

Contract Automation from Telematic Agreements to Smart Contracts

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Abstract

Technology creates new opportunities for socio-economic relations, commercial exchange and to overcome national borders, allowing to conclude and execute agreements more quickly regardless of the distance between the parties. However, technology also tests the contractual institution as it requires to adapt it to immediate, transnational, automatic uses, and to the legal issues that consequently arise. This chapter aims to analyze the evolution of the relationship between technology and contract through the *fil rouge* of contract automation, with specific regard to the conclusion of telematic agreements and the next frontier for contract automation, ie ‘smart contracts’.

I. Automation and the Contract

Over a century has passed since the German doctrine, primarily with Auwers,¹ and a few years later the Italian doctrine, with Cicu and Scialoja,² began the

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¹ W. Auwers, *Des Rechtsschutz der automatischen wagen nach gemeinem Recht* (Göttingen: W. Fr. Kästner, 1891); Id, *Des Rechtsschutz der automatischen wagen nach gemeinem Recht* (Norderstedt: Hansebooks, 2016); F. Günther, *Das Automatenrecht* (Göttingen: W. Fr. Kästner, 1892); Id, *Das Automatenrecht* (Whitefish: Kessinger, 2010); K. Schels, *Der strafrechtliche Schutz des Automaten* (Munich: Jur. Diss. Erlangen, 1897); F. Schiller, *Rechtsverhältnisse des Automaten* (Zurich: Zürcher Diss., 1898); P. Ertel, *Der Automatenmissbrauch und seine Charakterisierung als Delikt* (Berlin: Druck von Wilhelm Pilz, 1898); H. Neumond, *Der Automat. Ein Beitrag zur Lehre über die Vertragsofferte*, *Archiv für die civilistische Praxis* (Heidelberg: Mohr Siebeck, 1899), 166.

² A. Cicu, *Gli automi nel diritto privato* (Milano: Società Editrice Libreria, 1901), 8; Id, *Scritti minori*, II (Milano: Giuffrè, 1965); A. Scialoja, *L’offerta a persona indeterminata ed il contratto concluso mediante automatico* (Città di Castello: Tipografia S. Lapi, 1902). More recently, see among others: A.M. Gambino, *L’accordo telematico* (Milano: Giuffrè, 1997); F. Delfini, *Contratto telematico e commercio elettronico* (Milano: Giuffrè, 2002); S. Sica and P. Stanzione eds, *Commercio elettronico e categorie civilistiche* (Milano: Giuffrè, 2002). In recent European doctrine, see: R. Schulze and D. Staudenmayer, ‘Digital Revolution – Challenges for Contract Law’, in R. Schulze and D. Staudenmayer eds, *Digital Revolution: Challenges for Contract Law in Practice* (Baden-Baden: Hart-Nomos, 2016), 19; S. Grundmann and P. Hacker, ‘The Digital

exploration of the then futuristic relationship between automatic devices, private relations and contractual stipulation.

Such authors paved the way to the analysis of the impact of the so-called automation on the contractual features, dynamics and remedies. A long and detailed analytical path, then, contributed to the taxonomy and evolution of the institution of contract, including its elements and related events.

The development of digital technology and telematics³ has led to the emergence of new contractual typologies based on economic behaviors that go beyond evaluating the convenience of the terms, to satisfy needs through ever faster, often immediate, and effective exchanges.⁴

The process of depersonalization of relationships and the consequent objectification of the contract which had already matured with mass bargaining have been fulfilled with telematic negotiation. This is even more apparent when it operates through electronic agents, that is automatic programs which conclude contracts between machines on the basis of preventive instructions without individual control.⁵

Those forms of bargaining led to the evolution of the model of progressive development of contractual consent, where a reduction in transaction costs and

Dimension as a Challenge to European Contract Law. The Architecture', in S. Grundmann ed, *European Contract Law in the Digital Age* (Cambridge: Intersentia, 2018), 3.

³ The term telematics derives from the Greek adverb 'tele-' which means distant, and from the suffix '-ema' which means functional element that gives shape to something. Thélème was also the imaginary abbey with which Gargantua, a character conceived by Francois Rabelais, a French humanist of the 16th century, foreshadowed a world of complete freedom. Unlike others, Thélème was an abbey without walls and external barriers: everyone could enter it and was well received, some could get lost. Therefore, the concept of telematics, indicates a set of IT services that are offered and used in real time through a telecommunication network, which may act as communication tools between the parties. On this subject, one may also see: A.M. Gambino, A. Stazi and D. Mula, *Diritto dell'informatica e della comunicazione* (Torino: Giappichelli, 3rd ed, 2019).

⁴ In this regard, see, *ex multis*: K. Kryczka, 'Electronic Contracts and the Harmonization of Contract Laws in Europe – An Action Required, a Mission Impossible?' 13 *European Review of Private Law*, 149-170 (2005); P. Sammarco, 'I nuovi contratti dell'informatica. Sistema e prassi', in F. Galgano ed, *Trattato di diritto commerciale e diritto pubblico dell'economia* (Padova: CEDAM, 2006).

⁵ The use of an electronic agent introduces an alternative path beyond the party's control in the traditional production process and manifestation of the will to negotiate. Indeed, complex processing mechanisms lead to the determination of an artificial, predetermined negotiating will which is potentially increasingly different from that of the user due to technological evolution. In this case, the results of the bargaining are not always foreseeable and it cannot be excluded that the electronic agent will at least in part complete contracts upon unwanted assumptions or beyond the program user's expectations. Regarding these multiple related issues, see among others: P. Perlingieri, 'Relazione conclusiva', in Id, S. Giova and I. Prisco eds, *Il trattamento algoritmico dei dati tra etica, diritto ed economia* (Napoli: Edizioni Scientifiche Italiane, 2020), 379; G. Teubner, *Soggetti giuridici digitali? Sullo status privatistico degli agenti software autonomi* (Napoli: Edizioni Scientifiche Italiane, 2020); G. Sartor, 'Cognitive Automata and the Law: Electronic Contracting and the Intentionality of Software Agents' 17 *Artificial Intelligence and Law*, 253-290 (2009); G. Finocchiaro, 'The conclusion of the electronic contract through "software agents" A false legal problem? Brief considerations' 19 *Computer Law & Security Review*, 20-24 (2003).

a greater possibility of information regarding the subject of the exchange have overcome the perplexities around fewer reflections on purchasing certain goods or services.⁶

II. Types of Telematic Contract

With reference to telematic contracts, which are characterized by the use of electronic means in order to put distant parts in contact, subcategories have been identified.

A first general distinction is between telematic contracts in the broad sense, characterized by the provision of a service electronically, and those in the strict sense, in which the bargain is formed thanks to the electronic impulses exchanged between the terminals connected to distance.⁷

A key classification between telematic contracts is based on the subjective profile, which differentiates the business to business contracts related to the negotiations between professional operators, the business to consumer contracts involving relationships between professional operators and consumers, and consumer-to-consumer relationships between private entities outside their professional activities.⁸

However, this classification appears to be linked to statutory schemes that the new commercial techniques have overcome. Indeed, the provisions aimed at protecting the ‘weak part’ in the regulation of electronic commercial relations are not anchored merely to the subjective condition of the party itself, whether consumer or professional, but they are based on the objective conditions in which the parties place themselves in such relationships.⁹

Another reconstruction of French origin proposes to subdivide telematic contracts into three heterogeneous classes. The first one includes agreements concluded outside the system and executed through the terminals. The second

⁶ See eg: A.M. Gambino, *L'accordo telematico* n 2 above; Id, ‘Il contratto telematico’, in W. Bigiavi, *Giurisprudenza sistematica di diritto civile e commerciale*, 2 (Torino: UTET, 1999).

