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ISSUES ON FINANCIAL MARKET REGULATION, BUSINESS DEVELOPMENT AND GOVERNMENT'S POLICIES ON GLOBALIZATION

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The "Law and Economics Yearly Review" is an academic journal to promote a legal and economic debate. It is published twice annually (Part I and Part II), by the Fondazione Gerardo Capriglione Onlus (an organization aimed to promote and develop the research activity on financial regulation) in association with Queen Mary University of London. The journal faces questions about development issues and other several matters related to the international context, originated by globalization. Delays in political actions, limits of certain Government's policies, business development constraints and the "sovereign debt crisis" are some aims of our studies. The global financial and economic crisis is analysed in its controversial perspectives; the same approach qualifies the research of possible remedies to override this period of progressive capitalism's turbulences and to promote a sustainable retrieval.

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CONTENTS

FOCUS ON GLOBAL PERSPECTIVES

DRIVERLESS CAR AND *SELF-LEARNING CAR*: LIABILITY FOR DAMAGES

Luca Di Donna [*] - Mads Andenas[**]

ABSTRACT: *This article is concerned with the legal issues regarding civil liability for damage caused by the ownership, production and "operation" of smart vehicles. The new millennium is characterized by ever more pressing scientific and technological development, by the affirmation of new technologies, by greater interaction between man and machine.*

The authors argue in favour of a liability regime, anchored in general principles of law, which combines the strict liability of the manufacturer with presumed fault liability of the owner and/or driver of the vehicle. A joint and several interweaving of these forms of liability will provide efficient legal protection of victims of road accidents caused by smart vehicles. The liability is supported on the precautionary principle and fundamental principles of the Constitution, as found also in constitutions of other Western countries, and further supported by the EU Charter of Fundamental Rights and the European Convention on Human Rights.

1. Artificial intelligence finds expression in various fields of science and technology, and in the automotive sector, it has one of its most effective

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achievements, as it enables the development of a system that can achieve a degree of autonomy and almost total self-determination.

For centuries, the driving of vehicles on wheels has historically been entrusted to a natural intelligence, such as the animal or the slave, and then to the motor drive proper to the traditional car, not implemented by intelligent systems. With artificial intelligence applied to the automotive sector, we will return, and in part we have already returned, to the past, i.e. to the traction of vehicles on wheels by an intelligence, albeit not natural but artificial, and yesterday's buggy would seem to be homologous, in substance, to level 2 or 3 self-driving cars[1].

The conception and diffusion of cars animated by artificial intelligence is certainly a very important event in the legal and social sphere in the 21st century, on a par with the advent of traditional cars at the beginning of the previous century - initially reserved for a small elite and then spreading across almost all social classes, first in the United States of America thanks to Henry Ford's intuition[2], thus becoming, in the years immediately following the end of the Second World War, a popular phenomenon, and then almost a fundamental asset

[1] Such an effective expression is due to RUFFOLO, *Intelligenza artificiale e automotive: le responsabilità da veicoli self-driving e driverless*, in ID. (ed.), *Intelligenza artificiale. Il diritto, i diritti, l'etica*, Milano, 2020, 157.

[2] CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, Bologna, 2021, 10-16, who, by publishing and comparing two photos of New York's Fifth Avenue on Easter morning 1900 and Easter morning 1913 respectively, have figuratively highlighted how in just a few years, from 1900 to 1913, we went from transport on wheels entrusted to animal traction, i.e. the carriage, to transport on wheels entrusted to motor traction, i.e. the car. In 1900 Fifth Avenue was full of horse-drawn carriages and had only one car, while in 1913 the situation was reversed, with the same street full of cars and only one horse. The Authors have also pointed out that the emergence of the car led to the development of numerous sectors of the economy, some directly linked to the automobile sector, such as oil, manufacturing and rubber, and others relating to related activities concerning the infrastructure and services needed to allow cars to circulate, as well as to the transformation of the city territory and the living habits of its inhabitants with the birth of residential neighbourhoods in the suburbs, far from the urban centre and the places of work, the so-called suburbs, and the creation of a new economy, which was to become a new form of social life. The car also represented a symbol of integration in American society, leading to the social marginalisation of those who did not own one. See also SEO, *Policing the Open Road. How Cars Transformed American Freedom*, Cambridge, 2019.

for the implementation of individual rights[3] - as well as the invention of the steam engine and the railway in the 19th century, going even further back.

The application of the most advanced artificial intelligence systems to the automotive sector and, consequently, the development of so-called *autonomous vehicles* is growing steadily and, day after day, technology pervades cars, making them capable of performing many tricks that improve, make more pleasant and, above all, safer the driving experience: already today, most cars are able to open electronically, without the need for a manual key; they can even be opened remotely by the parent company using reference software; they can provide information on road conditions, traffic, weather; they are equipped with intelligent sensors that warn the driver in the event of low tyre pressure or tyre failure, or if it is necessary to refuel, indicating the kilometres of autonomy that the car is able to cover with the remaining tank, or if the car is open on the move or not locked with the equipment locks.

Cars are also equipped with safety systems, also electronic, which are able to determine the stability of the vehicles, the possible risk of skidding, for example on snowy or icy or simply wet roads, as well as assessing the grip of the tyres on the ground, the attitude of the car, the tightness and ability of the brakes to stop the vehicle and the physical space needed to stop. Small cameras on the front and/or rear of the car allow the driver to follow what is happening outside the car, even in the darkest corners of the road, with an efficient impact on vision, enabling the driver to gain more information from the manoeuvring environment surrounding the car.

These video camera systems are useful for driving, both when parking a car, as they allow you to collect measurements of the distance to the cars following and preceding your own, and when driving, as they mark the distance between cars and decelerate the speed depending on whether or not the car is getting too

[3] In Italy, the automotive boom took place between the 1950s and the 1970s, in parallel with the expansion of the road network. For an overview of the "automotive miracle" in Italy, see PAOLINI, *Storia sociale dell'automobile in Italia*, Roma, 2007.

close to the car in front in the same direction of travel, regardless of human intervention: the system is activated and works automatically, without requiring the driver's participation. They are also useful for overtaking manoeuvres, as they track the path of the car in relation to the surrounding cars and detect the presence of other cars in adjacent lanes, preventing the car from swerving if this manoeuvre could result in a collision.

In addition, sensors on seat belts, car operating lights and vehicle maintenance conditions complete the picture of the electronic components that equip cars and turn them into a car that is attentive to the safety of the people sitting on board.

Forms of assisted driving that lead to a partial automation of driving have been around for a long time; just think of the historic ABS, anti-skid *software* and *cruise control*[4].

The list of such intelligent software applied to cars is not exhaustive, as it obviously varies from car to car, depending on the model, and above all it has to be constantly updated according to technological evolution; new products are always being designed and installed in cars, while existing ones are implemented and enriched with new functions and operational capabilities.

There are already some types of cars that are even more advanced than those described above, in terms of greater autonomy and decision-making power, since they are designed and built to be driven by an advanced artificial intelligence system that disregards human interaction and is able to drive the cars completely autonomously and independently of the driver, so-called *driverless cars*, thus transforming cars from simple means of transport into places of rest, work or leisure[5].

[4] It should not be forgotten that autopilot has existed and been used for many years for a significant part of air navigation.

[5] LEVY, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, in 9 *The Journal of Business, Entrepreneurship & the Law*, 2016, 357-359, concerning *driverless cars*, suggestively stated that "*(i)n a typical morning commute in the near future, car owners will be transported from place to*

Thus, *self-driving* cars have evolved to such an extent that they have become *driverless*, i.e., without the traditional driver, and are a symbol of many technological advances.

The characteristics and performance of the *driverless car*, belonging to automation levels 4 and 5, the highest, as well as reducing road accidents[6], will have a considerable social impact, will bring about an urban transformation, will favour environmental protection and drastically reduce atmospheric pollution with the abandonment of coal and the use of renewable energies[7] and will bring about considerable economic growth[8], but will also generate many application difficulties, from an ethical, legal, social and economic point of view, in the considerable transitional period in which there will be uneven driving systems, represented by traditional vehicles, moderately automated vehicles and fully automated cars that entrust driving to an algorithm, replicating all the phenomena

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place by a self-driven car, as they lounge back drinking coffee or reading the morning news. (...) The advent of autonomous driverless vehicles presents a plethora of new and unique legal issues, which will need to be analyzed to facilitate the adequate transition of this new technology to the marketplace. In particular, with "autonomous vehicles" (...) designed to replace human intervention with a safer alternative the chief in question posed is how to assign liability when these vehicles inevitably get into an accident. (...) Existing legal models of strict liability for defective products, laws allowing express consent for the waiver of liability, and the existing insurance structure are broad enough to encompass any issues which may arise with driverless cars. Simply put, when applying liability law to autonomous driverless cars, there is no need to reinvent the wheel".

[6] Estimates from trials of automated driving suggest that its full deployment would lead to a 90% reduction in road accidents.

[7] These objectives, which had already begun to be pursued since the early 2000s, were also highlighted, at European level, in *Recovery Plan Next Generation EU*.

[8] According to some Authors, the spread of *driverless cars* will also increase social inclusion and allow new forms of mobility and independence to all those who, for a wide variety of reasons, ranging from age to economics, are currently marginalised due to the impossibility of owning or driving a car. The document published in 2018, entitled "*A Common EU Approach to liability rules and insurance for connected and autonomous vehicles. European Added Value Assessment. Accompanying the European Parliament's legislative own-initiative report*", predicted that the path towards automated cars and the emergence of *driverless cars* could lead to economic growth of EUR 148 billion in a five-year period (in *https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615635/EPRS_STU(2018)615635_EN.pdf*). See CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit., 99-100. It seems, however, likely that economic development, at least in the initial phase, will reach certain categories and certain business sectors to the detriment of those linked to the traditional model of road traffic.

that already occurred in the period of transition from animal-drawn to motor-driven traffic, already briefly illustrated.

