter; Raskin 2017); C.L. Reyes, 'Conceptualizing Cryptolaw', 96. *Nebraska L. Rev.* 2017, p. 384-445; p. Ryan, 'Smart Contract Relations in e-Commerce: Legal Implications of Exchanges Conducted on the Blockchain', 7. *Technology Innovation Management Review* 2017, p. 10-17; A. Savelyev, 'Contract Law 2.0: «Smart» Contracts as the Beginning of the End of Classic Contract Law', Higher School of Economics Research Paper No. WP BRP 71/LAW/2016, ssrn.com/abstract=2885241 (hereinafter: Savelyev 2016); J. Schrey & T. Thalhoffer, 'Rechtliche Aspekte der Blockchain', *Neue Juristische Wochenschrift (NJW)* 2017, p. 1431-1436; L.H. Scholz, 'Algorithmic Contracts', 20. *Stanford Technology Law Review* 2017, p. 101-147 (hereinafter: Scholz 2017); J.M. Sklaroff, 'Smart Contracts and the Cost of Inflexibility', 166. *University Pennsylvania Law Review* 2017, p. 263-303; T. Söbbing, 'Smart Contracts und Blockchain: Definitionen, Arbeitsweise, Rechtsfragen', *IT-Rechts-Berater (ITBR)* 2018, p. 43-46 (hereinafter: Söbbing 2018); T.F.E. Tjong Tjin Tai, 'Juridische aspecten van blockchain en smart contracts', 54. *Tijdschrift voor Privaatrecht* 2017, p. 563-608 (hereinafter: Tjong Tjin Tai 2017a); T.F.E. Tjong Tjin Tai, 'Smart contracts en het recht', 93. *Nederlands Juristenblad* 2017, p. 176-182 (hereinafter: Tjong Tjin Tai 2017b); K. Werbach & N. Cornell, 'Contracts Ex Machina', 67. *Duke Law Journal* 2017, p. 313-382; K. Werbach, 'Trust, But Verify: Why the Blockchain Needs the Law', 33. *Berkeley Tech. L.J.* 2018, pp. 489-553 (hereinafter: Werbach 2018).

what smart contracts really are but also what legal implications they cause or might cause in the future.

As the readers' level of knowledge on smart contracts probably differs, the next section (§2) defines smart contracts. Due to the fact that this contribution focuses mainly on *blockchain-based* smart contracts the then following section (§3) discusses why blockchain technology is a driver for the idea of smart contracting, followed by a section (§4) showing some (potential) fields of application for smart contracting. The consecutive and main section (§5) deals with some of the myths around smart contracts, followed by a short conclusion (§6).

2. Defining Smart Contracts

Any discussion about smart contracts must begin with the definition of the concept.³ There are numerous definitions of what a smart contract is, and as such not all can be presented here.⁴ However, smart contracts are often defined as a special protocol intended to contribute, verify or implement the negotiation or performance of the contract in a trackable and irreversible manner without the interference of third parties.⁵ One can go back to Szabo, who in the 1990s defined for the first time a smart contract as a “computerized transaction protocol that executes the terms of a contract. The general objectives of smart contract design are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries like banks or other kind of agents.”⁶ Related economic goals of smart contracts include reducing loss resulted by fraud, enforcement costs or other transaction costs. They are presumed to be able to provide full transparency of the transaction and to grant a high degree of privacy contemporaneously.⁷ Szabo's definition can be simplified to a computer code that is created to automatically

3 For more details see Durovic & Janssen 2018, p. 754 ff.

4 A good overview over the difference smart contracts definitions gives M. Finck, Grundlagen und Technologie von Smart Contracts, in: M. Fries & B.P. Paal (eds.), *Smart Contracts*, Tübingen: Mohr Siebeck: 2019, p. 1-12.

5 See e.g. Bourque & Fung Ling Tsui 2014, p. 4; T. Söbbing 2018, p. 43, 43.

6 N. Szabo, 'Smart Contracts', <http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html> (hereinafter: Szabo, 'Smart Contracts').

