

STUDY ON THE IMPACT OF SMART CONTRACTS AND DIGITAL SIGNATURES ON THE FINANCIAL LANDSCAPE

SPULBĂR ANDREI CRISTIAN

PHD STUDENT, “EUGENIU CARADA” DOCTORAL SCHOOL OF ECONOMICS SCIENCES
UNIVERSITY OF CRAIOVA

e-mail: andrei.spulbar@gmail.com

Abstract

The article examines the impact of electronic contracts on financial systems, highlighting the changes brought about by financial technologies (FinTech) through electronic contracts as well as digital signatures. The impact of FinTech also extends to markets, transforming the way businesses and institutions interact, including intra-organisational and stakeholder relationships. The article highlights the benefits of e-contracting, such as reduced costs, increased efficiency and process automation. Through FinTech, e-commerce has evolved significantly, facilitating new business models with a digital presence and improving contracting between companies and their customers. Particular attention is paid to electronic signatures, which are considered legal means of signing documents in the digital environment. The article also highlights the evolution of smart contracts, based on blockchain technology, which automate contractual processes and can be concluded without the direct involvement of the parties. Thus, a landscape is emerging in which financial technologies continue to redefine and innovate the global financial system.

Keywords: Financial technologies (FinTech); Electronic (smart) contracts; Digital signatures; eIDAS Regulation; E-commerce.

Clasificare JEL : G15, G20, F30

1. Introduction

In recent years, financial technologies (FinTech) have profoundly reshaped the global financial landscape. This transformation is prominently marked by the integration of electronic contracts and digital signatures into mainstream financial systems. This paper delves into the implications of such advancements, exploring how they redefine traditional business models and financial transactions.

Electronic contracts, often facilitated by the Internet and Information and Communications Technology (IT&C), are revolutionizing not only intra-organizational processes but also inter-organizational and stakeholder interactions. This shift has been significantly supported by various directives and regulations at the European Union level, ensuring a harmonious and secure transition towards digital contracting.

A pivotal element in this technological revolution is the advent of smart contracts. Rooted in blockchain technology, smart contracts automate contractual processes, allowing agreements to be executed without direct human involvement. This automation raises important questions about the legal and practical aspects of contracts in the digital age, challenging traditional notions of contractual agreements.

Smart contracts on blockchain platforms provide a unique way of ensuring the authenticity and enforceability of agreements. They promise enhanced efficiency and reduced costs, potentially revolutionizing how organizations operate by reducing reliance on external legal validation mechanisms.

The paper also examines the legal frameworks governing electronic contracts and digital signatures, particularly focusing on the European Union's eIDAS regulation. This regulation plays a crucial role in ensuring the validity and cross-border recognition of electronic signatures and contracts, fostering consumer protection and trust in digital transactions.

Looking forward, the integration of smart contracts and digital signatures heralds a new era of digital financial transactions. This paper speculates on the potential evolution of digital currencies and the impact of programmable financial assets enabled by smart contracts. Such advancements could lead to more targeted and purpose-driven use of financial resources, potentially creating localized economic ecosystems.

2. Fintech evolution

Electronic contracts may be considered as contracts formed, signed, performed or notified by the use of electronic means of communication. In a broad sense, an electronic contract is digital information distributed over the Internet. The integration of IT&C technology that led to the birth of the Internet with the processes carried out by businesses and public institutions has revolutionised intra-organisational, inter-organisational relations and relations between these entities and their stakeholders (e.g., customers, citizens, local communities, etc.).

The European Commission is one of the most active regional organisations in the field of e-procurement. Over the years, the Commission has enacted Directive 2000/31/EC on electronic commerce, Directive 97/7/EC on distance contracts and Directive 1999/93/EC on electronic signatures. In addition, the European Commission has also issued a number of horizontal directives which also have an impact on electronic contracts, such as directives on the protection of personal data and copyright in the digital environment. In 2014, the European Parliament repealed Directive 1999/93/EC with a Regulation on electronic identification and trust services for electronic transactions established on the territory of the Member States. The International Chamber of Commerce (ICC) has also issued several publications on electronic transactions, including the 2004 publication on terms and conditions in electronic transactions and the 2008 Guide to the use of various forms of electronic commerce and the establishment of a framework for digital message authentication (GUIDEC). The Organisation for Economic Co-operation and Development adopted in 1997 guidelines for the development of cryptography legislation, which, although mainly addressed to governments, also covered some aspects of the use of cryptography in electronic contracts. The OECD is also active in the development of guidelines and policies on electronic commerce which are intended to address certain issues relating to electronic contracts.

IT&C technology has also revolutionised modern markets, with the internet becoming the engine for the development of e-marketplaces that has led to the radical transformation of business models. Traditional commerce relied on physical shops and commercial employees, whereas e-commerce relies on digital commerce platforms. Today, a large proportion of shopping is done over the internet and goods and services are now available to shoppers regardless of distance or time.