Awareness of these difficulties due to the transition from traditional to automated and connected road traffic led the European Union to undertake an intensive study to identify key principles for managing the transition phase, resulting in the "*Ethics of Connected and Automated Vehicles*" document of 2020[9].

In the future scenario characterised by the massive circulation of *driverless cars*, therefore, the car will not only be able to make routes without the human driver, i.e. make the traditional driver superfluous, and learn from his direct experience, but it will have the ability to "communicate" with other vehicles and adapt its driving according to the information received from them and from the interactive road network, thus improving routes, consumption and, in general, its performance.

Indeed, the intelligent car system belongs to the *Internet of Things*, since the development of self-driving cars necessarily presupposes a network that makes several products interact, exploiting the network connection[10], enabling them to share information on themselves and their surroundings, and therefore also on users and, specifically, on drivers, in order to act autonomously, improve and self-correct, with the consequent and important issues also related to privacy

[9] The spread of *self-learning* artificial intelligence and *self-driving* cars has generated many ethical dilemmas, especially in relation to so-called tragic choices from which fundamental rights such as health or human life necessarily derive. Among them, it is worth mentioning the one summarised in the metaphor of the *trolley problem*, which indicates the situation of someone who is in charge of a trolley and has to choose whether to continue its journey on a track where there are a certain number of people or to activate the possibility of moving to a track where there is only one person, choosing, therefore, in this case, to sacrifice the latter instead of a larger number of people. The *Ethics of Connected and Automated Vehicles* report specified that the advantage derived by the community from the circulation of *driverless cars*, in terms of reducing the number of accidents, must not lead to the violation of the fundamental principles and ethical and legal rights provided for the protection of the human person. On this subject, THOMSON, *The Trolley Problem*, in *94 Yale Law Journal*, 1985, 1395 ff.; CALABRESI, BOBBIT, *Tragic Choices*, New York, 1978.

[10] Of fundamental importance is the operation of the satellite system.

and the processing of personal and even sensitive data[11].

In addition, the automated car system is organised on five different levels, which mark the degree of depth and development of the technology applied to cars[12].

This organisation foresees a level 0, the basic one, to which traditional cars belong and which are totally managed and controlled by the human operator; a level 1, the so-called Driver Assistance, characterised by the presence of human driver assistance devices, such as *Cruise Control*, *Stability Control*; a level 2, the so-called Partial Automation, to which the constant control of the human driver is still necessary, whose participation in the functional processes of the car is still preponderant, but the car is equipped with automatic devices capable of autonomously controlling the functional processes of the car. *Partial Automation*, in which constant control by the human driver is still necessary, whose participation in the functional processes of the car is still predominant, but the car is equipped with automatic devices capable of autonomously controlling the activities of acceleration, deceleration and steering in predetermined scenarios; levels 3 and 4, in the experimental phase, cc. dd. respectively *Conditional Automation* and *High Automation*, in which the degree of automation of the vehicle begins to increase and, consequently, human activity is increasingly sacrificed in favour of electronic management of the vehicle. *Full Automation*, still

[11] Just think of what already happens when we simply use *car sharing* services: the car tracks where we are, the route we choose, the time period, and other such information, based on the initial consent given by the user.

[12] LEVY, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, cit., 359-360, dealing with the definitional aspect of *driverless cars*, pointed out that "*the National Highway Traffic Safety Administration (NHTSA) broadly set out to identify a five-level classification system for all driver-assistance technologies. In a very general sense, autonomous vehicles refer to Level (3) and (4) of NHTSA's definitions. The Level (3) Limited Self-Driving Automation class is self-driving vehicles which pass or "transition" the control of the car back to the driver if environmental of road conditions require, and the driver is expected to take over as needed. The Level (4) Fully Self-Driving Automation class is vehicles which are capable of performing all driving functions, including all critical safety adjustments autonomously without a driver's assistance*", quoting the definition of *driverless cars* of the State of Nevada, as "*a type that fully take control away from the driver, and make moment-to-moment decisions autonomously through a computerized system*".

in the experimental phase, in which automation is total and the car is able to drive and move in total autonomy, completely excluding any human intervention and which, therefore, may not have those components typical of traditional cars through which human intervention is achieved, such as the pedals, the steering wheel, totally overturning the current concept of the car.

The development and use of *smart vehicles* equipped with artificial intelligence is designed to achieve the objectives of road safety, environmental protection and personal health: this type of car is powered by electricity generators, it is interconnected with other cars in the same category that are equipped with the same electronic devices, as well as with repeaters along the route, which are responsible for transmitting information on the road and the route to the cars.

These cars are at the centre of a crossroads of information, exchanging data from one vehicle to another and from one vehicle to the road and the operators who connect to them, as well as to the network; smart devices work thanks to their connection to the web, they are constantly hooked up to the internet to collect the data needed to ensure the system is operational and to optimise driving.

For this reason, they transmit and make public the data concerning the vehicle and its passengers, geolocation, the status and needs of the car, as well as driving conditions: all this serves to ensure that passengers make the journey and reach their destination in the safest conditions, preventing or avoiding road accidents, managing inconveniences due to traffic or road works, and with the maximum comfort that technology can provide.

These innovative solutions serve to change the concept of mobility, to simplify the administration of roads, especially those with high traffic flow: in a smart city, electronic control units are always able to define the amount of traffic expected on each route, the level of environmental pollution, the management of road traffic, the presence of accidents and the fastest and most effective ways to

resolve conflicts arising from them and to prevent road blockages.

Electronic devices can divert traffic, change a route, dispatch a rescue facility, monitor road safety, prevent unlawful acts, and provide emergency assistance where needed.

They may be the most tangible example of placing the human person, and his rights, at the centre of every assessment and decision, because data, information and results must be made to rotate around them in order to arrive at the solution most suited to their interests, but it must be remembered that in the European context the accession to the Vienna Convention of 1968 does not allow the circulation of cars without the presence of a human driver who maintains control of the vehicle[13], unlike the US context[14], by virtue of the non-adherence to the Vienna Convention, while in the specific Italian context the circulation of vehicles with the human driver on board with the sole tasks of supervision of the driving carried out by the artificial intelligence and of assistance and intervention if the need arises, corresponding to level 3, is only allowed within the strict limits outlined by the Decree of the Ministry of Transport of 28 February 2018, on "*Implementation modalities and operational tools for road testing of "Smart Road" and connected and automatic driving solutions*"[15].

2. The usefulness and advantages of *smart vehicles* have, over time, been balanced by the problems they have raised in the testing phase: the news has brought to our attention a number of significant cases of accidents caused by cars equipped with artificial intelligence and fully autonomous driving, which have

[13] Vienna Convention allows the driver not to keep his hands on the steering wheel and to confine himself to monitoring the vehicle when it is moving independently, provided that he always retains the ability to regain control of the vehicle immediately. The original text, in article 8, outlined a stricter discipline, providing for the presence in the vehicle of a driver who always maintained control of the vehicle and was always in control of his own vehicle, so that he could comply with the requirements of prudence and be constantly able to carry out all the manoeuvres for which he was responsible.

[14] In this context, a number of states, first and foremost Nevada, have formally regulated and allowed the circulation of *Highly Automated Vehicles*.

[15] Decree implementing article 1 (72) of Law no. 205 of 27 December 2017.

forced science to reflect on how to perfect these devices and jurists to question the liability models that could be adapted to the case in question[16].

One need only recall, among the most relevant events, the accident that occurred in February 2016 in Mountain View, California, between a bus and a *smart vehicle*[17] and, a few months later, in May 2016, in Florida, the serious accident involving a *smart car*, which led to the death of a man[18], rather than another accident that occurred in March 2018, in Mountain View, California, and

[16] For specific literature on the topic see ALPA, ANDENAS, *European Private Law*, Pisa, 2022, 283 ss.; CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit., *passim*; TAMPIERI, *L'intelligenza artificiale: una nuova sfida anche per le automobili*, in *Contr. impr.*, 2020, 732 ss.; AL MUREDEN, *Autonomous cars e responsabilità civile tra disciplina vigente e prospettive de jure condendo*, in *Contr. impr.*, 2019, 895 ss.; ID., *Sicurezza "ragionevole" degli autoveicoli e responsabilità del produttore nell'ordinamento italiano e negli Stati Uniti*, in *Contr. impr.*, 2012, 1505 ss.; RUFFOLO, AL MUREDEN, *Autonomous vehicles e responsabilità nel nostro sistema ed in quello statunitense*, in *Giur. it.*, 2019, 1704 ss.; RUFFOLO, *Intelligenza artificiale e automotive: le responsabilità da veicoli self-driving e driverless*, in ID., (a cura di), *Intelligenza artificiale. Il diritto, i diritti, l'etica*, cit., 153 ss.; ABRAHAM, RABIN, *Automated Vehicles and Manufacturer Responsibility for Accidents: A New Legal Regime for a New Era*, in *105 Virginia Law Review*, 2019, 127 ss.; SHAVELL, *On the Redesign of Accident Liability for the World of Autonomous Vehicles, (August 19, 2019). Harvard Law School John M. Olin Center Discussion Paper No. 1014*, in *https://ssrn.com/abstract=3437474*; CAROCCIA, *Autonomous vehicles e diritto privato. Quando il piccolo mondo antico non basta più*, in AA.VV., *Rapporti civilistici e intelligenze artificiali: attività e responsabilità*, Napoli, 2020, 173 ss.; SCAGLIARINI (a cura di), *Smart roads e driverless cars: tra diritto, tecnologie, etica pubblica*, Torino, 2019; COMENALE PINTO, ROSAFIO, *Responsabilità civile per la circolazione degli autoveicoli a conduzione autonoma. Dal Grande Fratello al Grande Conducente*, in *Dir. trasp.*, 2019, 367 ss.; GEISTFELD, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, in *105 Calif. L. Rev.*, 2017, 1611 ss.; BURNS, SHULGAN, *Autonomy. The Quest to Build the Driverless Car and How it Will Reshape Our World*, London, 2018; CERINI, *Dal decreto Smart Roads in avanti: ridisegnare responsabilità e soluzioni assicurative*, in *Danno e resp.*, 2018, 109 ss.; DAVOLA, *Veicoli autonomi, sinistri stradali e nuovi modelli di responsabilità civile*, in *Opinio Juris in comparatione*, 2018, 109 ss.; GAETA, *Automazione e responsabilità civile automobilistica*, in *Resp. civ. prev.*, 2016, 1718 ss.; FUNKHOUSER, *Paving the Road Ahead: Autonomus Vehicles, Product Liability, and the Need for a New Approach*, in *Utah L. Rev*, 2013, 437 ss.; LEVY, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, cit., 355 ss.; MARCHANT, LINDOR, *The Coming Collision Between Autonomous Vehicles and the Liability System*, in *52 Santa Clara L. Rev*., 2012, 1321 ff.