7 Buchleitner & Rabl 2017, p. 4, 5; Guggenberger 2017, p. 83, 94; Kaulartz 2016a, p. 201, 202; Szabo, 'Smart Contracts'.

execute contractual duties upon the occurrence of a trigger event as a 'digital condition precedent',⁸ or agreements wherein execution is automated, usually by a computer programme.⁹ A minimum consensus definition can be distilled: a smart contract is a form of computer code which is self-executing and self-enforcing.¹⁰ As the current smart contracts work without self-learning systems it has to be emphasised that they neither need artificial intelligence nor deep learning.¹¹

It has become apparent that there are many debates and confusions surrounding the concept of smart contracts. For blockchain-based smart contracts, a useful dichotomy can be drawn between the 'smart contract code', which is the computer code stored, verified and executed in a blockchain, and the 'smart legal contract', which is a complement for a legal contract to apply such technology.¹² In essence, a 'smart legal contract' is a combination of the 'smart contract code' and traditional legal language.¹³ A blockchain-based smart contract is ultimately only a computer code that specifies the contractual terms in 'if this happens, that shall happen' language, in a way understandable to a computer, on a blockchain platform. Once verified, it will self-execute and self-enforce by recognizing the occurrence of the relevant triggering event and dispensing the assets accordingly.¹⁴

As for the question regarding how a smart contract works in practice and how it is concluded, Szabo uses his famous vending machine analogy.¹⁵ A vending machine takes coins and dispenses change and product according to the displayed price. Once the coins are inserted, there is no further human intervention required to conclude and later execute the contract. Similar to a smart contract, a contract concluded through a vending machine is also in principle immutable and self-enforcing. Even if a person was forced to buy something from the vending machine, the machine would still give the product to the person regardless the fact that the

8 Paech 2017, p. 1072, 1082.

9 Raskin 2017, p. 305, 306; T. Söbbing 2018, p. 43, 44.

10 Börding et al 2017, p. 134, 138; Mik 2017, p. 269, 269; O'Shields 2017, p. 177, 179. A slightly different definition offers Kaulartz 2016a, p. 201, 203.

11 Jacobs & Lange-Hausstein 2017, p. 10, 13; Kaulartz & Heckmann 2016, p. 618, 618; T. Söbbing 2018, p. 43, 44.

12 J. Stark, 'Making Sense of Blockchain Smart Contracts', *Coindesk*, Jun 4 2016, www.coindesk.com/making-sense-smart-contracts/.

13 Djazayeri 2016; Kaulartz 2016a, p. 201, 205.

14 Tjong Tjin Tai 2017b, p. 176, 177.

15 N. Szabo, 'Formalizing and Securing Relationships on Public Networks'.

transaction would be legally invalid *ex tunc* due to duress. Furthermore, in theory, anybody with coins can participate in an exchange with the vendor regardless of the legal capacity of the contracting parties. Where smart contracts go further is “in proposing to embed contracts in all sorts of property that is valuable and controlled by digital means”.¹⁶ Essentially, once both parties agree on a smart contract, its execution is taken from their control. Human discretion in performance and enforcement are deemed to be excised.¹⁷

3. Blockchain Technology as the Driver for the Smart Contract Idea

Smart contracts do not necessarily require blockchain technology.¹⁸ However, there is little doubt that the main reason for the increasing importance of smart contracts is the recent rise of blockchain technology. This technology allows smart contracts to use their full potential for automation and this is the type of smart contracts at the heart of this contribution. *Bitcoin*, which proliferated this technology, led ultimately to the establishment of *Ethereum*, a sophisticated blockchain platform allowing more complicated (smart contract) transactions beyond just transfers of currency, or bitcoins.¹⁹ *Ethereum* even developed its own coding language: *Solidity*.²⁰ The blockchain technology demonstrates how a network could be set up so that once a transaction is set in motion, the network can produce outputs autonomously without the direct intervention of any party or other intermediaries.²¹ Because of this feature, it is often said that the contracting parties do not need to trust each other, they can rely on the system as a whole to carry out transactions knowing that the other party cannot frustrate the intended outcome.²² Blockchain not only allows verification of each transaction through the nodes (the computers in the chain), but it also, by storing the contract in a ‘block’ and sending it to each

16 Ibid.

17 Paech 2017, p. 1072, 1077.

18 *Blockchain (technology)* is sometimes also referred to as *distributed ledger (technology)* or *shared ledger (technology)*. While these three notions still remain in flux (and some authors consider them to designate different forms of technology), this contribution will for the sake of simplicity only use the term blockchain (technology).