⁷ French doctrine lists electronic contracts and ‘conclus et exécutés par la télématique’ (par exemple, procédures de réservation électronique) contracts; - soit conclus par la télématique mais exécutés en dehors de cette technique (par exemple procédures de commande par terminal); - soit conclus en dehors de la télématique mais exécutés par elle (par exemple contrats d'accès aux banques de données): X. Linant De Bellefonds and A. Holland, *Contrats informatiques et télématiques* (Parigi: Delmas, 1988), 161.

⁸ In a comparative perspective, see eg: C.W. Pappas, ‘Comparative U.S. & (and) EU Approaches to E-Commerce Regulation: Jurisdiction, Electronic Contracts, Electronic Signatures and Taxation’ 31 *Denver Journal of International Law & Policy*, 325-348 (2020); Z.S. Tang, *Electronic Consumer Contracts in the Conflict of Laws* (Londra: Bloomsbury, 2015); F.F. Wang, *Law of Electronic Commercial Transactions: Contemporary Issues in the EU, US and China* (London: Routledge, 2014).

⁹ One may see also: A. Stazi, ‘Digital copyright and consumer/user protection: Moving toward a new framework?’ 2 *Queen Mary Journal of Intellectual Property*, 158-174 (2012); Id and D. Mula, n 3 above.

class identifies agreements concluded through the IT medium and executed outside the telematic network. In the third case, both the contract conclusion and implementation take place online, eg for the circulation of rights relating to intangible assets and IT services.¹⁰

With regard to the procedures to conclude electronic contracts that are functional to electronic commerce, two main options for expressing consent are identified: a) contracts where consent is expressed with a 'click', the so-called 'point and click' on an offer contained in a website – or more recently in an app on mobile devices;¹¹ b) contracts in which consent is expressed by email.¹²

In the context of contracts concluded via access to a website or app, according to a part of the doctrine the completion of the agreement and therefore the *Idealtypus* of the electronic contract consists in completing a form including the typing of the card numbers with a subsequent acknowledgement of receipt by the offeror.¹³

On the other hand, in the contract concluded by email the principle of receptivity is followed but tempered by the principle of effective knowledge: the agreement is completed through an effective dialogue with mutual communication.¹⁴

III. The Telematic Agreement

Agreement and dialogue do not constitute a monad. The Principles of European Contract Law, or PECL reaffirm the centrality of the agreement even in the absence of dialogue. The PECL identify the contract with sufficient agreement, thus marking a clear break with the principle of completeness of

¹⁰ P. Le Tourneau, *Contrats informatiques et électroniques* (Parigi: Dalloz-Sirey, 4th ed, 2006).

¹¹ The term 'app' is an abbreviated form of 'application', which in practice is used especially with regard to mobile apps for mobile phones, tablets, etc. The majority of the applications are found in real virtual stores called app stores. The contracts concluded through the app appear similar to the hypothesis of the contract concluded through access to the site, as also this case is a form of communication one to many and not one to one as for the contracts via email.

¹² These typologies can be framed in the inter-absent relationships. However, they have at least an unusual aspect characterizing them, in that the parties do not follow the normal logical-chronological sequence between the moment of processing the communication and that of sending the reply, or at least this sequence is strongly compressed. So, while in the contact *de visu* the assignment that follows an announcement can be easily corrected according to canons of reasonableness, in telematic contracts the screen of the program does not allow to easily identify neither the professional quality of the offeror nor the legal binding nature of the commitment undertaken.

¹³ In this perspective, the credit card spending manifests the willingness to legally bind the purchaser and has real efficacy involving the conclusion of the contract for the beginning of execution, according to a unilateral contract scheme. See A.M. Gambino, *L'accordo telematico* n 2 above, 138.

¹⁴ Provided eg in the Italian legal system at Art 1335 of the Civil Code and in the common law systems in the so-called mailbox rule; in this regard, see *amplius*, below in the following paragraph.

consent on all elements of the contract.¹⁵

On the one hand, technology has been considered a solution to the problem of the formation of contracts with a view to facilitating the exchange of promises, reducing the time delay due to distance, limiting communication risks, automating responses and reducing transaction costs.¹⁶

Still, the trade-off between the use of technology and consent is increasingly evident, the bottom line being that their very presence is inversely related. In fact, consensual contracts have been more and more replaced by formality-based agreements.¹⁷

Therefore, the interpreter must assess the meaning of the tenderer's communications on a case-by-case basis, starting from the moment the purchase is solicited, and inspired by the usual criteria of good faith and correctness.

Furthermore, in a system specially based from the beginning on spontaneous adherence to certain rules of good conduct, the so-called 'netiquette',¹⁸ it has been found that such 'needed' courtesy generates constraints, which are still socially penalized although not legally punishable.¹⁹

Different legal systems have responded to the problem of forming contracts between distant parties in different ways, and the two main solutions – the mailbox rule, and the reception rule – have given rise to an ongoing debate.²⁰

A number of technical solutions have appeared in the history of the contract regarding the formation of agreements when the parties are not in the

¹⁵ See: Arts 2: 101 and 2: 103 PECL. In the same sense, Art 2: 204 PECL states that: 'any form of declaration or behavior of the oblate that indicates acceptance of the proposal constitutes acceptance', and Art 2:211 PECL states that: 'even when the contract conclusion procedure is not structured in proposal and acceptance, the rules of this section apply equally with the appropriate adaptations'.

¹⁶ See: M. Granieri, 'Technological contracts', in P.G. Monateri ed, *Comparative Contract Law* (Cheltenham-Northampton: Edward Elgar, 2017), 408; J.M. Moringiello and W.L. Reynolds, 'From Lord Coke to Internet Privacy: The Past, Present and Future of the Law of Electronic Contracting' 72 *Maryland Law Review*, 452-500 (2013); J. Savirimuthu, 'Online Contract Formation: Taking Technological Infrastructure Seriously' 2 *University of Ottawa Law & Technology Journal*, 105-144 (2005).

¹⁷ In this sense, see: R.T. Nimmer, 'Electronic Contracting: Legal Issues' 14 *Marshall Journal of Computer & Information Law*, 211-246 (1996); C. Reed, *Internet Law: Texts and Materials* (Londra: Butterworths, 2000), 175; J.K. Winn and B.H. Bix, 'Symposium: Cyberpersons, Propertization, and Contract in the Information Culture: Diverging Perspectives on Electronic Contracting in the U.S. and EU' 54 *Cleveland State Law Review*, 175-189 (2006); J.M. Moringiello and W.L. Reynolds, 'From Lord Coke to Internet Privacy: The Past, Present and Future of the Law of Electronic Contracting' 72 *Maryland Law Review*, 452-500 (2013).

¹⁸ Term composed of *net* (network) + *etiquette* ('label').

¹⁹ See: I.T. Hardy, 'The Proper Legal Regime for Cyberspace' 55 *University of Pittsburgh Law Review*, 993-1056 (1993); M.R. Burnstein 'Conflicts of the Net: Choice of Law in Transnational Cyberspace' 29 *Vanderbilt Journal of Transnational Law*, 75-116 (1996).