[17] *https://www.sicurauto.it/news/google-car-in-crash-primo-incidente-colposo-della-guida-autonoma/*.

[18] *https://www.lastampa.it/motori/tecnologia/2016/07/01/news/tesla-negli-usa-primo-incidente-mortale-causato-dalla-guida-autonoma-1.34829132/*.

also involved an automated vehicle[19] and yet another case in March 2018, in Tempe, Arizona[20], and yet another accidents caused, in April 2021, in Texas[21], and in November 2021, in Indiana[22].

These cases give rise to a number of reflections and questions, first and foremost, on the regulatory vacuum that characterises this sector, which is entirely entrusted to the market (as it should be), but without a minimum regulatory framework that serves to set limits on the extent to which artificial intelligence vehicles can be developed and implemented, and to regulate remedies to counter the harmful consequences of their use.

Moreover, in the absence of *ad hoc* regulations, one of the main knots that civil law is called upon to resolve concerns the applicable regulations for damages caused by an *automated vehicle*; the problem arises of applying the traditional categories of civil liability to protect the victims of damage caused by the use, possession, ownership and production and marketing of *smart vehicles* and to fill any gaps through the application and evolutionary interpretation of the same, which also take shape for this specific application of artificial intelligence in the rules on the liability of the manufacturer, which before the introduction of the specific discipline of European matrix could be called upon to respond under the generic protection provided by art. 2043 of the Italian Civil Code, with the addition of the specific one relating to damage caused by the circulation of vehicles[23].

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[19] *https://www.corriere.it/tecnologia/economia-digitale/18_giugno_08/incidente-tesla-investigatori-il-pilota-automatico-non-ha-frenato-ma-ha-accelerato-55caf9e6-6aeb-11e8-9465-050f9dd27758.shtml*.

[20] *https://www.auto21.net/2018/03/19/incidente-uber-in-arizona-ha-coinvolto-robo-taxi-ed-un-pedone-deceduto/*.

[21] *https://www.agi.it/economia/news/2021-04-19/autopilot-titolo-tesla-12237471/*.

[22] *https://www.automoto.it/elettrico/tragico-evento-tesla-altra-model-3-andata-a-fuoco-video.html.*

[23] The problem of the suitability of the existing legal rules to regulate artificial intelligence applied to the circulation of vehicles also concerns the strictly technical regulation of the automotive sector, concerning safety standards, requirements for the approval and circulation of autonomous vehicles, and the management of road safety and traffic data, outlined by Directive no. 2010/40/EU, as well as, at the national level, by the Decree of the Ministry of Infrastructure and Transport of 1 February 2013, concerning the "*diffusione dei sistemi di trasporto intelligenti (ITS) in Italia*" and implementing Directive no. 2010/40/EU, and by the subsequent so-called *Smart Roads* Decree of

More specifically, it is a question of comparing an advanced technological phenomenon characterised by the more or less total overcoming of the need for a human driver in the car, with a regulatory framework based on the unavoidable presence of the driver in the car and the full control of the vehicle by the driver. The question is, therefore, whether the intelligent car also requires the creation of a specific and structured system of rules, for the creation of which the legislator, and more generally the jurist, cannot consider themselves completely autonomous, but must inevitably relate to the highly technical contributions of the scientists who deal with the technological phenomenon, so that the rule of science becomes a legal norm[24], as happened after the emergence of the traditional car[25] - which led to the transition from a form of traffic entrusted to the age-old rules of common sense and the diligence of the average man to a set of detailed and technical rules on the conduct to be adopted by drivers, passengers and pedestrians[26] - or it could be considered that the current legal framework is

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28 February 2018, no. 70, on "*Modalità attuative e strumenti operative della sperimentazione su strada delle soluzioni di Smart Road e di guida connessa e automatica*", which authorised the testing of *driverless cars*, towards a fully digitalised road system. In addition, further interventions by the EU institutions are of particular importance on the subject, including the European Parliament Resolution of 13 March 2018 on a "*Strategia europea per i sistemi di trasporto intelligenti cooperative*" (2017/2067 (INI)), the European Commission Communication "*Verso la mobilità automatizzata: una strategia dell'UE per la mobilità del futuro* " of 17 May 2018 (COM(2018) 283 *final*) and the European Parliament Resolution of 15 January 2019 concerning "*Autonomous driving in European transport*" (2018/2089 (INI)). Finally, the Amsterdam Declaration, signed on 14 April 2016, whereby European Transport Ministers shared the objective of preparing a common sector charter in order to create common rules and standards, should not be forgotten.

[24] In this sense CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit., 139.

[25] This has created an area of uniform law, in relation to different legal systems, certainly in relation to the need for a licence to drive cars, an identification code for cars and a public register of cars, as well as the provision of rules on how traffic should be conducted, from speed limits to road signs and vehicle accessories to allow communication between vehicles or between vehicles and pedestrians.

[26] The spread of the motor car in Italy was accompanied by a preference for regulations which, in order to encourage the circulation of cars, did not introduce any particular obstacles to the costs of guaranteeing safety standards. As regards the driver's liability, the driver was initially liable for damage caused in accordance with the general rule of the 1865 Italian Civil Code, laid down in article 1151, based on proof of fault; indeed, under the 1865 Italian Civil Code, there was no

also suitable for regulating cars driven, in whole or in part, by a computer programme, perhaps changing the relationship between the liability of the driver and owner and that of the manufacturer, by virtue of the spread of artificial intelligence software for driver assistance or complete driving automation, with the risk, however, moving from a *driver-focused* liability regime to a *product-focused* regime, i.e. shifting the centre of gravity of liability towards the manufacturer, by means of interpretative or legislative choices which in any case take account of the different levels of automation that cars may present, providing a regulatory regime capable of ensuring an adequate level of certainty and predictability in relation to the marketing and circulation of *self-driving* cars[27].

This is undoubtedly the problem regarding the definition of a concrete liability regime for damages resulting from the general use of artificial intelligence tools; in the case of automated cars, it is easier to realise the extent and relevance of the issue, since it is possible to better perceive the road accident caused by the vehicle moving autonomously, without any human support, and it is therefore possible to better assess the legal profiles connected with the need to protect the victim, i.e. the person involved in the road accident caused by the intelligent vehicle.

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specific rule for liability for accidents caused by cars, since this technological product was unknown, and perhaps not even thought of, at the time when that code came into force. Subsequently, the first regulatory instrument adopted was the "Testo Unico di norme per la tutela delle strade e per la circolazione (R.D. no. 1740 of 8 December 1933), which provided, at art. 120, a specific rule of a private and compensatory nature relating to the liability of the driver and the owner of the vehicle, characterised by greater severity than the previous regime, coinciding with the reversal of the burden of proof of the fault of the damaging party, unless the driver proves that he took every care to avoid the damage, and with the exclusion of the possibility of considering damage deriving from a fortuitous event as damage caused by defects in the construction or maintenance of the vehicle, and with the joint and several liability of the owner, unless he proves that the circulation took place against his will. This discipline was absorbed into article 2054 of the Italian Civil Code of 1942, but any reference to fault disappeared, leading to a form of objective liability, which essentially imposes the costs arising from road traffic on the owner of the car both as driver and for damage caused by persons to whom he has allowed to use the car, as well as for manufacturing and maintenance defects of the vehicle.

[27] On this subject see CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit., 27.

From a strictly concrete and empirical point of view, it must be considered that the current phase of expansion and diffusion of intelligent vehicles is characterised by the circulation of *self-driving* vehicles with vigilant driving, i.e. with automated driving and human control, but in the future *driverless cars* are expected to circulate, completely devoid of commands entrusted to man, and for a not short transitional period, and perhaps forever, the two different types of cars will circulate together[28]. It should also be borne in mind that intelligent cars should lead to a reduction in the number of road accidents, and therefore in the number of people involved, even though they will probably cause damage to people who would not have been involved in the absence of the new technology[29].

With specific reference to the development of *self-driving cars*, the Decree of the Ministry of Infrastructure and Transport of February 2013, implementing Directive no. 2010/40/EU, which outlines a "*Quadro generale per la diffusione dei sistemi di trasporto intelligente nel settore del trasporto stradale* ", specified that the provisions of the current Community and national reference framework shall apply to liability for defective products. On the contrary, the European Parliament, in its Resolution of February 2017, had highlighted the inadequacy of the existing regulatory framework on liability in relation to possible damage caused by autonomous cars, reiterated in its Resolution of 15 January 2019, on "*Autonomous driving in European transport*", in which it was specified that the existing rules on product liability and those concerning civil liability and motor vehicle insurance constitute a framework no longer adequate in the face of the new risks arising

[28] On this point see BURNS, SHULGAN, *Autonomy. The Quest to Build the Driverless Car and How it Will Reshape Our World*, cit., *passim.*

[29] The prediction and expectation of fewer road accidents as a result of intelligent cars could lead to the establishment of higher standards of technical regulation in the sector that would halt technological progress. Thinks, for example, of the theories, mostly inspired by ethical reasons rather than strictly legal assessments, according to which *smart cars* should be able to assess, for example, the number of children in the car and those on the road who would be involved in the accident, in order to assess which ones are expendable during an emergency manoeuvre (the so-called "*trolley problem*").

from the increase in automation, connectivity and complexity of vehicles.