19 See more detailed Scholz 2017, p. 101, 120; Tjong Tjin Tai 2017b, p. 176, 177.

20 See <https://solidity.readthedocs.io/en/develop/>.

21 Clifford Chance, ‘Smart Contracts. Legal Agreements for the Digital Age’, November 2017, 2, www.cliffordchance.com/briefings/2017/06/smart_contracts_legalagreementsforth.html.

22 Whether this statement is completely correct as it stands will be discussed under 5.4.

node, makes the execution automatic and, in principle, *immutable*. Thus it is regularly stated that smart contracting allows the “digitization of trust through certainty of execution” and the “creation of efficiency through removal of intermediaries and the costs they bring to the transactions”.²³ These characteristics are perhaps the greatest appeal of blockchain-based smart contracts.

4. Some (Potential) Fields of Application for Smart Contracting

Currently, there are various ideas on how to make use of blockchain-based smart contract in modern day practice and in the future. One frequently mentioned example²⁴ is the compensation for suffered damages due to delayed or cancelled flights under the EU Flight Compensation Regulation 261/2004.²⁵ These are normally cases which include a large number of potential claimants while the fixed sums for compensation are relatively small. The criteria for the validity of the passengers’ claims (for delayed or cancelled flight) are in principle purely objective and the conditions which trigger the compensation can be verified reliably by *oracles*, which means by external sources. However, as already mentioned correctly by Guggenberger, this example also demonstrates that there is almost no claim simple enough to be determined exclusively by objective criteria since in specific circumstances an airline is exempted from paying compensation in case of ‘extraordinary circumstances’ (see art. 5(3) of the Flight Compensation Regulation 261/2004). It goes without saying that undetermined terms such as the aforementioned are challenging the automation of contracts.²⁶ Nonetheless, the idea of automated payment of damages in this area is gaining increasing support as can be seen from an interesting legal initiative of the German *Bundesrat* (Federal Council).²⁷ In this initiative the *Bundesrat* proposes even a *mandatory* automation of damages for delayed or cancelled flights/trains to increase the level of enforcement and to ensure the payment of damages.²⁸

23 Hsiao 2017, p. 685, 687.

24 See e.g. Buchleitner & Rabl 2017, p. 4, 7; Fries 2019.

25 Regulation (EC) No 261/2004 of the European Parliament and of the Council of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, and repealing Regulation (EEC) No 295/91.

26 Guggenberger 2017, p. 83, 95.

27 [https://www.bundesrat.de/SharedDocs/drucksachen/2018/0501-0600/571-18\(B\).pdf?__blob=publicationFile&v=1](https://www.bundesrat.de/SharedDocs/drucksachen/2018/0501-0600/571-18(B).pdf?__blob=publicationFile&v=1).

28 See on this initiative Fries 2019 and 5.7 in this contribution.

Needless to say, there are many other (potential) fields of application for smart contracts: besides the well-known smart refrigerator example (the refrigerator ‘orders’ the food automatically),²⁹ ‘the pay as you drive-principle’, which is presently subject to discussion in the insurance industry, is another potential application of blockchain-based smart contracts.³⁰ Here the policyholder concludes a smart car insurance contract with the insurance company. The contract contains a ‘pay as you drive-provision’: the riskier the policyholder drives, the higher his premium. For data collection, the policyholder’s car has a blockchain interface and the blockchain-based smart (insurance) contract adjusts automatically the amount of the payable premium according to the manner the insured car is driven.³¹ A similar idea is ‘drive as long as you pay’—here a car can only be driven as long as the premiums are paid. If premiums have not been paid, the blockchain-based smart insurance contract uses the blockchain interface to block the further use of the vehicle.³² There is also the idea of combining smart contracts and smart meters in order to automatically cut off the supply of gas, water and electricity in case of unpaid bills.³³

5. Demystifying Smart Contracts

This paragraph shifts the focus to particular statements about (blockchain-based) smart contracts and scrutinizes whether they need to be set straight. Some aspects discussed here can overlap with each other or are intertwined, and, depending on the readers’ smart contract knowledge, some of those aspects might be rather obvious, while to others they are not. It also goes without saying that the statements to be discussed here are highly selective and by no means exhaustive.

29 Djazayeri 2016.

30 Buchleitner & Rabl 2017, p. 4, 7; Djazayeri 2016; Jacobs & Lange-Hausstein 2017, p. 10, 12; Kaulartz & Heckmann 2016, p. 618, 618.