Already business practice allows us to see a number of obvious advantages that electronic contracts bring, namely: lower costs, increased efficiency, fewer errors and automation of procedures for establishing and executing contracts. E-contracting has enabled e-commerce to develop on a global scale, new business models based entirely on a digital presence have been created, and contracting between companies still applying traditional business models and their customers has also been facilitated.

Evolutionarily, it can be seen that a number of already generally known procedures have been used to create and conclude an electronic contract: e-mail (the parties express their agreement by exchanging e-mails containing the contractual terms, the offer and any other communications), online forms (forms that the user has to fill in with personal data and by which the user explicitly agrees to the contractual terms and conditions) or EULA - End User License Agreements (which the user has to accept).

But in the context of increasing global digitisation and the growing impact of artificial intelligence in economic and social life, we see a trend towards less human involvement not only in defining contract terms but also in their enforcement. Moreover, new types of contracts can be

concluded without direct human involvement through digital agents (electronic platforms). Smart contracts are a clear example of this trend.

Greenspan (2016) [1] opines that a smart contract is a piece of code that is stored on a blockchain, powered by blockchain transactions and reads and writes data to a blockchain database. This approach is an applicable one compared to other views presented in the literature and emphasizes that blockchain technology is one of the core features of smart contracts.

Blockchain technology allows for the automation of the contractual process for both parties, an aspect that has led some authors to consider that this new type of contracting calls into question the very notion of contract in the legal sense, especially given that these contracts can be concluded automatically by electronic agents used by the parties. In some cases, one of the parties to the contract may be a decentralised autonomous organisation (ODA).

According to Hayes (2016) [2] ODA is a series of long-term smart contracts as opposed to a simple smart contract which has a specific goal and ends when that goal has been achieved. Other authors, including Stinchcombe (2000) [3] consider that each contract is, in fact, a miniature organisation, and that, by extension, all organisations are nothing more than a complex made up of several contracts. Companies are created on the basis of several contracts (employment contracts, contracts with suppliers, rental contracts, sales contracts, etc.) Traditionally, the obligations resulting from these contracts are costly because they have to be sanctioned by external entities such as the entities forming the legal system. In the case of smart contracts, these costs are substantially reduced or even eliminated. This leads us to the conclusion that blockchain-based organizations will be more efficient and competitive compared to traditional organizations (Cong and He, 2018) [4].

For an electronic contract to be valid, it is necessary for the parties to exchange a set of information designed to prevent information asymmetry that may result from the seller having more information about the transaction than the buyer. Requirements on information provided prior to the signing of the contract are seen as the main vehicle for consumer protection, an area in which the European Commission is very active considering that this principle is included in many directives. In the e-commerce directive, pre-contractual information is seen mainly from a technical point of view. Article 10 of that directive, for example, details the steps that the buyer has to take to sign a contract, the steps that sellers have to take to fulfil contractual conditions and the technical means by which input errors can be identified and corrected, as well as the language that can be used to conclude a contract.

We believe that a summary description of the main types of smart contracts, namely shrink-wrap contracts, click-wrap contracts and browse-wrap contracts, is also required in this section of the paper (Kamantauskas, 2015) [5].

Shrink-wrap contracts are commonly used to protect software packages and, in these cases, the terms and conditions are not visible to the consumer until the package is opened, the seal is broken or the software is installed. This means that a consumer cannot read the terms and conditions before paying for the software, which raises legal issues about the validity of this type of contract. In most European countries, such a contract is considered valid as long as the buyer has the right to return the product or cancel the service after paying the price and unsealing the package, if he does not agree with the contractual terms. In other cases, the contractual terms may render the contract invalid, especially if the buyer has no means of expressing consent other than to continue using the product or service.

A browse-wrap contract refers to an agreement relating to the viewing, use or downloading of software from a website, in which the website owner states that a particular action such as downloading or use of the website constitutes acceptance of a contract and will be taken as confirmation of acceptance of the terms and conditions of the contract. In most cases, browse-wrap contracts do not involve the sale of goods and services, but the download of certain software or digital products or the use of a website. There is no visible means of giving consent to the terms

and conditions of the contract, they are simply presented on the website. In this case, the main legal problem is that in many cases the user is not informed that he is entering into a legal relationship when he takes a certain action and that it is not clear whether that action can be considered as a sign of acceptance of the terms and conditions. In general, it is considered that if the terms and conditions are not prominently displayed and the user is not clearly informed that a certain action leads to the establishment of a contract, then this contract is not valid.

Click-wrap contracts refer to when a seller uses a digital platform to display products and services with all relevant details. In this case, buyers can browse the website and if they are interested in a particular product, go to the product page to get more information. Once the buyer has read the information on the terms of payment, delivery and the possibility of exchange or return, they complete the order, at which point they must also agree to these terms. The contract is concluded when the customer specifies that they agree to the terms and conditions and completes the order. From a legal point of view, this type of contract is the most similar to a traditional contract.