The issue is very complex and multifaceted, since there are many questions relating to damage caused by intelligent cars, including in particular whether any kind of liability can be established and to which party it should be attributed, to the driver who remained passive and inert in the vehicle and allowed the accident to happen (perhaps because he was unable to unlock the "autopilot" and intervene to prevent the event), or to the car owner, or to the vehicle manufacturer for the product defect, or to the software or algorithm manufacturer who installed a defective smart system in the car. The characteristics, indeed, of the autonomy, self-learning and unpredictability of the behaviour of cars equipped with *machine learning software* could lead to the conclusion that the car was the sole cause of the damage and, consequently, in theory, that only the car itself is obliged to compensate for it.

It is also possible that the liability of these parties may be concurrent, because the victim's interest is to be compensated for the damage suffered as a result of the artificial intelligence product and therefore to bring proceedings against the "driver" and the owner of the vehicle jointly in order to have their joint and several liability established.

It is also necessary to consider external events that may affect the cause of the damage, such as a network error, whereby the vehicle loses its internet connection and is no longer able to collect and transmit data, with the result that it is no longer able to analyse the route and drive safely; or if the car's smart system has been affected by a hacker attack that has changed the vehicle's reading keys, altering the car's cognitive and functional capacity, which has therefore lost the ability to act autonomously.

The latter two events may have a causal impact on the production of the damage, in the sense of breaking the causal link between the damage event and the conduct of one of the persons indicated above (driver, vehicle owner, manufacturer), with the consequence that the latter will be relieved of the

relevant liability and the judge will have to take this into account when assessing the imputation of the unlawful conduct.

There are therefore two scenarios that can be opened in this case: either the cause of the damage is attributed to a case of force majeure, consisting of the accidental, sudden, supervening and unforeseeable interruption of the internet connection - which has precisely prevented the smart vehicle from operating autonomously in a correct manner - and, therefore, the victim of the illicit action will remain without compensation cover, without prejudice, obviously, to the activation of the mechanisms still provided for by law to protect against these prejudicial situations, such as, for example, the Guarantee Fund for Road Victims; or the damage is attributed to the wrongful act of a third party who has affected the smooth running of the car, with the result that the injured party will be able to choose between bringing an action for non-contractual liability against the third party hacker, with the difficulty however of proving the constituent elements of the unlawful act and, first and foremost, the fault of the hacker, or bringing an action against the manufacturer of the *smart car* claiming the liability of the manufacturer arising from the fact that the artificial intelligence system had a flaw or a bug that allowed the hacking by the third party.

In all cases, the preferred legal solution is not immediately obvious and must in any case take account of the need to protect the fundamental rights of the injured party, including the right to health, which is affected, sometimes seriously, by accidents caused by automated cars.

From this perspective, one cannot lose sight of the fact that the provision of insurance cover can help to cover the risks associated with the use of vehicles equipped with artificial intelligence and, above all, arising from the difficulty of identifying, *prima facie*, a person immediately responsible for the unlawful conduct perpetrated by the *smart vehicle*; this is all the more true if we take into account the fact that vehicle insurance for damage caused by road accidents is a system that has been in place for decades for “ordinary” cars, which helps to

spread the costs and risks associated with road traffic among society, while always guaranteeing protection for the victims of unlawful acts.

Returning to the liability regime applicable to damages deriving from automated cars and the possible distribution of liability among the subjects involved in various ways in the performance of the unlawful act, it is evident that such assessments are complicated by a series of factors and conditions concerning the type of vehicle taken into consideration: first of all, it is necessary to assess the level of automation possessed by the vehicle, in order to understand to what extent it is able to act and interact autonomously with the surrounding reality and make decisions regarding the various choices to be made on the driving route; secondly, it is necessary to consider the role of the driver, which in this type of vehicle should be zero: he is equated to all intents and purposes to a passenger, he lets himself be transported by the intelligent car, he is deprived of any initiative, in the sense that, even if he wants to, he does not have the possibility to intervene in the management and running of the vehicle and, like all passengers, he can also engage in other activities while driving.

The relationship between man and machine is totally unbalanced in favour of the latter, where the machine leads man and determines all the initiatives to be taken, while man is a passive subject who suffers the choices of the machine and watches as events unfold like a spectator. This is exactly what happens to a passenger transported by a plane, train or bus driven by others.

It is clear that the greater the degree of independence of the machine, the more it will be entrusted with every initiative inherent in driving the vehicle, including checking the safety of driving for passengers and third parties who pass each other on the way, be they pedestrians or other vehicles, as well as checking all the conditions under which the vehicle operates.

It is clear that this is the most relevant and problematic case from the point of view of ascertaining responsibility, because it is the one in which the algorithm that governs the car has such a degree of sophistication that it completely

replaces the human being in all sensory perceptions of the environment surrounding the vehicle, in the acquisition of all information that enables the vehicle to reach its destination safely and within a reasonable timeframe, and in the taking of all decisions necessary to meet the demands of driving, including those that may be unforeseen in response to the occurrence of unforeseen and risky events.

In this case, the car totally replaces the driver and behaves in the same way as the latter when driving the vehicle, if not better, because it should be programmed to respond to all the stresses of driving with a readiness and intelligence that is superior as it is automatic, without suffering the shortcomings due to the nature of the human being; in other words, the expectation is that the *smart car* will be able to travel a more or less long distance with a constant capacity for vigilance, control, resistance to all weather and road conditions that is greater than that of a human being, because it should be free of problems of fatigue, tiredness, eyesight, or all the other physiological needs of humans that require occasional periods of rest or concentration.

This obviously has a positive effect on driving dynamics and efficiency, on road safety and on greater care for the environment and the human being.

It is this type of vehicle that should be the focus of attention from the outset in order to determine the type of liability that can be incurred in the event that, despite the improvements in electronics and components, an accident and consequent damage occur.

3. Talking about the liability of vehicles, albeit autonomous, the traditional discipline to be considered, in order to verify its applicability to the new technological and social phenomenon, is certainly represented by that contained in article 2054 of the Italian Civil Code, relating to the circulation of vehicles, which obliges the driver of a vehicle without railways to pay compensation for the damage caused to persons or property by the circulation of the vehicle, if he does

not prove that he did everything possible to avoid the damage[30].

The civil liability remedies provided for in this provision confer a presumption of liability on the driver of the vehicle, who is liable for the tort solely because he drove the car, unless he proves that he did everything possible to avoid the damage.

This presumption of fault can only be rebutted if the driver proves that he did everything possible to avoid the damage and it is clear from the circumstances of the accident that there was no real possibility of avoiding the accident, provided that he did not infringe specific rules having a causal link with the accident[31].

The driver's liability is therefore not a type of objective liability, such as that under articles 2050, 2051 and 2052 of the Italian Civil Code, but rather a presumed liability, which can be overcome if the driver demonstrates, not the impossibility of different conduct or the utmost diligence, but that he has observed, within the limits of normal diligence, behaviour that is free from fault and conforms to the rules of the highway code, which must be assessed by the judge with reference to the concrete case[32].

Together with the driver, the third paragraph of article 2054 of the Italian Civil Code establishes the joint liability of the owner of the vehicle[33], unless he

[30] On the subject, CALABRESI, *Costo degli incidenti e responsabilità civile. Analisi economico-giuridica*, Ristampa inalterata dell'edizione del 1975 a cura di AL MUREDEN, Milano, 2015; ARGINE, *Le Sezioni Unite e il concetto di circolazione stradale: luci ed ombre interpretative*, in *Resp. civ. prev.*, 2016, 214 ff.; LAPICCIRELLA, voice «*Strade (Disciplina della circolazione sulle)*», in *Nov. Dig. it.*, XVIII, Torino, 1971, 476 ff.; GALLONE, *La circolazione dei veicoli. Una ricerca di diritto giurisprudenziale*, Milano, 1996; STELLA RICHTER, *Il problema della sosta: strategie ed aspetti normativi*, in *Giust. civ.*, 1987, 543 ss.; ZANELLI, *L'uso pubblico delle strade e aree di circolazione quale condizione di applicabilità della presunzione di responsabilità del conducente e del proprietario del veicolo*, in *Riv. giur. circ. trasp.*, 1952, 456 ss.

[31] Cass. civ., 11.4.2017, no. 9278. Cass. civ., 4.4.2017, no. 8663; Cass. civ., 22.2.2017, no. 4551; Cass. civ., 6.9.2012, no. 14959.

[32] In this sense, Cass. civ., 16.2.2017, no. 4130.

[33] With regard to the boundaries of the notion of owner in the case in question, the Supreme Court has specified that the person jointly and severally liable under article 2054 of the Italian Civil Code with the driver of the leased vehicle is the user of the vehicle and not the granting owner, since under articles 91 and 196 of the Legislative Decree no. 285 of 30 April 1992, liability is alternative

proves that the vehicle was driven against his will.

A new type of liability for presumed fault, which can only be overcome if the owner demonstrates that he has expressed his objection by means of concrete and appropriate hostile conduct specifically aimed at prohibiting the movement and expressed in acts and facts revealing the diligence and precautions adopted for the purpose[34].

In any case, the driver and the owner are liable for damage resulting from construction defects or faulty maintenance of the vehicle, in accordance with the provisions of the last paragraph of article 2054 of the Italian Civil Code.

The term "construction defect" refers not only to work carried out during the production of a vehicle, but also to structural changes to the mechanics and/or dynamics of the car[35].

This is the legal framework for road traffic offences and damage caused by motor vehicles, from which it can be deduced that the persons liable are essentially the driver and the owner of the vehicle, since they are in control of the vehicle and take decisions on whether or not to use it and how to do so.

This circumstance constitutes the causal link between any damage caused to third parties and the commission or omission of the persons presumed by law to be liable.