31 For further examples see Börding et al 2017; p. 134, 137; Buchleitner & Rabl 2017, p. 4, 6; Kaulartz & Heckmann 2016, p. 618, p. 619; Kaulartz 2016a, p. 201, 203; O’Shields 2017, p. 177, 181; Raskin 2017, p. 305, 330; Tjong Tjin Tai 2017b, p. 176, 182.

32 Fries 2019, p. 902; F. Hofmann, ‘Smart contracts und Overenforcement’, in: M. Fries & B. p. Paal (eds.), *Smart Contracts*, Tübingen: Mohr Siebeck: 2019, p. 125-140, p. 128 (hereinafter: Hofmann 2019).

33 Hofmann 2019, p. 128 ff.; C.G. Paulus & R. Matzke, ‘Smart Contracts und Smart Meter – Versorgungssperre per Fernzugriff’, *Neue Juristische Wochenschrift (NJW)* 2018, p. 1905-1911.

5.1 *Are Smart Contracts Smart After All? Or at Least Contracts?*

The term smart contract is without any doubt catchy and can draw considerable attention, but that cannot take away that this term for the concept of a self-executing and computer-coded agreement is unfortunate as it exacerbates confusion and creates unrealistic expectations.³⁴ One reason for it is that irrespective of the advantages of smart contracts they are not smart and one might even call them 'dumb contracts': smart contracts cannot react to events which have not been programmed as they can only execute what is part of their computer code using the 'if this happens that happens'-method. Unlike traditional legal contracts smart contracts only know the *ex ante*-perspective and can therefore for example not handle unforeseen circumstances normally governed by the doctrine of frustration in English Common Law, '*onvoorziene omstandigheden*' in Dutch Law, or '*Wegfall der Geschäftsgrundlage*' in German law. Smart contracts are therefore 'blind' for this kind of events.

The term smart contract is however not only a misnomer because they are as seen not smart, but also for the fact that they are not even contracts in a legal sense.³⁵ Regardless whether a smart contract is an 'offchain' or 'onchain' smart contract, only the execution is automated at the moment, while the contract conclusion itself with offer and acceptance still occurs traditionally without any kind of smart contract automation or even artificial intelligence. However, in the future things might become different in the event that a smart contracts platform will also be used to *find* a previously unknown contracting party and *conclude* the contract (with the platform as a sort of electronic agent for both contracting parties) which will then be *executed* automatically.³⁶ In that case the formation and the execution of smart contracts would become 'smart' and would turn smart contracts into 'real legal contracts' or at least a smart contract could not any longer be distinguished from the underlying legal contract.

5.2 *Are Smart Contracts Self-enforcing?*

As has already been outlined, one of the key selling points of smart contracts is that once all necessary information has been computer coded smart contracts are self-enforcing and self-executing. This is surely in

34 Bourque & Fung Ling Tsui 2014, p. 4, 4; O'Shields 2017, p. 177-178.

35 Buchleitner & Rabl 2017, p. 4, 6; Djazayeri 2016; T. Söbbing 2018, p. 43, 46.

36 For more details see Scholz 2017, p. 141 ff.

principle true but it also hides the fact that smart contracts often need additional outside information to be enforceable.³⁷ Hence, what smart contracts often need are *trusted third parties* who act as *oracles* which are 'embedded' in the smart contract itself. In layman's terms, these oracles 'provide' the smart contract with the necessary outside information (such as for example the actual price for stocks or gold etc.). However, it is apparent that the use of oracles is against the idealistic view that smart contracts are purely self-enforcing and that with every oracle added to a smart contract the self-enforcement level is decreasing.

5.3 Smart Contracts Do Not Need Any Law or Law Enforcement Institutions?

In his influential book '*Codes and Other Laws of Cyberspace*', Lessig wrote the famous sentence that "*code is the law*"³⁸ and Savelyev titles in one of his contributions that smart contracts are "the beginning of the end of classic contract law".³⁹ Such phrases, however, unfortunately suggest that smart contracts do not need any private law (and also no law enforcement institutions such as the courts etc.) as everything is governed and decided exclusively by the 'almost almighty computer code'. At least if one wants to understand the mentioned statements literally⁴⁰ they are incorrect for at least two reasons: first, smart contracts are incomplete as not all information needed to make a smart contract legally enforceable are also part of the computer code. For example, they are not scrutinizing (yet) whether a contracting party has the capacity to conclude contracts. Hence, additionally traditional contract law must regulate the legal fields which are not computer coded into the smart contract. Secondly, the computer code of a smart contract itself can (like provisions of a traditional legal contract) be ambiguous, invalid or unfair under the applicable law. Just because contractual terms are coded in computer language does not make them immune to the governing (mandatory) law. Insofar there is no difference between a traditional legal contract and a smart contract. So neither is code is the law nor are smart contracts the end of classic contract law or render law enforcement institutions obsolete.