²⁰ Among others, see: R.B. Schlesinger and P.G. Bonassies, *Formation of Contracts: A Study of the Common Core of Legal Systems* (New York: Dobbs Ferry, 1968); I.R. Macneil, 'Time of Acceptance: Too Many Problems for a Single Rule' 122 *University of Pennsylvania Law Review*, 947-979 (1964).

same place at the same time. Some of these solutions have been completely replaced over time, while others have been recently added or are under development. Whenever new technology emerged, the question arose as to whether pre-existing contractual law rules could meet trade needs and ensure an adequate level of certainty in commercial practice.²¹

The mailbox rule represents the solution adopted in the common law system, according to which the contract is intended to be perfected at the time the offeror sends their acceptance.²²

Civil law countries have preferred the reception rule, according to which a contract is formed when the offeror receives the recipient's acceptance, following a similar logic to the contextual bargaining in person.²³

²¹ See: S. Holmes, 'Stevens v. Publicis: The Rise of "No E-Mail Modification" Clauses?' 6 *Washington Journal of Law, Technology & Arts*, 67-68 (2009); A. Rawls, 'Contract Formation in an Internet Age' 10 *Columbia Science & Technology Law Review*, 200-231 (2009).

²² The rule was established in *Adams v. Lindsell* (1818) 106 ER 250, and later accepted in the United States: *Mactier's Adm'r's v. Frith*, 6 Wend. 103 (NY 1830). In doctrine, see: R. LeRoy Miller and G.A. Jentz, *Business Law Today* (Boston: Cengage Learning, 2010); R.T. Nimmer, n 17 above, 222; A. Rawls, n 21 above, 205; E.A. Farnsworth, 'Comparative Contract Law', in M. Reimann and R. Zimmermann eds, *The Oxford Handbook of Comparative Law* (Oxford: Oxford University Press, 2016), 916; A.F.M. Maniruzzaman, 'Formation of International Sales of Contracts: a Comparative Perspective' 29 *International Business Law Journal*, 487 (2001). The leading case on the matter is a decision of the British High Court on the case *Mondial Shipping & Chartering BV v Astarte Shipping Ltd.*, (1995) CLC 1011. The case assessed the rituality of the declarations of legal relevance made by e-mail communications, as well as the operation of the same where the withdrawal from its contractual obligation was manifested by sending an electronic communication within the deadline. The Court opted for the applicability of the rules relating to inter absent contracts, based on the so-called shipping principle, or mailbox rule, which identifies the moment of consent with the act of sending the declaration by the offeror (ie the accepting subject). Having to establish the time to which the withdrawal dated, considering that it did not have to be activated before a certain term and that the relative declaration had been sent a few minutes before the same term, yet coinciding with the non-working weekend, the Court ended up stating the full operation of the withdrawal declaration in light of the fact that it would have become known only on the first following business day.

²³ See Art 11 of Directive 2000/31/EC and Artt 1326-1335 of the Italian Civil Code, while in France the Civil Code does not provide for a solution and the French courts have generally decided these questions on a case by case basis. J. Bell, S. Boyron and S. Whittaker, *Principles of French Law* (Oxford: Oxford University Press, 1998), 312, however, note that there seems to be a preference among the French courts for acceptance at the time and place of dispatch. In the Italian legal system, Art 1335 of the Civil Code establishes a presumption of knowledge *iuris tantum* with respect to the declaration sent to the recipient's address, therefore at the time of the knowledge or knowability of the communication by the latter. This presumption can thus be won by proof against the recipient who could not receive the news of the communication, without fault. In Germany, the contract is concluded when the acceptance reaches the offeror. This rule can be inferred from § 130(1) BGB, according to which any declaration of intention (being it an offer, a revocation of an offer, an acceptance or another declaration) directed to an absent person becomes effective when it reaches that person. See H. Kotz, *Vertragsrecht* (Heidelberg: Mohr Siebeck, 2012), 99; W. Flume, 'Allgemeiner Teil des bürgerlichen Rechts', in *Das Rechtsgeschäft*, II (Berlino: Springer, 1979), 657; H. Beale, B. Fauvarque-Cosson, J. Rutgers and S. Vogenauer, *Cases, Materials and Text on Contract law* (Oxford: Hart, 2019), 257; K. Zweigert and H. Kötz, *An introduction to comparative law* (Oxford: Clarendon Press, 1998), 362, state that every declaration of will is effective as soon as it

International trade legislation has shown a preference for the reception rule,²⁴ while over time the mailbox rule has lost relevance, also as a consequence of the spread of digital technologies.²⁵

Comparative studies have dealt extensively with the issue of evaluating one option over the other, and the ability of each solution to adapt to online bargaining.²⁶

In some cases, in the telematic context, such as sending emails or instant messages, the interval between sending and delivery is so short that the offer and acceptance are separated by a negligible fraction of time, thus making the revocation almost impossible.

This explains the European Union legislator's rationale behind extending the application of the *jus poenitendi* already foreseen in the distance contracts directive to electronic bargaining.²⁷ If there is no time to weigh an agreement, some time must be given to change your mind and dissolve the agreement.

Also in the United States, the Restatement of Contracts subjects 'substantially instantaneous' bidirectional communications to the same principle applicable to acceptances where both parties are present.²⁸

The mailbox and reception rules are only different solutions to allocate the communication risk between the parties. The common law stated that a rule based on the tenderer's actual receipt of the acceptance would have given rise to the

comes into the 'sphere of influence' of the addressee. They take the old school example of a bird-lover that chooses not to empty the letter-box in his garden for fear of affrighting the tomtits within; in that case, the declaration is treated as having arrived. The concept of reaching (*zugehen*) is well explained in the *Delivery to a housemaid* case, even though it concerns an offer. In that case, the Reichsgericht stated that an offer becomes effective when the letter or the telegram containing it has been delivered at the offeree's house, regardless of whether the offeree has been informed of the offer. See RG, 25 October 1917 RGZ 91, 60 (delivery to a housemaid).

²⁴ Regarding the complex interaction between the provisions adopted in the Convention on contracts for the international sale of goods and the Convention on the use of electronic communications in international contracts, see: C.H. Martin, 'The Electronic Contracts Convention, the CISG, and New Sources of E-Commerce Law' 16 *Tulane Journal of International & Comparative Law*, 467-504 (2008)

²⁵ A. Rawls, n 21 above, 207; E. Mik, 'The Effectiveness of Acceptances Communicated by Electronic Means, or – Does the Postal Acceptance Rule Apply to Email?' 26 *Journal of Contract Law*, 8 (2009); UCITA denies the application of the mailbox rule for electronic messages; see: S.M. Kierkegaard 'E-Contract Formation: US and EU Perspectives' 3 *Slider Journal of Law Commerce & Technology*, 37 (2007); V. Watnick 'The Electronic Formation of Contracts and the Common Law "Mailbox Rule"' 56 *Baylor Law Review*, 197 (2004), believes that since there is no clear default rule for electronically sent acceptance times, the mailbox rule should be maintained for electronic acceptances of contracts not covered by UCITA.

²⁶ J.M. Moringiello, 'Signals, Assent and Internet Contracting' 57 *Rutgers Law Review*, 1307-1350 (2005), highlighted how in practice consumers perceive transactions on paper as different from electronic transactions.

²⁷ See Arts 9-16 Directive 2011/83/EU, which has extended the provisions of Directive 97/7/EC.