The question now is how this legal model of liability can be adapted to a situation in which the terms of reference have changed, in which instead of a driver there is a partially automated, and in future fully automated, machine which regulates and determines the driving conditions of the vehicle and leaves the driver in a secondary role: in this case, it is difficult to assess whether the driver's conduct was in accordance with the rules of diligent driving and guided by the principle of prudence, whether the driver did everything possible to avoid the

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and not concurrent, and only the user has the legal availability of the asset and therefore the possibility of prohibiting its circulation (Cass. civ., 27.6.2014, no. 14635).

[34] Cass. civ., 27.9.2017, no. 22449. In the same sense, Cass. civ., 29.1.2016, no. 1820; Cass. civ., 14.7.2011, no. 15478.

[35] Cass. civ., 27.8.2015, no. 17240.

damage, or whether the driver was taken by surprise while driving, struck by an external event that was unavoidable despite the fact that he had observed all the rules and prerequisites of culpable conduct.

The intensity of these questions obviously differs depending on whether one thinks of the future circulation of completely *driverless cars*, which will transform all users from drivers into transporters[36], allowing them only to start and stop the car, or the circulation of level 4 autonomous cars, with replacement human driving, in which humans will have to take over the driving of the car when requested to do so, and level 3, with supplementary human driving, in which humans will have to remain alert and ready to switch to active driving whenever necessary.

The figure of the owner remains unchanged, and can be re-proposed here according to its traditional features, even if it is necessary to ascertain what is meant by the owner's contrary intention to use the automated vehicle, or better still, in what type of conduct the contrary intention should be manifested, the only exemption from liability.

The owner, who is not also the driver of the vehicle, may be held liable according to the same principle as that underlying the provision of the Italian Civil Code, since he is jointly and severally liable for the very fact of being the owner of the vehicle and because he has not proved that he has actually opposed the use of the vehicle by the third party user, or by the automated machine itself, if it is able to determine by itself whether and when to start and what the final objective of driving is.

The case of the driver is more complex, and in this case, it would be better

[36] Pioneering the conception and creation of the *driverless car* was the car manufacturer Tesla: in this sense LEVY, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, cit., 364: "*the only automaker to bring anything approaching driverless technology to the market thus far has been Tesla motors. The Tesla Model S currently offers an "Autopilot" feature that allows the car to operate semiautonomously under the driver's supervision. The Model S is able to self-park, to pull out and meet its driver, and to drive itself on highways including steering, stopping, accelerating, and changing lanes*".

to call him “user”, given that he uses the vehicle passively, without being able, in principle, to influence its controls and technical-operational decisions. At most, the user can set the route and determine where to go, and in any case can unlock the automated system to regain control of the vehicle, if the software programmer allows him to do so.

It may seem obvious that a *smart car* will start because the person who intends to use it wants it to do so, and this person may be the owner himself, but also a person other than the owner, who uses the automated car to be accompanied and then turns it on and makes it ready to start and move.

It is, therefore, on these concepts that the jurist’s attention should be focused, especially on the role assumed by the third party who is not the owner, who arranges for the vehicle to be driven, who takes advantage of the vehicle’s services, who follows the route taken by the vehicle and who witnesses the occurrence of external events involving the car.

The “driver-passenger” is able to check and be aware of the vehicle’s programming, its movements and the moves it decides to make and, therefore, can ascertain the level of safety that the vehicle provides during the journey, as well as the degree of attention that is paid by the car in preventing damage to property and persons.

In this sense, the question that arises spontaneously concerns the type of connection that exists between man and machine and, above all, the respective causal incidence of the behaviour of the machine and man with respect to the adoption of the decision that determines the performance of the unlawful act and the causation of the damage.

In order to answer this question, it is necessary to consider the different types of driver-user, as well as whether the artificial intelligence device fitted to the vehicle provides for the possibility of interaction with the driver, at least in the most dangerous circumstances.

In fact, it is clear that if there is no possibility for man to intervene in the

situations which, from time to time, arise, no form of liability can be attributed to him, since it is not possible to ascertain his possible unlawful conduct; in fact he is unable, even if he wanted to, to act to prevent or repress the unlawful act which is about to be committed, or in any case to take any action aimed at avoiding the road accident. Nor can the driver-user interfere in the decision-making process of the machine, because this is not allowed to him by the programming of the software; consequently, in the total absence of decision-making power, any liability attributed to him would be of an objective nature, but would not be justified by a valid legal reason.

It is a different matter, however, when the artificial intelligence system provides for the possibility of interaction with the human being, in the sense that the latter is allowed to intervene in the automated processes, to modify them, to direct them and to instruct them, and then to leave the vehicle to operate in perfect autonomy.

Not only that, but the system can be programmed to alert the person in the passenger compartment in the event of danger, in order to prompt them to intervene and, if necessary, take over the controls to try to remedy the risk.

In this case, the driver's function is no longer that of a mere user of the vehicle, a passive subject of driving, but takes on more active connotations, being involved, even if only in part, in the management and driving of the artificially intelligent vehicle, even if this form of intervention in driving is not comparable to that carried out by the driver of a vehicle at the lower levels of automation (from level 1 to level 3), where the role of the human driver in driving the car is predominant.

There are several types of behaviour that a driver can adopt while driving the vehicle (always conducted by the automatic system): the first type is that of the driver who is alert and focused on the route, who follows the progress of the vehicle and is ready to intervene if necessary; a second type of behaviour is that of the distracted driver, who devotes himself to various activities that distract him

from concentrating on driving (reading the mobile phone, phone calls, messages, social networks, videos and so on); then there is the driver who has physical abnormalities that prevent him from driving and who must therefore rely completely on the guidance of the artificial intelligence. Lastly, and this is an exceptional case, the driver may suffer an illness or other dysfunction while driving and therefore find himself unable to react even if prompted by the algorithm.

All these cases represent graduated forms of imputation of fault on the part of the driver, in the sense that they are all subject to the principle of presumption of fault prescribed by the rule contained in article 2054 of the Italian Civil Code, in which the driver's liability can be excluded only if he is able to provide proof of the lack of fault in causing the illicit act.

This evidence will be all the more difficult to provide the greater the degree of recklessness or negligence that will have emerged in individual cases: in the above examples, the level of culpability of the driver is lower in the first and third cases, while it is more pronounced in the second case.

The noteworthy fact is that the traditional discipline provided for by the Italian Civil Code for road traffic damage can be applied to torts committed by an automated vehicle, and this not only in cases of lighter automation, i.e. less independent of human action, but also in cases of fully autonomous *smart vehicles*, within the limits and in the manner described above.

Automation, algorithm, and artificial intelligence do not exclude the principle of the presumption of fault and do not relieve the driver and the owner of the *smart vehicle* from the responsibilities attributed to them by the rules of civil liability.

For all the different cases, it is essentially a question of verifying what level of diligence is required.

Therefore, alongside the liability of the owner of the vehicle, as set out in the third paragraph of article 2054 of the Italian Civil Code, the liability of the

driver of the vehicle, on the basis of presumed negligence, is also included under the first paragraph of article 2054 of the Italian Civil Code.

In this case too, liability is joint and several, with the result that the victim of the offence can bring an action against the driver or the owner of the car, or both, on the understanding that they are all jointly and severally liable to pay compensation for the damage and that the person who materially compensated the damage has the right of recourse against the other, to the extent determined by the seriousness of their respective faults and the extent of the consequences resulting from them.

This legal analysis has focused on the cases of vehicles equipped with the highest level of automation, number five, and it is evident that the conclusions reached in terms of the applicability to them of the regulations set forth above apply all the more to cases of vehicles with the lowest levels of automation, because in these cases, human interaction with the machine is all the greater as the level is lower, and consequently, the degree of guilt of the driver in provoking the illicit act (materially determined by the automated machine) increases. The responsibility of the owner is always retained, who is also liable in this case as long as he has not firmly opposed the use of the *smart vehicle*.

Finally, it can be reasonably affirmed, in summary, that only for completely self-driving cars, i.e. level 5 cars, one could abstractly think of subtracting them from the discipline of liability for the circulation of vehicles, *ex* art. 2054 of the Italian Civil Code, to entrust them to the discipline of things in custody *ex* art. 2051 of the Italian Civil Code and/or the performance of dangerous activities *ex* art. 2050 of the Italian Civil Code.

4. In addition to the codified liability regime, the liability of the producer of the intelligent vehicle, i.e. the programmer of the software or algorithm that governs the vehicle and endows it with intelligence, must be added.

First of all, it should be noted that the increasing intensity of car

automation could lead to an increasing shift of the centre of gravity of liability from the driver to the car manufacturer, with the consequent risk of slowing down technological progress and the production of intelligent cars, as well as of passing on the increase in production costs to the price of the goods and, therefore, to the final purchaser of the car.

However, it would also be a mistake to reduce the manufacturer's liability in this area in favour of extending it to the vehicle owner or driver, whose role would be diluted in the case of autonomous driving, with the risk of discouraging the purchase of intelligent cars, generating the paradox of limiting the manufacturer's liability so as not to restrict its production activity, but discouraging consumers from buying the products of that activity.

It remains preferable, therefore, to apply the current regime of producer liability for the car manufacturer, which relies heavily on business risk, albeit possibly with adaptations, also in terms of interpretation, required by the peculiarities of *self-learning* artificial intelligence, by including in the notion of producer of a component also the designer and supplier of the software and of the learning algorithm and possibly of the training algorithm, thus making them also directly liable to the consumer[37].

The manufacturer of the intelligent car may therefore be liable for damages arising from defects in the product, or from defects in the design of the vehicle, or from failure to provide information on the use of the product, or from providing incorrect or untrue information.

A manufacturing defect exists when a vehicle does not function as it should according to its technical characteristics, and according to what should be the functioning of an average product of the same type, irrespective of the negligent behaviour of the manufacturer.