37 Also for blockchain-based smart contracts it should be borne in mind that the blockchains are not connected to the internet.

38 L. Lessig, *Codes and Other Laws of Cyberspace*, New York: Basic Books 1999, p. 24. See more detailed for this aspect Kaulartz & Heckmann 2016, p. 618-623; Tjong Tjin Tai 2017b, p. 176, 179.

39 Savelyev 2016.

40 For a broader understanding of 'code is the law' see Fries 2019, p. 902.

5.4 *Smart Contracts Do Not Need Any Trust?*

Another key selling point often mentioned in this context is that there is no trust needed for blockchain-based smart contract transactions—neither in any kind of intermediaries nor in the other contracting party. The smart contract setting itself is supposed to create the necessary trust and is therefore often referred to as a ‘*trustless trust*’ system.⁴¹ However, a closer look shows that smart contracting also needs some trust, but the persons and/or institutions to be trusted in the first place are different. A smart contract requires trust in the oracles on the one hand and in the security of the smart contract system itself on the other. If potential customers do not trust either of them (e.g. because of a previous security breach or the oracles are not trustworthy) they will turn their backs to smart contracts and return to the traditional way of contracting. So trust also remains of importance for smart contracting, even though the allocation of trust might differ from the normal contract setting. And one should not underestimate the fact that, even in a smart contract scenario, customers will still prefer a contractual counterpart that is reliable and has a good reputation in terms of quality of the goods to be delivered or the services to be provided.

5.5 *Do Smart Contracts Reduce Transactions Costs?*

The main argument for businesses to use smart contracts seems to be obvious and that is as already mentioned before the reduction of different kinds of transaction costs: Smart contracting reduces enforcement costs (as e.g. problems such as no or late payment belong to the past), costs for intermediaries such as banks do not appear, and also the contract standardization due to smart contracting helps businesses to reduce costs. However, at the moment we are still at a stage where it is questionable whether smart contracts can really reduce transaction costs. One reason for this doubt is that smart contracting generates high initial costs. Drafting smart contracts is expensive and requires infrastructure and expert (coding) knowledge. Only those who can afford the powerful hardware and have the coding know-how (or who can afford to hire a programmer) can utilize the technology, though increasingly start-ups pop up to allow also ‘laymen’ to draft their own smart contracts.

And as long as the legal uncertainties about smart contracting remain, legal practitioners will still recommend to draft a traditional ‘paper

41 See on this point especially Werbach 2018.

contract' as a 'legal wrapper' for the smart contract.⁴² Needless to say, this practice is hard to bring in line with the intended aim of reducing transaction costs. However, with increasing legal certainty about smart contracting and if smart contracts could also be concluded in a smart fashion (e.g. through smart contract platforms as electronic agents) it is more likely that transaction costs can be considerably reduced.

5.6 Is Consumer Law Inapplicable or at Least Irrelevant to Smart Contracts?

What can be predicted and what can also be seen from the aforementioned examples of smart contracts is that the main sphere of applicability of smart contracts is likely to be in business-to-consumer contracts.⁴³ The reason is that an investment in smart contracting makes sense if businesses can make use of a drafted smart contract module for a multitude of clients in order to make the invested transaction costs worthwhile. But one has to bear in mind that one of the most urgent legal questions in this area to be answered now is how consumer law affects smart contracting; here there is a notable tendency in legal literature which is trying to do its best to keep smart contracting unaffected by consumer law to the greatest possible extent.

The most surprising and far-reaching statement in this regard was probably made by Savelyev who argues "that the whole layer of legal provisions relating to consumer law (...) is non-applicable to smart contracts".⁴⁴ It goes without saying that this would have an enormous legal impact as important consumer protection mechanisms such as information duties or the right to withdrawal etc. would be inapplicable. However, this opinion does not give any reason for the non-applicability of regularly even mandatory consumer law in smart contract scenarios and should be rejected.⁴⁵ It almost goes without saying that the (EU)

42 Clifford Chance, 'Are Smart Contracts Contracts? Talking Tech Looks at the Concepts and Realities of Smart Contracts', Talking Tech (December 2017), <https://talkingtech.cliffordchance.com/en/tech/are-smart-contracts-contracts.html>. See also Allen 2018, p. 330 ff.