²⁸ Restatement (Second) of Contracts § 64 (1981). In doctrine, see: A. Rawls, n 21 above, 210; P. Fasciano 'Internet Electronic Mail: A Last Bastion for the Mailbox Rule' 25 *Hofstra Law Review*, 971-1004 (1997); E. Mik, n 25 above, 16, according to whom the mailbox rule is still suitable for the use of email in the formation of the contract.

risk that a withdrawal of the acceptance could arrive before it was received.²⁹

To regulate this situation, common law has evolved in such a way that all contractual communications – offers, revocations, refusals – are effective upon receipt, except acceptance.³⁰ The mailbox rule is also instrumental in favoring a faster conclusion of the contract, to the point that a contract is in any case concluded if the tenderer has not yet received the acceptance.³¹

Since the withdrawal of acceptance is less and less practicable due to technological evolution and it would not make sense to maintain a difference in treatment between the different ways of forming the contract, the reception rule has become prevalent in many legal systems.³²

Within the European Union, Art 11 of the E-commerce Directive requires that the service provider acknowledges receipt of the recipient's order without undue delay and by electronic means.³³ The law considers the order and the acknowledgement of receipt received when the parties to whom they are addressed are able to access them; this rule also applies to the exchange of e-mail or equivalent individual communications. Therefore, the Directive is based on a sort of reinforced reception rule in the aim of establishing a harmonized solution at European level.³⁴

Moreover, as an additional protection for users, the Directive introduces a differentiating element to overseas solutions, requiring that the service provider makes available appropriate, effective and accessible means³⁵ to the recipient,

²⁹ I.R. Macneil, n 20 above, 953. Regarding the time that passes from the offer and acceptance, Macneil notes that it is not surprising that the Anglo-American courts have kept it as short as possible by adopting the mailbox rule. Indeed, it can be said that one of the main functions of this rule is to reduce the duration of the offeror's right of revocation. Furthermore, not only does the rule itself shorten the revocation period, but it also removes an element of uncertainty from the contractual relationship. By comparing the risks, the bidder is already exposed to the possibility that his offer is never received by the counterparty; see: A. Rawls, n 21 above, 212.

³⁰ See: P. Fasciano, n 28 above, 222.

³¹ In this regard, see: I.R. Macneil, n 20 above, 954; E. Mik, 'The Effectiveness of Acceptances Communicated' n 25 above, 9. 'Receiving' an acceptance does not necessarily correspond to the recipient's actual knowledge. In electronic bargaining, it has been argued that receipt of acceptance occurs when it has entered the information processing system designated for such messages by the tenderer; see: A. Rawls, n 21 above, 211.

³² In this regard, see again: A. Rawls, n 21 above, 204.

³³ On this point, see: S.M. Kierkegaard, n 25 above, 28; C.H. Ramberg, 'The E-Commerce Directive and formation of contract in a comparative perspective' 26 *European Law Review*, 429-450 (2001).

³⁴ J.K. Winn and J. Haubold, 'Electronic Promises: Contract Law Reform and E-Commerce in a Comparative Perspective' 27 *European Law Review*, 575 (2002), recognize a possible interference with the national provisions, mentioning § 130.1 of the German BGB regarding the moment in which the contractual declaration is considered as received. Neither the UETA nor the E-Sign take a position on the applicability of the rule of the shipment or mailbox or of the reception for the formation of the contract. A. Rawls, n 21 above, 209, proposes the adoption of the reception rule for all contracts in the United States, however formed, in order to ensure consistency in the decisions on the subject at national and international level.

³⁵ For example, a home screen, or a pop-up window, or an intermediate review image.

to allow the identification and correction of insertion errors before placing the order.³⁶

In common law systems, the binding nature of the offer has traditionally been opposed to the use of the invitation to treat, which rather is a mere promotional message.³⁷

The Vienna Convention – also applicable to international sales – is in line with this interpretation, where in Art 14.2 it is expected that:

(a) proposal other than one addressed to one or more specific persons is to be considered merely as an invitation to make offers, unless the contrary is clearly indicated by the person making the proposal.³⁸

Thus, a ‘click’ on the digitized goods on the screen could mean a request for information on the pre-contractual phase, an invitation to offer, a purchase request, a request to send the goods or an acceptance of the offer. Through hypertext navigation, then, you can easily switch from an online contract advertisement to the actual offer.³⁹

The common law courts method consisted in the case-by-case assessment between invitation to offer and offer binding, attaching strong relevance to the context in which the business takes place⁴⁰ and the existence of an *intention* to be obliged.⁴¹

Instead, the civil law system (such as the French system) grounds the contract analysis on the principle of completeness of the offer, which is traced

³⁶ This step is only procedural and does not change the solutions adopted by national laws for the formation of contracts; see: M. Granieri, n 16 above, 19.

³⁷ This, in the reductive perception that ‘the merchant might find himself involved in any number of contractual obligations which he would be quite unable to carry out his stock being necessarily limited’; see: P. Owsia, *Formation of Contract. A Comparative Study Under English, French, Islamic and Iranian Law* (Londra: Kluwer, 1994); *contra*: P.S. Atiyah, *An Introduction to the Law of Contract*, (Oxford: Oxford University Press, 4th ed, 1989), 65.

³⁸ Therefore, the intention to bind to the offer must be explicitly expressed, since the presence of the essential elements of the contractual proposal is not considered a sufficient requirement. Also Art 2.2 of the UNIDROIT Principles of International Commercial Contracts of 1994 is in substantial compliance with the common law principle, according to which: ‘A proposal for concluding a contract constitutes an offer if it is sufficiently defined and indicates the intention of the offeror to be bound in case of acceptance’.

³⁹ In this regard, see eg: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A comprehensive approach to stimulating cross-border e-Commerce for Europe’s citizens and businesses; one may also see: A. Stazi, *La pubblicità commerciale online* (Milano: Giuffrè, 2004), 16.

⁴⁰ See US District Court, Southern District of New York, September 9, 1996; Memorandum, Attorney General, State of Minnesota, County of Ramsey, Second Judicial District, C6-95-7227, December 1996, 6.

⁴¹ Which can be inferred through ‘an inquiry whether the facts show some performance was promised in positive terms in return for something requested’. See S. Williston, *Contracts* (New York: Thomson, 1957), 65. See also, among others: E. Peel, *Treitel The Law of Contract* (London: Thomson, 14th ed, 2015), 2; P.S. Atiyah and S.A. Smith, *Atiyah’s Introduction to the Law of Contract* (Oxford: Oxford University Press, 6th ed, 2006), 35.

back to the figure of the unilateral declaration of will (*déclaration unilatérale de volonté*) and must include also the conditions of the contract in addition to the expression of the intention to contract.⁴²

Thus, for example the sending of catalogs and price lists, and the display of the goods in the shop window with the relative price are generally considered to be offers made to the public, whose conditions cannot change once accepted by the customer.⁴³ The bidder can refuse to fulfill only because of a serious and legitimate reason, such as the exhaustion of the goods.⁴⁴

In the Italian system, if one considers online electronic catalogs in which goods or services are offered for direct purchase, a type of offer to the public pursuant to Art 1336 of the Civil Code is configured on condition that the site: a) is open to any users or in any case to a number of users so vast as to make the sending of the offer independent of the individual person; b) contains all the essential elements of the contractual proposal.⁴⁵

If there is a mere invitation to offer, on one hand the applicable rules will be those on advertising communications, with particular reference to the principles of non-deception, truth, correctness and completeness; on the other hand, the regulation of pre-contractual liability in Art 1337 of the Italian Civil Code applies.⁴⁶

In the French system, the level of information required in the content of the offer changes with the *nature du contrat*.⁴⁷

In the German system, a declaration is not qualified as an offer but rather as an invitation to make offers if the offeror prevents his or her offer from

⁴² A. Weill and F. Terré, *Droit civil, Les obligations* (Paris: Dalloz, 4th ed, 1986), 142, define the offer as 'une déclaration unilatérale de volonté adressée par une personne à une autre, et par laquelle l'offrant proposé à autrui la conclusion d'un contrat'. According to J. Ghestin, *Traité de droit civil: Les obligations: Le contrat: Formation* (Paris: Librairie Générale de Droit et de Jurisprudence, 1988), 219: 'On peut a priori définir l'offre comme une manifestation de volonté unilatérale par laquelle une personne fait connaître son intention de contracter et les conditions essentielles du contrat'. The invitation, the French expression of the invitation to treat, distinguishes between the non-binding offer subsystems, the invitation to faire des offres and the offer avec réserves or sans engagement; see: M. Planiol and G. Ripert, *Traité pratique de droit civil français* (Paris: Librairie Générale de Droit et de Jurisprudence, 2nd ed, 1953), 145.