The defect must manifest itself in the context of use of the product in

[37] In this sense RUFFOLO, *Intelligenza artificiale e automotive: le responsabilità da veicoli self-driving e driverless*, in ID. (ed.), *Intelligenza artificiale. Il diritto, i diritti, l'etica*, cit., 160.

accordance with its intended use and for which it was conceived and without the product having been modified by the consumer in relation to the initial conditions of production. The design defect of a vehicle can be inferred from the fact that the accident would not have occurred if the vehicle had been of a different design: in this case, the proof to be provided by the consumer is undoubtedly more difficult, since this defect gives rise to a liability that lies on the borderline between the strict liability of the producer and the fault-based liability of the provider of services and, in particular, of intellectual work.

The role played by the designer is fundamental, because the structuring of the software that governs the vehicle's automation depends on him, the information that is fed into the automatic system and that manages the decisions that the vehicle takes is derived from him; there are several doubts in this respect: the car is approaching a crossroads with a green light and a pedestrian is crossing the road, in violation of the obligation to wait for the light to turn red, a sudden braking action could avoid and save the pedestrian, but risks causing damage to the driver; what decision should the vehicle take, preferring to protect the driver or the third pedestrian?

The choice is obviously due to the information that has been loaded onto the software by the designer of the algorithm and its processing by the latter, but it is certain that it is not possible to set up, *ab initio*, a choice of preference between protecting the health of one person rather than another.

The designer develops an idea which is translated into the preparation of the product and therefore carries out an intellectual activity, so much so that cases of design defect are generally identified with the malfunctioning of the software mounted on the vehicle.

Hence the doubt that the provisions on providers of professional activities apply to this case, instead of those on producer liability, with the consequent greater burden of proof on the part of the injured party, due to the fact that he has to prove that the damage was caused by the subjective element of the fault of

the author of the unlawful act.

In any event, the assessment as to the occurrence of such defects must be made having regard to the safety which may legitimately be expected from the production and entry into service of the vehicle and, in particular, having regard to the fact that the manufacturer places on the market an automated vehicle which he presents as safe and the reasonable average consumer expects that product to be equipped with the safety which the manufacturer represents.

These circumstances must be compared with the safety that was actually displayed by the car that caused the accident. If it turns out that the vehicle did not meet these requirements, or that these requirements were not met during the use of the car, then it is clear that the product has the defect that is the cause of liability.

In relation to what specifically can be considered a defect in the automotive sector, the question arises as to whether the presence or absence of programmes that allow the rejection or preference of a man-made manoeuvre, in place of or modified by the car's artificial intelligence, can be considered a defect in the intelligent car[38].

Moreover, the presence of a defect in the car animated by artificial intelligence, even more so than in other types of products, cannot be considered to exclude the safety of the intelligent car, i.e. the presence of all the standards imposed by the regulations; indeed, a car that is safe because it complies with the regulatory provisions cannot be considered *tout court* as not being defective, otherwise the protection of injured parties would be weakened, since the car could well prove to be defective and harmful after being placed on the market and, above all, after the intelligent life, characterised by self-learning from

[38] This question has long concerned automated aircraft guidance, the so-called autopilot, if it allows or prevents human pilot manoeuvres. Examples include the plane that crashed because the human pilot decided to commit suicide by crashing the plane into a mountain without the on-board computer inhibiting the crash manoeuvre, or the plane that crashed in Indonesia because the autopilot refused to accept the human pilot's corrective manoeuvre.

experience, has been carried out[39]. And to this end, the risk of hacking is definitely not negligible and could well deviate the car's behaviour, to the point of causing it to perform damaging actions[40]; nor can such hacking be considered always and in any case attracted by the "development risk", with the exclusion of the manufacturer's liability, considering that in the presence of an excessively high development risk the relative activity carried out could be considered dangerous pursuant to art. 2050 of the Italian Civil Code.

If this were not the case, the mere approval and registration of the intelligent vehicle would be sufficient to exclude the presence of a defect, as well as construction defects under article 2054 of the Italian Civil Code, thus making the manufacturer immune from product liability and the owner or driver of the vehicle immune from liability for construction defects respectively.

Lastly, the information obligations of the manufacturer should not be overlooked and must be fulfilled in order to allow the consumer to be always adequately informed about the characteristics, functions, conditions of use and problems of the *smart vehicle* he has purchased. Defective information, understood as omitted or partial or erroneous information, is one of the most relevant causes of producer liability.

The manufacturer must always make sure that the consumer is informed

[39] The almost unanimous jurisprudential orientation considers that, in general, the adherence of a product to the regulatory safety standards represents a minimum protection, a necessary condition for placing the product on the market but not sufficient for the product to be considered "not defective", since it may subsequently be defective and cause damage. Moreover, it is the Italian Consumer Code itself that clearly distinguishes the discipline on the safe product, provided for in art. 102 ff. of the Italian Consumer Code, which specifies, in art. 111, that the provisions on liability for defective products are not affected, from the discipline on the defective product, provided for in art. 114 ff., which defines a product as defective when it does not offer the safety that could legitimately be expected taking into account all the circumstances.

[40] One example is the hacker attack suffered by the Tesla car, in which the hacker allegedly took control of more than twenty Tesla vehicles in ten countries around the world by exploiting a software vulnerability, which was attributed to the car owners and a third party, but not to the car manufacturer; the hacker allegedly managed to unlock the doors and windows of the cars, turn on the cars without keys, disable the security systems and activate the interior cameras (news appeared in the *Daily Mail in* January 2020, in *https://www.dailymail.co.uk/sciencetech/article-10396015/Hacker-19-takes-control-20-Teslas-flaw-party-software.html*).

above all about the dangers and risks involved in using the smart product, such as warning them that the system works via a network connection and could therefore be deactivated if this connection were to be lost, with the consequence that the car would lose all its smart functions and would probably no longer be able to drive autonomously.

This information is essential to prepare the driver for such an eventuality and to encourage him to pay more attention to the route, which can be crucial in preventing a road accident.

Another relevant type of information is that on the correct way to use the vehicle, since the correct use of the product, in accordance with its technical characteristics, makes it safe for the consumer: the manufacturer must provide clear and comprehensible instructions on the use of the vehicle; incorrect information on this compromises the safety of the product to the detriment of the consumer.

In any event, the manufacturer is obliged to inform the consumer of the risks that are closely linked to the use of a *smart vehicle*, making him aware of the fact that when he decides to make use of this type of product, he is consciously expressing a willingness to assume such risks: the consumer must be made aware that there are various conditions of the road that require the participation of the human being in driving, because they cannot be entrusted entirely to artificial intelligence.

This means that the human driver must still maintain an active vigilance throughout the journey, because he or she must be ready to intervene in place of or in support of the artificial intelligence in preventing the accident.

These circumstances must be considered in order to calibrate the type and intensity of liability to be attributed to the producer.

Clearly, the traditional system of producer liability must be interpreted taking into account the fact that we are dealing with automated vehicles, capable of managing themselves autonomously, but which at the same time interact with

the human being who acts as driver, who has the power to intervene in driving processes and to foresee and prevent the occurrence of harmful events.

Therefore, the particular condition of the driver requires consideration of his conduct at the time of the accident in order to verify whether he made any attempt to avoid the accident and, before that, whether he was in a position to take any preventive action; the various types of conduct that the driver may engage in while driving have been listed above and, depending on them, it is possible to graduate the producer's liability.

In the case of a distracted driver engaged in activities other than driving the vehicle, the causal participation of his conduct in causing the accident significantly reduces product liability, considering that it must always be ascertained whether, despite the driver's negligent conduct, the defect would in any event have exclusively influenced the occurrence of the accident.

If, on the other hand, the driver has always been alert while driving and vigilant in preventing errors, i.e. if he is impaired or otherwise incapable of interfering with the decision-making processes of driving, the role of the product defect in causing the accident will be more incisive and therefore there will be a greater likelihood of the producer's liability being recognised.

Any assessment of the defectiveness of the product or its design must, however, be compared with the correct use of the product made by the consumer, in accordance with the instructions received from the manufacturer and the use that can ordinarily be made of products of the same type: it is clear that improper use of the vehicle exempts the manufacturer from liability, since it departs from the safety conditions that have been laid down for the vehicle and entails an assumption of the specific risk by the consumer, who is aware that damage could be caused to him.

Hence the importance of proper information on the subject, enabling the consumer to form an informed consensus on how the vehicle is to be used and on the consequences of its different uses.

In addition, the state of technical and scientific knowledge existing at the time of the production and entry into service of the vehicle must be taken into account, which represents a valid defence for the manufacturer: this exception may apply to the exceptions of production or design defect and lack of information.

This means that the design that was made or the information that was communicated was in line with the current results of science and technology which, at the time of production of the vehicle, did not allow different conclusions from those which were designed and informed with regard, above all, to the safety of the vehicle.

In other words, the manufacturer, for its part, equipped the *smart car* with all safety requirements for the driver and third parties, as determined by the state of scientific and technical development. Any new scientific developments at the time of the accident do not confirm the manufacturer's liability, as they were not known when the vehicle was manufactured and marketed.

5. The liability system outlined above, which combines the strict liability of the manufacturer with the presumed fault liability of the owner and/or driver of the vehicle, in a joint and several interweaving that is functional to the most efficient protection of the rights of the victim of the road accident caused by the *smart vehicle*, represents, at this stage, an adequate and valid hermeneutical solution, in an evolutionary key, with respect to the alleged legislative gap in relation to the spread and circulation of highly automated artificially intelligent cars.

This legislation, in the necessary hermeneutic activity, must be anchored to the general principles, which in any interpretative activity of the norms represent a fundamental and flexible normative parameter, above all to the precautionary principle, which when it operates in relation to non-contractual responsibility becomes a chapter of responsibility and fills the doubts about the ascertainment

of causality"[41] and, more generally, to the fundamental principles of the Constitution, especially for the protection of the human person, not dissimilar from those contemplated in the Constitutions of other Western countries, in the Fundamental Charter of the European Union and in the European Convention on Human Rights[42], which would also plausibly inspire all the phases of the development of artificial intelligence systems, right from the design phase[43].

In essence, the same interpretative solution put forward for intelligent software in general also applies to *smart cars*, albeit with the addition of the specific rule already in place for the circulation of vehicles.