43 Tjong Tjin Tai 2017b, p. 176, 182. Different however Savelyev 2016, p. 20. He thinks the main field of applicability of smart contracts are going to be the business-to-business transactions. The exact impact of the development of smart contracts on consumer law and consumer policy is of course yet uncertain.

44 Savelyev 2016, p. 20.

45 Numerous authors do not even discuss the problem of the applicability of consumer law for smart contracts and are assuming (naturally) its applicability in this context. See e.g. Buchleitner & Rabl 2017, p. 4, 12; Kaulartz 2016a, p. 201, 204; T. Söbbing 2018, p. 43, 46; Tjong Tjin Tai 2017b, p. 176, 181.

consumer law and the corresponding national law implementing EU consumer law directives are applicable once the necessary requirements are fulfilled. As such, smart contracting is not and cannot be a blind spot for consumer protection law.

However, even for those authors recognizing that consumer law in principle applies to smart contracts, it seems that there is a will to limit its concrete impact as far as possible. This can be shortly illustrated taking the discussion about the possible impact of the EU Unfair Terms Directive⁴⁶ on smart contracting. Some writers argue that the Unfair Terms Directive might not be applicable to smart contracts as its art. 1(1) requires an unfair contract *term* which indicates the necessity of a *textual* form—a requirement an algorithm cannot fulfil.⁴⁷ This train of thought is however not very convincing as the Unfair Terms Directive does not per se require a textual form of the contractual terms in order to apply. In addition, it would be counterproductive if the protection the Unfair Terms Directive grants could be so easily circumvented by converting unfair terms into a smart contract code.

Others question the applicability of the Unfair Terms Directive because not the whole content of the smart contract might be a pre-formulated but some terms could be individually negotiated.⁴⁸ Art. 3(2) of the Unfair Terms Directive answers this question clearly in stipulating that the fact that certain aspects of a term or one specific term have been individually negotiated shall not exclude the application of the Unfair Terms Directive to the rest of a contract (if an overall assessment of the contract indicates that it is remaining part is a pre-formulated standard contract). Hence, it can be concluded that consumer law applies normally to smart contracts and that there is no particular *lex smart contracts*.

5.7 *Are Smart Contracts Incompatible with Principles of Private Law?*

The rise of smart contracting does however present the clear opportunity to discuss and scrutinize fundamental principles of private law. One of the current question concerns whether the concept of smart contracts is

46 Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts.

47 Söbbing 2018, p. 43, 46.

48 Kaulartz & Heckmann 2016, p. 618, 622 raise this question. However, they come correctly to the conclusion that the (implemented) Unfair Terms Directive is applicable in a smart contract scenario.

compatible with fundamental principles of private law as they currently stand. An obstacle concerns for instance whether automated performance of contract damages claims via smart contracts (such as in the case of cancelled or delayed flights or trains) could 'force a benefit' on the obligee;⁴⁹ and in so doing potentially depriving him of his right of initiative, i.e. the right to (judicially) enforce a claim.

However, this argument generally is not especially convincing because the contract parties' private autonomy forms the basis for the conclusion of a smart contract and, put simply, they have thereby agreed to the 'benefit'. Nonetheless, the argument does appear more convincing at first glance when one takes into regard the aforementioned discussion on the contentious introduction of *mandatory* smart contracts for delayed or cancelled flights or trains.⁵⁰ Such mandatory smart contracts in this area would lead to the automatic payment of flat-rate compensation to the passenger whereby neither his consent nor any further action on his part are necessary. However, closer examination indeed shows that the parties do not lose their right of initiative: the example of flights or train journeys illustrates that it is not the passenger but rather the airline or train operator that is burdened with the initiative to take legal action.⁵¹ It is the company that would have to initiate legal proceedings to argue that the compensation payments were made incorrectly (e.g. due to defective computer code). Furthermore, it is not realistic in such situations to assume that the passenger would relinquish his claims because his relationship with the airline or train operator is of greater importance than receiving compensation. One cannot genuinely refer to the notion of a state-initiated forced benefit in such cases. And if one really has such great concerns against automated payments, the right-holder could, as Fries suggests, simply elect to opt-in of this process when concluding the contract.⁵² Another probably more efficient option would be an opt-out mechanism for the right-holder for the automated payments of damages.