⁴³ In this regard, see eg: A. Weill and F. Terré, n 42 above, 220.

⁴⁴ The problem of the scarcity of the goods available to the seller is resolved here with the application of the 'first come, first served' principle, since '*est de la nature des choses que l'offre au public soit réservée aux premiers acceptants dans les limites des quantités offertes*'; see: J. Ghestin, *Traité de droit civil: La formation du contrat* (Paris: Librairie Générale de Droit et de Jurisprudence, 1993), 266.

⁴⁵ Examples of offers to the public can be found in the products of a supermarket that have exhibited the sale price, in the products offered in teleshopping, etc. According to Art 1336, para 2, the revocation of the offer to the public in the same forms as the offer – or in another equivalent – is effective also for those who have not heard of it. It is not necessary, therefore, that anyone who has heard of the offer must then know of the revocation in order for it to be effective also against her. It is sufficient that offer and revocation are carried out in the same forms.

⁴⁶ In this regard, one may also see: A. Stazi, *La pubblicità commercial*, n 39 above, 176.

⁴⁷ See eg Court of Cassation 27 June 1973 has ruled that in a hypothesis of *bail* (lease), the offer must mention '*la chose louée, le montant du loyer, et la date possible d'entrée en jouissance*'.

having binding force through the use of express phrases, such as *'freibleibend'* or *'ohne Obligo'* ('without engagement').⁴⁸ However, if the addressee agrees to the invitation and the proposer remains silent, the jurisprudence usually considers such declaration as an acceptance.⁴⁹

Beyond the formal solutions individually adopted by different legal systems, the comparative perspective shows that the most interesting question concerns the role of consent as a mechanism to form the contract. Online, the relevance of the human factor is reduced to the point that there is a tendency to replace the complexity of the will with formality, and the 'humanistic model' of contractual behavior is a prerequisite in favor of prevailing needs for speed and efficiency of transactions.⁵⁰

IV. The Next Frontier: Smart Contracts (?)

The development of distributed ledger technologies, first of all the Blockchain,⁵¹ allows the creation of so-called 'smart contracts',⁵² characterized

⁴⁸ According to § 145 BGB, the offeror is bound by his or her offer and cannot withdraw it.

⁴⁹ For example, in the *Aeroplane Charter* case (BGH, 8 March 1984, NJW 1984, 1885) the Federal Court of Justice has declared that the use of the words 'without engagement' does not necessarily prevent a communication from constituting an effective offer. Indeed, according to the principle of good faith, the proposer should have expressly rejected the offer. On the contrary, his or her silence should count as acceptance. See H. Beale, B. Fauvarque-Cosson, J. Rutgers, S. Vogenauer, *Cases, Materials and Text on Contract law* (Oxford: Hart, 3rd ed, 2019), 362.

⁵⁰ In this regard, see: M. Granieri, n 16 above, 19, who notes that in mass market transactions the practice of standard terms has provoked discussions on consensus which are now superseded by the so-called «Rolling contracts», which continue until someone decides to terminate them, rather than until a certain date (for example such contracts are generally known in the practice of insurance relationships); R.T. Nimmer, 'Electronic Contracting: Legal Issues' 14 *Marshall Journal of Computer & Information Law*, 212 (1996); M.J. Radin, 'Humans, Computers, and Binding Commitments' 75 *Indiana Law Journal*, 1125-1162 (2000), who distinguishes between "contract as consent" and 'contract as product'. For a discussion of the reconstruction of individual will in contract theory and the adoption of a subjective consensus theory linked to liberalism, see: E.M. Weitzenboek, 'Electronic Agents and the Formation of Contracts' 9 *International Journal of Law and Technology*, 218 (2001).

⁵¹ A distributed ledger technology, such as the Blockchain, is a consensus mechanism for geographically distributed, shared and synchronized digital data without a central administrative authority or centralized data store. See eg: UK Government Scientific Adviser (2016) *Distributed Ledger Technology: beyond Blockchain*, available at urly.it/3d6tg (last visited 30 June 2021); M. Giuliano, 'The Blockchain and smart contracts in the innovation of law in the third millennium', available at urly.it/3d49n (last visited 30 June 2021); P. De Filippi and A. Wright, 'Decentralized Blockchain Technology and the Rise of Lex Cryptographia', available at <https://tinyurl.com/5ex3j233> (last visited 30 June 2021).

⁵² The idea of smart contracts was proposed by Nick Szabo in the nineties of the last century; see: N. Szabo, 'Formalizing and Securing Relationships on Public Networks', available at <https://tinyurl.com/v2r5mv5m> (last visited 30 June 2021); Id, 'Smart Contracts: Building Blocks for Digital Markets', available at <https://tinyurl.com/9nbeeftt> (last visited 30 June 2021); Id, 'Smart Contracts', available at <https://tinyurl.com/r95ura8a> (last visited 30 June 2021), who argued that the objectives of such contracts would be to fulfill contractual obligations such as payment terms,

by the self-execution of the contractual clauses without the need for human intervention, and generally excluding the possibility of interrupting such execution or modifying the content, with the exception of the options of multi-signature or self-destruct.⁵³

In some cases, the smart contracts represent the implementation of a previous contractual agreement in the legal sense, whose clauses are formalized in the computer source code.⁵⁴ Therefore, the contracting parties have the advantage of structuring their relations and services in a more efficient and self-executing way, regardless of the ambiguity of natural language.⁵⁵

In other cases, smart contracts introduce new coded relationships that are both defined and automatically applied by the computer code, but are not linked to any underlying contractual rights or obligations.⁵⁶

On the other hand, regardless of the technical necessity, there may be a legal need to draw up a smart contract in writing in order to make its clauses legally binding and applicable at the judicial level.⁵⁷

privileges, confidentiality and even enforcement, and to minimize both harmful and accidental exceptions and the need for trusted intermediaries. With regard to the definition of smart contracts, see: R. Pardolesi and A. Davola, 'What Is Wrong in the Debate About Smart Contracts', available at urly.it/3d49a (last visited 30 June 2021); R. De Caria, 'The Legal Meaning of Smart Contracts' 26 *European Review of Private Law*, 731-751 (2019); R. Herian, 'Legal Recognition of Blockchain Registries and Smart Contracts', available at <https://tinyurl.com/2j3tf32y> (last visited 30 June 2021); L.W. Cong and Z. He, 'Blockchain Disruption and Smart Contracts', available at <https://tinyurl.com/4697v22b> (last visited 30 June 2021); one may also see: A. Stazi, *Automazione contrattuale e "contratti intelligenti". Gli smart contracts nel diritto comparato* (Torino: Giappichelli, 2019), 105.