This system of liability, as well as the intrinsic characteristics of cars animated by artificial intelligence systems, which will determine the transition from a road traffic system based on the human driver to an automatic driving system entrusted to an algorithm, also require a reconsideration of the rules and models governing the system of compulsory private insurance for the civil liability of the owner and driver of the car, introduced in Italy for the first time in 1969[44] - to guarantee effective compensation for injured parties in the event that the persons abstractly responsible for the damage lack adequate resources to compensate for it pursuant to art. 2054 of the Italian Civil Code - and after a few years, in 1972, provided for at a European level, thus initiating a process of harmonisation of the regulations of the various European countries on insurance against civil liability arising from the circulation of motor vehicles, considered of

[41] DEL PRATO, *I principi nell'esperienza civile: una panoramica*, in *Rivista Italiana per le Scienze giuridiche*, 2014, 273.

[42] In this regard, Corte cost., no. 20/2019; Corte cost., no. 269/2017; CARTABIA, *I principi di ragionevolezza e proporzionalità nella giurisprudenza costituzionale italiana*. *Conferenza trilaterale delle Corti costituzionali italiana, portoghese e spagnola*, 24-26 October 2013, in *https://www.cortecostituzionale.it/documenti/convegni_seminari/RI_Cartabia_Roma2013.pdf*, 1 ss.

[43] On this subject, CARAVITA DI TORITTO, *Principi costituzionali e intelligenza artificiale*, in RUFFOLO (ed.), *Intelligenza artificiale. Il diritto, i diritti e l'etica*, cit., 451 ff.;

[44] The compulsory insurance scheme for civil liability in respect of the use of motor vehicles was introduced in Italy by law no. 990 of 24 December 1969.

fundamental importance to achieve the free circulation of persons and goods[45].

On the contrary, it is a sector that is undergoing a process of change as a result of technological innovations. Indeed, technical advances, and specifically artificial intelligence, are radically affecting the way insurance companies operate, from data management, insurance products and services, to customer relations, risk analysis, and claims settlement[46].

In the case of intelligent cars, in particular, insurance policies need to be updated to take account of all the factors that contribute to damage, from the

[45] The first intervention at European level concerning the compulsory insurance system for third party liability for damage deriving from the circulation of motor vehicles is due to Directive no. 72/166/EEC, which extended the insurance obligation to all the Member States of the European Economic Community; worthy of note, on this subject, is Directive no. 2009/103/EC, which outlined certain common principles to be integrated with the disciplines of the Member States. As a consequence of the spread of the car as a mass phenomenon, the European Economic Community also felt the need for a common discipline that would dictate mutually recognised uniform standards and guarantee an adequate level of car safety, implemented first with an agreement ratified in Geneva in 1958, promoted by the *Inland Transport Division* of the *United Nations Economic Commission for Europe* (UNECE), and then with Directive no. 70/156/EEC of the European Council. The subject of passenger car safety at European level is currently governed by EU Regulation no. 2018/858 of the European Parliament and of the Council of 30 May 2018, repealing Directive no. 2007/46/EC, which sets out the minimum safety standards for a car to be considered reasonably safe so that it can be placed on the market.

[46] On the relationship between artificial intelligence and the insurance sector see FERRARI, PALOPOLI, *Rapporti civilistici e intelligenze artificiali: attività assicurativa*, in AA.VV., *Rapporti civilistici e intelligenze artificiali: attività e responsabilità*, cit., 193-210; MANCINI, TORINI, *L'Intelligenza Artificiale nella finanza e nelle assicurazioni*, in RUFFOLO (a cura di), *Intelligenza artificiale. Il diritto, i diritti, l'etica*, cit., 619-623. Relativamente ai contratti di assicurazione, si vedano *ex multis* ANTONUCCI, *Commenti agli articoli da 1882 a 1903 del codice civile (disposizioni generali sull'assicurazione)*, in VOLPE PUTZOLU, *Commentario breve al Diritto delle assicurazioni*, Padova, 2013, 5 ss.; ID., *Commento all'articolo 1932 del codice civile (contratto di assicurazione e disposizioni finali)*, in VOLPE PUTZOLU, *Commentario breve al Diritto delle assicurazioni*, cit., 166 ss.; BOTTIGLIERI, *Dell'assicurazione contro i danni. Artt. 1904-1918*, Milano, 2010; CALVO, *Il contratto di assicurazione. Fattispecie ed effetti*, Milano, 2012; DE GREGORIO, FANELLI, LA TORRE, *Il contratto di assicurazione*, Milano, 1987; FANELLI, voce «*Assicurazione contro i danni*», in *Enc. giur. Treccani*, III, Roma, 1988, 1 ss.; ID., *Le assicurazioni*, in *Trattato di diritto civile e commerciale* diretto da CICU, MESSINEO, Milano, 1973; MIOTTO, *La linea di confine tra oggetto del contratto di assicurazione e responsabilità dell'assicuratore*, in *Resp. civ. prev.*, 2012, 205 ss.; PECCENINI, *Assicurazione*, Bologna, 2011; ROSSETTI, *Caratteri generali del contratto di assicurazione*, in ALPA (a cura di), *Le assicurazioni private*, Torino, 2006, 782 ss.; ID., *Il diritto delle assicurazioni*, Padova, 2011; VOLPE PUTZOLU, *L'assicurazione*, in *Trattato di diritto privato* diretto da RESCIGNO, 13, *Obbligazioni e contratti*, Torino, 1985; DONATI, *Trattato del diritto delle assicurazioni private*, voll. I, II e III, Milano, 1952-1956.

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driver's conduct and the owner's psychological attitude to the risk of a defect in the computer product or the possibility of alteration of the algorithm due to an unexpected change in telematic parameters.

At the same time, it is necessary to review the policy for determining the amount of the policy premium, the types of risks to be insured, the duration of insurance policies and the way in which costs and risks are distributed between the insurance company and the various parties involved in the commission of the offence.

Currently, a reference to the insurance regime for self-driving cars is contained in art. 19 of the Decree of the Ministry of Transport of 28 February 2018, on "*Modalità attuative e strumenti operative della sperimentazione su strada delle soluzioni di «Smart Roads» e di guida connessa e automatica*", with the extension to these vehicles of the obligation imposed on traditional ones and the provision of a minimum limit equal to four times that provided for the vehicle used for the experimentation in its version without the automatic driving technologies, in accordance with the legislation in force, with the further provision that the insurance contract must expressly state that the insurer is aware of the way in which the vehicle is used and that the vehicle is used in automatic operation mode on public roads.

Moreover, the expected drastic reduction in road accidents caused by highly automated cars, if it actually occurs, is likely to lead to a consequent reduction in the cost of insurance, which at present, on the contrary, is very significant for the car owner and can even exceed the purchase value of the car over time, the reduction of which, therefore, could represent an incentive for the purchase of this type of car, thus enabling consumers to overcome the so-called *status quo bias*, i.e. the initial mistrust of consumers with respect to new phenomena and products, preferring the traditional ones already known and

considered, erroneously, more reliable[47].

Moreover, the circulation of increasingly automated and interconnected cars will necessarily affect the legislation on *privacy*[48], since it will imply the use of numerous personal and confidential data of the users, with respect to which it will be necessary to guarantee an adequate and correct treatment, and, considering the need to connect the vehicle to the network and the consequent risk that third parties, by forcing access to the internet, could tamper with or control the car, it will raise delicate issues relating to the so-called *cyber security*[49].

In conclusion, therefore, even for highly intelligent and automated cars, almost to the point of becoming totally *driverless* in the future, as well as, more generally, for *self-learning* artificial intelligence, the current regulations, flexible and open to new phenomena, which were able to regulate the previous industrial revolution, pending further legislative steps, especially at European level, can be considered suitable and adequate to manage even the fourth industrial revolution, which characterises the 21st century, thanks to a careful analysis of the new technological phenomenon and of interpretative categories applied in an evolutionary and modern key, as well as legislative interventions limited to the strictly technical aspects of the phenomenon, including also the infrastructures

[47] For a more detailed discussion see CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit., 123-126.

[48] For an in-depth study on the relations between the development of artificial intelligence and privacy, see ALPA, *L'intelligenza artificiale. Il contesto giuridico*, Modena, 2021, 71 ss.; FINOCCHIARO, *Riflessioni su intelligenza artificiale e protezione dei dati personali*, in RUFFOLO (a cura di), *Intelligenza artificiale. Il diritto, i diritti, l'etica*, cit., 237 ss.; ID., *Considerazioni su intelligenza artificiale e protezione dei dati personali*, in RUFFOLO (a cura di), *XXVI lezioni di diritto dell'intelligenza artificiale*, Torino, 2021, 331 ss.; FRANZONI, *Lesione dei diritti della persona, tutela della privacy e intelligenza artificiale*, in RUFFOLO (a cura di), *XXVI lezioni di diritto dell'intelligenza artificiale*, cit., 339 ss.; AMIDEI, *Intelligenza artificiale e neuroscienze: verso un diritto alla "privacy mentale"?*, in RUFFOLO (a cura di), *XXVI lezioni di diritto dell'intelligenza artificiale*, cit., 355 ss.; PIZZETTI, *La protezione dei dati personali e la sfida dell'intelligenza artificiale*, in ID. (a cura di), *Intelligenza artificiale, protezione dei dati personali e regolazione*, Torino, 2018; ZAGREBELSKY, *Il diritto mite*, Torino, 1992; RODOTA', *Il mondo nella rete. Quali i diritti, quali i vincoli*, Roma-Bari, 2014.

[49] On the subject, LAGHI, *Struttura della rete e responsabilità: cybersecurity*, in AA.VV., *Rapporti civilistici e intelligenze artificiali: attività e responsabilità*, cit., 255 ff.

necessary for its circulation and diffusion, with the intention of balancing an adequate compensation protection of the subjects damaged by road accidents and an effective incentive for the producers of intelligent cars who have to make considerable investments for this activity.