5.8 Could Smart Contracts Lead to Overenforcement?

The general rise of smart contracts and the aforementioned discussion on the introduction of mandatory automated payment of damages for

49 See N. Guggenberger, 'Durchsetzung nach Datenlage', *Frankfurter Allgemeine Zeitung (FAZ)*, *Einspruch* from 2 May 2018 (hereinafter: Guggenberger 2018)

50 See Guggenberger 2018.

51 See also Fries 2019, p. 904.

52 Fries 2019, p. 904.

delayed or cancelled flights or trains do appear to signal the start of a new era which could turn a legal utopia into legal reality: the full enforcement of private rights. However, it is precisely the means to get a firm grip on full enforcement which gives several authors cause for concern. They assume that the substantive (consumer) rights are only a '*fleet in being*', i.e. they only ultimately are of symbolic importance⁵³ or the deficits in enforcement of rights are necessary for a just balance of interests and the private law system is not designed for the full enforcement of rights.⁵⁴ Accordingly, the full enforcement of rights through (mandatory) smart contracts (or other tools of automated payment of damages) would lead to a legally undesirable overenforcement of private rights.⁵⁵

Without going into detail, there are in my opinion strong arguments against this viewpoint. It must of course be the aim of every private law system actually compensate losses. The expectation that one creates for instance potential overcompensation through fixed-rate damages, but hopes that only a small percentage are enforced, does not hold water—it greatly neglects the compensation of losses suffered in the *individual* case. The actual compensation of *all* sustained loss is preferential over overcompensation in few instances. Furthermore, there is increasing recognition that also private law has to contribute to inciting particular behaviour, for instance by giving incentives for abiding by the contract (such as through the introduction of mandatory smart contracts).⁵⁶ The compensation of all sustained damage would thereby give the correct incentives to prevent. In addition, the aforementioned view must accept the criticism as to why such extensive efforts are made in the creation of the right and private law intervention when in the end their (full) enforcement even appear as being undesirable.

In any case, it appears to be correct and key that both legislators as well as legal scientists use the development of smart contracting as an impetus to consider whether and, where appropriate, how substantive private law has to be changed if it is to be enforced on a broader level.⁵⁷ If one follows the view that the flat-rate compensation in the EU Flight Compensation

53 J. Basedow, 'Rechtsdurchsetzung und Streitbeilegung', *Juristen Zeitung* 2018, p. 1-12, p. 10.

54 Hofmann 2019, p. 130.

55 Hofmann 2019, p. 139 ff.

56 For more detail Fries 2019, p. 903; A.U. Janssen, *Präventive Gewinnabschöpfung*, Mohr Siebeck: Tübingen 2016, p. 25 ff.

57 Fries 2019, p. 905; Hofmann 2019, p. 140.

Regulation has—insofar as the amount or even full enforcement is possible—overcompensatory effect, this could be adjusted down to a compensatory amount. The literature also in part views the automated enforcement as a chance to give greater precision to substantive law. For instance, compensation payments due to delayed carriage could now be calculated and paid to the exact minute.⁵⁸

6. Conclusion

This contribution is the modest attempt to give some general food for thought about smart contracts. Despite the slightly provocative title it was by no means an intention to condemn smart contracting as such but only to ‘demystify’ some surrounding statements to find out what smart contracts really are and what their potential is. It became clear that smart contracts are neither smart nor legally speaking contracts and that the term is therefore unfortunate. Smart contracts are also not purely self-enforcing as often proclaimed, they do need law and law enforcement institutions, and they cannot replace completely the element of trust. Whether smart contracting can already today reduce transaction costs is at least questionable. Not questionable is however that consumer law is applicable to smart contracts (if the requirements are met) and it can even be predicted that the question of smart contracting and consumer law is going to be one of the hot topics in this area. Last but not least this contribution has also shown that smart contracts are not as such incompatible with private law principles and that they do not lead per se to overenforcement.

The deeper understanding of smart contracting is the prerequisite for the identification of the *legal implications* arising from them now and in the future. Lawyers need to gain this knowledge of smart contracts to be able to ask the right legal questions and to accompany this technology legally. Because despite numerous uncertainties about them one thing seems to be certain: solid foundations for smart contracts are being set.

58 Fries 2019, p. 905.