⁵³ Multi-signature, or 'multisig', verification technology allows an individual to stop running a smart contract until several parties have signed the transaction with their private keys. These can include not only the parts of the smart contract, but also an external third party, a so-called referee. See: K.D. Werbach and N. Cornell, 'Contracts Ex Machina' 67 *Duke Law Journal*, 345 (2017). Furthermore, the code of most smart contracts contains a so-called kill switch. Solidity, the language used to write smart contracts on the Ethereum Blockchain, allows an operation called self-destruction, which removes the smart contract code from the Blockchain; see: H. Eenmaa-Dimitrieva and M.J. Schmidt-Kessen, 'Creating markets in no-trust environments: The law and economics of smart contracts' 35 *Computer Law & Security Review*, 84 (2019).

⁵⁴ The source code, in computer science, is the text of an algorithm of a program written in a programming language by a programmer during programming. It therefore defines the flow of execution of the program itself. See: Wikipedia, 'Source code', available at https://it.wikipedia.org/wiki/Codice_sorgente (last visited 30 June 2021).

⁵⁵ Thus, for example, a smart contract was created that simulates the mechanism for a public funding campaign, the so-called crowdfunding, with fifty-six lines of computer code (see <http://www.mintchalk.com/c/68f3e>). The creation of smart contract models, in practice, could lead to a reduction of the role of lawyers in the moment of contract formation, especially with respect to those that can be easily modeled; on this point, see: M. Corrales et al eds, *Legal Tech, Smart Contracts and Blockchain. Perspectives in Law, Business and Innovation* (Berlin: Springer, 2019).

⁵⁶ In this regard, see among others: Chamber of Digital Commerce – Smart Contracts Alliance (2018), 'Smart Contracts: Is the Law Ready?', available at <https://tinyurl.com/w39ndcnx> (last visited 30 June 2021).

⁵⁷ See: P. De Filippi and A. Wright, 'Decentralized Blockchain Technology' n 51 above, 11, who found that, while at the beginning smart contracts were mainly developed to automatically execute

However, a smart contract is not always immutable. First, the Blockchain could be ‘forked’ by the majority of users. Second, the computer code of smart contracts can contain several functions that allow for a certain range of flexibility.⁵⁸

Again, registering smart contracts on a Blockchain platform usually comes at a cost.⁵⁹ This effectively excludes the inclusion of detailed and complex clauses in smart contracts, as vice versa happens in legal practice especially in common law but increasingly also at an international level.⁶⁰

In a technical sense, it is possible to define smart contracts as computer protocols that execute themselves by applying the lines of the computer code for which they were programmed, which are stored on a distributed register.⁶¹

Eventually, they allow the drafting and possible automation of the agreements between the parties – as a truly ‘contractual’ case in the legal sense – according to an ‘if/then’ logic.⁶² This happens if an economic function is pursued through the computer protocols and is recognized by the legal system in which they are intended to carry out their effects.

A smart contract program is executed by a network of so-called miners who, once consensus has been reached on the outcome of the execution, update the status of the contract on the Blockchain accordingly. In this way, users can send or receive money, data, etc. through a contract.⁶³

Therefore, based on the capabilities of the Blockchain, the smart contracts operate autonomously in a transparent, anti-tampering and tendentially immutable way.⁶⁴

derivatives, options, futures and swaps, later they began to be used to facilitate the sale of goods on the network between unrelated persons without the need for a centralized organization. The authors cite in this sense the example of OpenBazaar, an open source service aimed at creating a decentralized global market in which people can buy and sell products directly, without intermediation costs or centralized control (see: <https://tinyurl.com/t54xdax5>, last visited 30 June 2021).

⁵⁸ Like the multi-signature or self-destruct assumptions mentioned above, but also functions like ‘call’ (which accepts an arbitrary number of arguments of any type), ‘enums’ (a way to create a user-defined type), ‘self-destruct’, and also variable functions that allow the smart contract to process inputs external; in this regard, see: A. Juels and B. Marino, ‘Setting Standards for Altering and Undoing Smart Contracts’, in J.J. Alferes et al eds, *Rule Technologies. Research, Tools, and Applications* (Cham: Springer, 2016), 151.

⁵⁹ Called for example ‘gas’ on the Ethereum platform; see: <https://tinyurl.com/vtj2ex2v> (last visited 30 June 2021).

⁶⁰ On this point, see: G.O.B. Jaccard, ‘Smart Contracts and the Role of Law’, available at <https://tinyurl.com/ys8dj3m9> (last visited 30 June 2021).

⁶¹ P. De Filippi and A. Wright, *Blockchain and the Law: The Rule of Code* (Cambridge: Harvard University Press, 2018), 33; V. Buterin, ‘Ethereum White Paper: A Next-Generation Smart Contract and Decentralized Application Platform’, available at <https://tinyurl.com/y2bfutse> (last visited 30 June 2021).

⁶² See eg: F. Idelberger et al, ‘Evaluation of Logic-Based Smart Contracts for Blockchain Systems’, in J.J. Alferes et al eds, *Rule Technologies* n 58 above.

⁶³ See: G.O.B. Jaccard, n 60 above, 5; A. Juels et al, ‘The Ring of Gyges: Investigating the Future of Criminal Smart Contract’, in E. Weippl ed, *Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security* (New York: ACM, 2016), 283.

⁶⁴ In this regard, see: P. De Filippi and A. Wright, *Blockchain and the Law*, n 61 above, 72; D.

These features give the contracting parties several significant advantages over traditional contracts: they can rely on contractual promises that are stored in the smart contract, ie the transaction protocol automatically executed without recourse to judicial intervention, and do not have to trust the counterparty.

This allows them to take calculated risks even in areas where the parties are not directly opposed to each other, but which are often characterized by anonymity and application risks, as is usually the case in electronic commerce and international contracts.⁶⁵

Consumers/users could particularly benefit from these advantages in a relevant way, since they usually face difficulties and costs for which they neglect to assert their rights in court.⁶⁶

Furthermore, smart contracts involve the possibility of reducing transaction costs by performing some functions currently performed by intermediaries such as eBay, Amazon, PayPal, etc.⁶⁷ Smart contracts allow the parties to incorporate the commercial practice in their agreement, bypassing the need for explicit but⁶⁸ redundant negotiation.

Automatic application or compensation has the potential to reduce the amount of disputes, so increasing certainty and limiting performance monitoring costs.⁶⁹ Therefore, smart contracts give generally rise to a further reduction of human intervention and formalization of the contract.⁷⁰

Once more, smart contracts increase the speed with which it is possible to execute contractual relationships if compared to traditional contracts. Since they are not dependent on paper and related procedural steps, and can be performed in real time, they simultaneously enable more cost savings and faster execution than paper contracts.⁷¹

Finally, smart contracts offer an alternative to one of the most characteristic aspects of contractual drafting: the intrinsic ambiguity of natural language,⁷²

Linardatos, 'Smart Contracts: Some Clarifying Remarks From a German Legal Point of View', available at <https://tinyurl.com/urrms8an> (last visited 30 June 2021).

⁶⁵ See: P. Ryan, 'Smart Contract Relations in e-Commerce: Legal Implications of Exchanges Conducted on the Blockchain' 7 *Technology Innovation Management Review*, 14-21.

⁶⁶ In this regard, see: O. Borgogno, 'Usefulness and Dangers of Smart Contracts in Consumer and Commercial Transactions', in L.A. Di Matteo et al eds, *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (Cambridge: Cambridge University Press, 2019), 8.

⁶⁷ *ibid* 13; M. Sokolov, 'Smart Legal Contract as a Future of Contracts Enforcement', available at <https://tinyurl.com/26sm33p3> (last visited 30 June 2021); E. Mik, 'Smart contracts: terminology, technical limitations and real world complexity' 9 *Law, Innovation and Technology*, 277 (2017).