The distinction between click-wrap and browse-wrap contracts is that in click-wrap contracts the buyer is directly notified of the contract terms and must agree to them, whereas in browse-wrap contracts the user is presumed to have read the terms and agreed to them once he has used or downloaded the product. As regards the legality of these contracts, the European e-commerce directive stipulates that the contract terms should be provided in a form that allows the buyer to store the information and reproduce it if necessary.

Electronic signatures are a legally valid method for signing documents in the digital environment. The use of a digital certificate, which proves the identity of the signer and the authenticity of the signature, allows any document to be validated in the same way as notarisation. The mechanism behind the digital signature is based on encryption methods that create a unique signature for each user. In this way, the electronic signature will secure documents in the virtual environment, guaranteeing their authenticity, integrity and non-repudiation (Karanikolas, 2019) [6]. Tenders, contracts, powers of attorney, invoices and many other documents can be signed anytime and from anywhere, as long as there is access to the internet and an electronic device such as a computer, phone or tablet. In general, the digital certificate represents the identity of the person or entity in the digital environment and is purchased from a company licensed to provide such certificates (Perry, 2018) [7].

There are currently three types of electronic signatures which can be classified as follows according to their complexity and legal effects:

(a) simple or basic electronic signature: data that can be used to identify the signatory (authenticity);

(b) advanced electronic signature: a signature which is linked to the signatory in a unique way, which allows the signatory to be identified, which is created using means under the signatory's control and which is linked to the data to which it refers in a way which allows subsequent changes to be detected;

(c) certified or qualified electronic signature: that type of advanced electronic signature which is based on a certificate created by a secure signing device. This type of signature satisfies the legal requirements for signing electronic documents, functioning just like a handwritten signature for paper documents.

The electronic signature, regardless of the nature of the technology on which it is based, must fulfil three main functions: authentication (to guarantee the identity of the person signing the document); integrity (to ensure the integrity of the message and that the information contained in the digital document has not been altered after it has been signed); non-repudiation (to guarantee that the person signing cannot deny the content of the document or the veracity of the signature). Note also that this type of signature does not imply confidentiality of the message.

At EU level, as of 2016, the eIDAS Regulation replaced the 1999 e-Signature Directive because it had not been fully and effectively implemented in all Member States due to differing interpretations in each country and the lack of a sufficiently developed technological infrastructure to allow the widespread use of electronic signatures. The main changes introduced by the new Regulation concern the validity of the electronic signature which must be recognised by all Member States and have the same legal and administrative effects as the handwritten signature. In addition to the electronic signature, the eIDAS Regulation also covers other elements necessary for the development of e-commerce: the date stamp which allows proof of the existence of the document on a given date and that it has not been modified subsequently, the electronic seal which allows proof of the authenticity of the document, the electronic receipt certificate, the electronic equivalent of a letter with acknowledgement of receipt, and the certificate of authenticity for websites.

Future financial and economic transactions in general will most likely be based on digital currencies (digital financial assets). By using smart contracts, these types of programmable financial assets will allow payments to be made automatically when certain conditions are met. Furthermore, digital money could have a memory and could be programmed to be used only for certain purposes (e.g., money from Fair Trade sources that can only be used to purchase Fair Trade products and services). Furthermore, local currencies could emerge that can only be used in a limited geographical/economic area, creating a self-sustaining economic/financial micro-ecosystem.

5. Conclusions

This paper has explored the transformative impact of financial technologies, particularly focusing on electronic contracts and digital signatures, within the financial landscape. It is evident that these technologies have not only streamlined financial transactions but also introduced innovative business models and operational efficiencies.

The emergence of smart contracts, underpinned by blockchain technology, has been a critical development. These contracts automate and enforce agreements in a trustless environment, offering unparalleled security and efficiency. Their role in reducing operational costs and human error in contract execution cannot be overstated. However, as this technology continues to evolve, it is crucial to monitor and address any emerging legal and ethical challenges.

The adaptation of legal frameworks, particularly the eIDAS regulation in the EU, has been vital in fostering the widespread adoption of electronic contracts and signatures. These regulations have not only validated the use of digital signatures but also emphasized consumer protection and trust in digital transactions. The harmonization of these legal frameworks across jurisdictions remains a key challenge and opportunity for further development.

The paper has highlighted the potential future directions of digital financial transactions, especially in the context of smart contracts and digital currencies. The possibility of programmable money and the creation of localized economic ecosystems presents exciting prospects for the future of finance. These innovations could lead to more efficient and purpose-driven financial transactions, potentially reshaping the very nature of economic exchange.

In conclusion, the integration of smart contracts and digital signatures into the financial sector marks a significant shift towards a more digitalized and efficient financial world. However, this transition requires continuous adaptation from regulatory bodies, businesses, and consumers alike. There is a need for ongoing research and dialogue among stakeholders to ensure these technologies are harnessed responsibly and inclusively, paving the way for a more secure and efficient financial future.

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