⁶⁸ On this point, see: J.M. Sklaroff, 'Smart Contracts and the Cost of Inflexibility' 166 *University of Pennsylvania Law Review*, 282 (2017).

⁶⁹ K.D. Werbach and N. Cornell, n 53 above, 318, 352.

⁷⁰ A. Savelyev, 'Contract law 2.0: Smart contracts as the beginning of the end of classic contract law' 26 *Information & Communications Technology Law*, 120, (2017).

⁷¹ In this regard, see: P. De Filippi and A. Wright, 'Decentralized Blockchain Technology' n 51 above, 25.

⁷² See, among others: M. Raskin 'The Law and Legality of Smart Contracts' 1 *Georgetown*

with the relative flexibility in terms of contractual performance.⁷³

The ambiguity and editorial shortcomings can also be used by the parties who intend to free themselves from contractual conditions that they no longer want to honor.⁷⁴ Compared to this phenomenon, smart contracts provide a different binding option by incorporating legal provisions into the computer code.⁷⁵

On the other hand, smart contracts also present a number of new issues and challenges for trade law and practice.

A first question that can arise is that of the identification of the other contracting party, considering that the Blockchain allows anonymous, or rather pseudonymous transactions,⁷⁶ such as in the case of transactions that are registered by referring to an IP address or cryptocurrency wallet.⁷⁷

The codification of the clauses in computer language could lead to a limitation of the possible contents of smart contracts, linked with the possibilities of automation of the contractual prose according to the if / then logic.⁷⁸

Connected to this is the risk that the code, drawn up by IT technicians, incorrectly reports the provisions of the contractual agreement between the parties, or that it may operate differently from what was planned, with the related issue of attributing liability.

Furthermore, there is the question of the risk of parties and legal operators misunderstanding of smart contracts.⁷⁹

Moreover, in practice the connection between the text in computer code and a contractual text drawn up in natural language is increasingly widespread; the texts may have the same content, the so-called split contracting, which is being the specification and/or execution of the other, the so-called hybrid agreement.⁸⁰

Law Technology Review, 324 (2017); E.A. Farnsworth “Meaning” in the Law of Contracts’ 76 *Yale Law Journal*, 939-965 (1967).

⁷³ In this regard, see: M.P. Gergen, ‘The Use of Open Terms in Contract’ 92 *Columbia Law Review*, 1006 (1992); G.K. Hadfield ‘Judicial Competence and the Interpretation of Incomplete Contracts’ 23 *Journal of Legal Studies*, 159-184 (1984).

⁷⁴ In this sense, see: S.J. Burnham et al, ‘Transactional Skills Training: Contract Drafting-Beyond the Basics’ *Transactions: The Tennessee Journal of Business Law*, 253-296 (2009).

⁷⁵ Thus: P. De Filippi and A. Wright, ‘Decentralized Blockchain Technology’ n 51 above, 25.

⁷⁶ By pseudonymity we mean the possibility that, although a person is not identifiable with his real name, such identification can still take place through the acquisition of further information about him, such as a pseudonym, an IP address, a current account, etc; on the subject, see: Article 29 Data Protection Working Party (2014) Opinion 05/2014 on Anonymisation Techniques, WP 216, available at <https://tinyurl.com/yb8rz48p> (last visited 30 June 2021).

⁷⁷ On this point, see: European Bank For Reconstruction and Development, Clifford Chance (2018) ‘Smart Contracts: Legal Framework and Proposed Guidelines for Lawmakers’, available at <https://tinyurl.com/tac5274> (last visited 30 June 2021).

⁷⁸ Cardozo Blockchain Project (2018) Research Report 2: ‘Smart Contracts’ & Legal Enforceability, available at <https://tinyurl.com/9dnauruj> (last visited 30 June 2021).

⁷⁹ Regarding these profiles, see: M. Giancaspro, ‘Is a Smart Contract Really a Smart Idea?’ 33 *Computer Law and Security Review*, 830 (2017); E. Mik, ‘Smart contracts’, n 67 above, 281.

⁸⁰ On this point, see: European Bank For Reconstruction and Development, Clifford Chance

Contrary to traditional contracts where the parties can decide whether or not to fulfill their obligations, the smart contract cannot be violated from the point of view of execution.⁸¹

In a system governed by self-imposed smart contracts and other technical agreements, there would be less need for judicial intervention, since the computer code through which the rules were defined is the same tool through which they are applied.⁸² This raises the question of what is legally or technically binding.

Although the implementation of basic contractual guarantees and consumer protection regulations in smart contracts is theoretically possible, in practice it can prove to be complex, given the formalized and deterministic nature of the computer code.⁸³

Furthermore, although most of the data comes from the Blockchain or other databases connected to it, some smart contracts may have to acquire data from outside the Blockchain to be executed. This creates the need to make use of reliable external sources, the so-called oracles, which represent interfaces between contracts and the outside world.⁸⁴

Reliable oracles that support and can satisfy a wide range of data requests are of paramount importance to many smart contracts.⁸⁵ On the other hand, this phenomenon requires the guarantee that the oracle is reliable and actually a third party, and that there is no interference or security threats during the acquisition of data from the same.⁸⁶

Another problematic issue concerns the need to intervene on a smart contract in the event that an injunction issued by the judicial authority must be executed.

In general, given the impossibility of interrupting the execution of a smart contract – excluding the exceptions mentioned above – this result may be realized in the hypothesis of using a private Blockchain that provides mechanisms for

(2018), n 77 above; P. De Filippi and A. Wright, *Blockchain and the Law*, n 61 above, 76; J.P. Allen, 'Wrapped and Stacked: Smart Contracts and the Interaction of Natural and Formal Languages' 14 *European Review of Contract Law*, 307-343 (2018).

⁸¹ Unless of course the parties could terminate the contract if they decide they do not want to remain tied to it.

⁸² From the merger of law and code it follows, therefore, that the only way to violate the law is to effectively break the code.

⁸³ T. Cutts, 'Smart Contracts and Consumers, LSE Legal Studies Working Paper No. 1/2019, available at <https://tinyurl.com/4yp7tkn7> (last visited 30 June 2021); P. De Filippi and A. Wright, 'Decentralized Blockchain Technology' n 51 above, 26.

⁸⁴ A case of smart contracts activated by external inputs is, for example, that of the insurance policies proposed by AXA and Etherisc, ie insurance companies that offer policies that compensate travelers who suffer flight delays or cancellations. Flight information is acquired automatically and in real time by an oracle company indicated in the contract and the compensation is paid automatically.

⁸⁵ In this sense, see: M. Sokolov, n 67 above, 10.

⁸⁶ E. Mik, 'Smart contracts', n 67 above, 292.

blocking the execution under the responsibility of certain nodes.⁸⁷

The fields of application of smart contracts are numerous. They can be used, at least in theory, in all cases in which economic activities are correlated to the Internet and some events can be digitally verified.⁸⁸

In addition to the financial and insurance sectors where digital bargaining already plays a central role, the use of smart contracts is developing in sectors such as agri-food, energy, entertainment, etc.⁸⁹

Contracts that concern access to digital content and are thus easily translatable into software represent privileged use cases of smart contracts.⁹⁰ By virtue of the growing interconnection of devices, sensors, etc. through the Internet of Things this phenomenon affects ever wider areas.⁹¹

Devices and other material properties can be registered on a Blockchain and, by using smart contracts, transformed into ‘smart properties’, thus allowing the control of material properties on the network, even through other machines.

A Blockchain can store the relationship between Internet-enabled machines at any time and smart contracts can allocate the corresponding rights and obligations of connected devices.

Different relationships and credentials can also be encoded in the Blockchain regarding certain cryptographically activated resources, such as key blocks or smartphones, to ensure that only certain subjects or nodes can have access to the functionality of the property.⁹²

V. Conclusion

This chapter investigated the evolution of the use of technology for the

⁸⁷ On this point, see: M. Giuliano, n 51 above.

⁸⁸ In this regard, see: D. Linardatos, n 64 above, 9; G. Governatori et al, ‘On legal contracts, imperative and declarative smart contracts, and blockchain systems’ 26 *Artificial Intelligence and Law*, 377-409 (2018).

⁸⁹ In this regard, see: Chamber of Digital Commerce – Smart Contracts Alliance (2018) n 56 above; R. Unsworth, ‘Smart Contract This! An Assessment of the Contractual Landscape and the Herculean Challenges it Currently Presents for “Self-executing” Contracts’, in M. Corrales et al, n 55 above, 17.

⁹⁰ This would allow the generalized implementation of a so-called metered Internet, where stocks are tied to micro-payments through related smart contracts. Since cryptocurrencies and smart contracts greatly reduce transaction costs, in particular, they allow artists, musicians, authors, etc to automatically collect royalties inherent to the copyrights on their works every time they are viewed or used. In this regard, see: P. De Filippi and A. Wright, ‘Decentralized Blockchain Technology’ n 51 above, 29; D.A. Wallach, ‘Bitcoin for Rockstars: How Cryptocurrency Can Revolutionize the Music Industry’, available at <https://tinyurl.com/9nvdbsxm> (last visited 30 June 2021).

⁹¹ C. Wendehorst, ‘Consumer Contracts and the Internet of Things’, in R. Schulze and D. Staudenmayer eds, *Digital Revolution: Challenges for Contract Law in Practice* (Baden-Baden: Hart-Nomos, 2016), 189.

⁹² On this point, see again: P. De Filippi and A. Wright, ‘Decentralized Blockchain Technology’ n 51 above, 14.

conclusion and execution of contracts. In this context, machines can considerably support contracting parties because they facilitate, accelerate, and make less onerous distant relationships.

Starting from the so-called automatic contracts, there has been an increase in the capacity of these means to replace human behaviours, thus becoming more and more autonomous. As a matter of fact, while telematic contracts only put in contact distant parties, smart contracts can even guarantee the self-execution of contracts without the need for human intervention.

Technological development has led to a new way of conceiving contracts. In particular, as stated above a process of depersonalisation of relationships has developed. Telematics and informatics have favoured the mass market and instant contracts to the detriment of the bargaining phase, which was the real essence of the agreement.

To face these changes, legal systems have tried to interpret old rules and adapt them to best fit the characteristics of online contracting. Think, for example, to the preference for the reception rule instead of the mailbox rule.

Additional rules have also arisen to accompany traditional contract law. They especially aim to ensure the protection of the weakest part of the contract, for instance with the application of the *jus poenitendi* to electronic bargaining, given that there is usually no time to weigh an agreement.

As already underlined, these means can bring many solutions but also some risks. Besides the advantages, smart contracts present also different challenges, as illustrated in the preceding section.

Smart contracts are the next frontier of contract automation. Recently, legal debates around smart contracts have increased because of the emergence of the Blockchain.

When smart contracts are based on a blockchain, they benefit from its characteristics such as decentralisation and immutability. It is considered that the features of blockchain technology better ensure the automatic performance of contracts, so having the potential to reduce disputes and overcoming the problem of lack of trust in electronic commerce and international contracts.

However, as with every new phenomenon, there is a need of evaluating the impact of smart contracts on contract law.

At the various levels, different initiatives have flourished to analyse smart contracts. To name a few, in 2019 the United Nations Commission on International Trade Law (UNCITRAL) and the International Institute for the Unification of Private Law (UNIDROIT) organised a joint workshop on this topic.⁹³

In 2020, the European Commission published a report on blockchains that also focuses on the legal issues concerning smart contracts and contract law.⁹⁴

⁹³ The workshop took place on 6-7 May 2019 in Rome. To see the summary of the discussions and conclusions of the workshop: urly.it/3d49w (last visited 30 June 2021).

⁹⁴ European Commission (2018).

The Commission responded to the invitation of the European Parliament, that with the Resolution of 3 October 2018 had stressed the need for the European Commission to undertake an in-depth assessment of the legal implications of smart contracts.⁹⁵

At the national level, some countries have issued dedicated legislation. For example, Italy introduced a legislation specifically relating to technologies based on distributed ledgers and smart contracts,⁹⁶ unlike other countries which limited themselves to dictate provisions on specific⁹⁷ aspects.

According to the Italian law, smart contracts can meet the requirement of the written form after computer identification of the interested parties, through a process that shall meet the requirements set by the Agency for Digital Italy.⁹⁸

In the same sense, the storage of a computer document through the use of technologies based on distributed ledgers produces the legal effects of the electronic time validation referred to in Art 41 of the EU e-IDAS regulation.⁹⁹

All these actions have in common the search for appropriate legal answers to a continuously changing environment, with the ultimate goal of fostering economic development by encouraging the spread of digital technology without renouncing legal certainty.

⁹⁵ European Parliament resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation (2017/2772(RSP)) P8_TA-PROV(2018)0373. In particular, see paras from 36 to 38 of the Resolution. See also the European Parliament Resolution of 16 February 2017 on civil law rules on robotics (2015/2103 8INL)) P8_TA-PROV(20170051).

⁹⁶ Legge 11 February 2019 no 12, Art 8-ter, entitled 'Technologies based on distributed registers and smart contracts', converting decreto legge 14 December 2018 no 135. See eg: G. Finocchiaro and C. Bompreszi, 'A legal analysis of the use of blockchain technology for the formation of smart legal contracts' *MediaLaws*, 111-135 (2020); one may also see: A. Stazi, *Automazione contrattuale e "contratti intelligenti"*, n 52 above, 129.

⁹⁷ In France, the Ordonnance no 2016-520 du 28 avril 2016 relative aux bons de caisse and the Ordinance no 2017-1674 du 8 décembre 2017 relative à l'utilisation d'un dispositif d'enregistrement électronique partagé pour la représentation et la transmission de titres financiers, allowed the use of the Blockchain for the registration and transfer of unlisted financial securities as an alternative to the traditional registration in accounting and corporate books. In this regard, see: R3, Norton Rose Fullbright 'Can smart contracts be legally binding contracts?', available at urly.it/3d49z (last visited 30 June 2021); L.D. Muka Tshibende, 'Contract Law and Smart Contracts: Property and Security Rights Issues' 26 *European Review of Private Law*, 874 (2019).

⁹⁸ Through guidelines to be adopted within ninety days from the date of entry into force of the law, but which so far have not been adopted. The provision is in line with Art 20, c. 1-bis, of the Digital Administration Code, contained in the decreto legislativo no 82/2005, which establishes the conditions for which an electronic document is suitable to satisfy the requirement of the written form.

⁹⁹ Regulation (EU) no 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC, OJ L 257 of 28 August 2014. In the abbreviation «e-IDAS», where «e» stands for «electronic» «ID» for «identification», «A» for «authentication» and «S» for «signature». See eg: J. Dumortier, 'Regulation (EU) No 910/2014 on Electronic Identification and Trust Services for Electronic Transactions in the Internal Market (eIDAS Regulation)', available at urly.it/3d4b9 (last visited 30 June 2021).