This conclusion obviously does not exclude the possibility that the European Union may come to dictate a specific discipline on liability for damages caused by autonomous and self-learning artificial intelligence systems, just as in the past it had dictated a uniform discipline for producer liability; if such a regulatory intervention by the European Union takes place, the hope is that the solution adopted will succeed in making the liability regime clearer and more streamlined than the interpretative application of existing rules, which are in part already uniform in the various European countries - unlike what would seem to be the case, however, and, above all, does not determine the result of halting, or, in any case, slowing down technological progress and the development of artificial intelligence, excessively penalizing the creators and producers of the advanced and autonomous intelligent systems, thus betraying the premises repeatedly declared by the European institutions and once again opening the way for a new winter of artificial intelligence.

Moreover, the need not to make the manufacturer of intelligent products excessively liable must necessarily be combined with the need not to leave any injured parties uncovered, perhaps providing victims with compulsory insurance cover not for liability but for the event, as already provided for "*remotely piloted aircraft*", i.e. drones, by the ENAC Regulation of 11 November 2019, with the aim, moreover, of not fragmenting and differentiating the rules on liability for damage caused by intelligent systems in relation to the different types of products animated by the same, but making them as unified and uniform as possible, albeit respecting any different distinctive features of the final products.

Ultimately, if the application of *self-learning* artificial intelligence to the automotive sector and the consequent spread and circulation of *self-driving* cars

were to make it necessary and not postpone an organic legislative intervention, both at European and national level - which, we repeat, at present does not seem strictly necessary - it would be a historic opportunity to reform the entire system of civil liability arising from injuries caused by the circulation of vehicles of the owner and driver, manufacturer's liability and the road accident insurance system and, more generally, the system of liability arising from algorithms, software and artificial intelligence products and the road accident system, also with a view to smart roads, although it is difficult to know where the extraordinary journey of artificial intelligence will take us and what challenges and opportunities it will present in the future.

It is certain that the path towards an artificial general intelligence is decidedly longer and more complex with respect to what was foreseen by one of the fathers of artificial intelligence, Marvin Misky, who, in 1970, believed that only within the next eight years would a machine with an intelligence similar to the human one be invented and created, but still in the following century this did not happen and many authors strongly doubt the possibility that this could ever happen; what we call, perhaps improperly, artificial intelligence coincides, in fact, with a super-technology with a computational, but sectoral, capacity far superior to that of man, with an ability to calculate data in a faster and more complex way, therefore with more memory and speed, and also capable of taking a great step forward with the ability to self-learn from experience, self-taught, on the basis of information conceived and programmed by a human intelligence, without, however, possessing any human-like consciousness - the functioning of which, moreover, is still largely unknown - nor the ability to explore feelings, emotions, values, or the vast range of activities and functions inherent in the human brain, determined by the countless exchanges between neurons, dendrites and synapses.

Intelligence, however, cannot be degraded to a collection of information, because what characterises it and makes it unique, both in general and with

reference to individual human beings, is precisely its ability to process that information thanks to the laws of biochemistry that govern the human body and the wisdom and consciousness that accompany that activity.

The abstract possibility that the experimentation, marketing and diffusion of *smart cars* might come to a standstill due to the economic and social crisis with a consequent weakening of the issues surrounding smart cars, must also be considered, but some authors, on the contrary, have considered the introduction of driverless technology as a "vaccine" capable of eradicating the most serious negative externalities from vehicle traffic, in particular accidents, stating that the implementation of automated traffic similar to the widespread distribution of vaccination treatments, is a remedy capable of minimising negative externalities and allowing essential activities to be carried out in conditions of reasonable safety[50].

If, on the contrary, the development and diffusion of intelligent cars and, more generally, of all the technology animated by the intelligent algorithm, continues to progress, it will be opportune and necessary to reflect on the scope and limits to be attributed to it, since although the most advanced AI system, according to any reasonable criterion of measurement, is far below the general intellectual capacities of man: this is a story that risks assuming dimensions that are unthinkable today, since it could even concern the ultimate future of our life in the universe. And it is a story that man will write. And since it is we who will be designing such machines, we should ask ourselves: what kind of future do we want? Only after much thought about what kind of future we want, we will be able to steer a course towards a desirable future[51].

Everything that surrounds us at present is always and only the product of human intelligence, including the so-called artificial intelligence, but the time is

[50] In these terms CALABRESI, AL MUREDEN, *Driverless cars. Intelligenza artificiale e futuro della mobilità*, cit, 172.

[51] Thus MAIRA, *Intelligenza artificiale: fantascienza o realtà?*, in ID., *Il cervello è più grande del cielo. I segreti della mente spiegati da un grande neurochirurgo*, Milano, 2019, 295.

certainly ripe for the various authors in this field, from the humanities to the strictly technical sphere, to govern this technological phenomenon, letting themselves be guided by the instinct for preservation and appeasing the desire for omnipotence, and to outline its maximum scope, even if only in qualitative rather than quantitative terms, beyond which the role of man would perhaps be distorted, since he could go from being the *dominator* of technology to being its *servus* and completely dependent on it.

In this context, it is essential to emphasise the role of technology as an instrument at the service of mankind, aimed at simplifying and improving his life and building a better world, and therefore to design and build it in such a way that it pursues and protects human values, avoiding, or at least reducing as far as possible, the possibility of realising the abstract risks inherent in technological progress, without forgetting that according to some scientists, the creation of a superintelligence, which cannot be controlled by its creator, would represent a greater danger to mankind than any other invention in human history.

THE QUEST TO IMPROVE STABILITY AND EFFICIENCY IN SECURITIES POST-TRADING THROUGH TECHNOLOGY – RECENT TRENDS

Thomas Droll [*] - Andrea Minto [**]

ABSTRACT: *This article provides an overview of the developments, trends and perspectives of financial market infrastructures. In particular, it aims to examine the application of technologies for securities custody and settlement.*

It offers the legal background understanding in respect of securities which are held through banks and other intermediaries necessary to access the highly complex area of cross-border securities law. In doing so, it displays and discusses the relevant legal developments concerning the main initiatives at international and European level that are projected at enhancing the efficiency of post-trade processes related to traditional securities, e.g. by using distributed ledger technology (DLT). This article mainly focuses on international standards, EU legislation and recent legislative proposals as well as on German law as an example of a national legal framework

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SUMMARY: 1. Overview. - 2. Current post-trade system and shortcomings – 2.1. Current post-trade market practices and legal underpinnings. – 2.2. Shortcomings. – 3. Current technological initiatives to improve the traditional post-trade system. – 3.1. Overall assessment: Technological stagnation. – 3.2. Improving the predictability of initial margin calls for clearing members and clients through technology. – 3.3. Improving the resilience of post-trade structures with regard to cyber-incidents. – 4. Use of DLT in the securities post-trading sphere. – 4.1. Potential of DLT to overcome shortcomings in the traditional post-trade system. – 4.2. Classification: Is traditional securities law applicable? – 4.3. Legal uncertainty in the application of traditional securities laws and related legislative projects.

1. The way securities are transferred from seller to acquirer has fundamentally changed since securities trading started more than 500 years ago.[1] The most impactful changes were driven by the goals of i) making the system more efficient and ii) improving the stability of the system by reducing counterparty, liquidity, and operational risks. Fifty years ago, settlement still involved the delivery of physical certificates in most jurisdictions.[2] Today, most processes are electronic and an intricate ecosystem – consisting of custodian banks, central counterparties (CCPs) and central securities depositaries (CSDs) – is in place that provides custody, clearing and settlement services. In section 2 we give a short overview of the current post-trade system and its shortcomings. In section 3 we discuss current initiatives that relate to technologically improving this system (which we will refer to as the "traditional post-trade system"), without changing its basic building blocks. Finally, in section 4, we describe more far-reaching projects that aim at enhancing the efficiency of post-trade processes

[1] A short overview of historical developments is provided by Paech (2016), Securities, Intermediation and the Blockchain - An inevitable Choice between Liquidity and Legal Certainty?, LSE Legal Studies Working Paper 20/2015 (update 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2697718&msclkid=5826f876a9ea11ecab4655aa483793fa#, pages 4-15.

[2] The limitations of this system are perhaps best symbolised by the US "paperwork crunch" of the late 1960s, where a massive backlog of unsettled transactions had built up, see Rogers (1996), Policy Perspectives on Revised U.C.C. Article 8, Boston College Law School Faculty Papers, https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=1346&context=lsfp&msclkid=70984edfa9e611ecb212a8043d4fe099.

related to traditional securities by using distributed ledger technology (DLT) and discuss relevant legal developments. Throughout this article, we mainly focus on international standards, EU and German law (as an example of a national legal framework).

2.

2.1. Current custody and settlement structures can be described as layered, account-based, structures.[3] The bulk of securities today exists in electronic form, either because the securities have been created exclusively in electronic form (dematerialised securities) or because the physical securities have been immobilised. Either way, the securities are ultimately recorded in an account ledger by a CSD. Typically, there are only a very limited number of market participants who have a direct access to these CSDs. All other investors need to access the CSDs indirectly, by using sub-custodians that hold the securities in the interest of the investors and link the investor to the CSD. In practice, in particular for cross-border investments, there is generally not only one sub-custodian involved but several, resulting in so-called securities holding chains.[4] Such a holding chain for a German fund investing in a security recorded in a Luxembourg CSD might look like this:

German investment fund <=> German depositary bank <=> French sub-custodian bank <=> Luxemburg subsidiary of French sub-custodian bank <=> CSD Luxemburg

When a security is sold to another party, in principle, the settlement

[3] A very comprehensive explanation of current post-trade market practices, German substantive law and conflict of law rules as well as comparisons to US, Belgian and Luxembourg law is provided by Schwarz (2016), Globaler Effektenhandel, Mohr Siebeck, albeit in German. Books in English include Yates, Montagu (2013), The law of Global Custody, 4th edition, Bloomsbury, and Chun (2012), Cross-border transactions of intermediated securities, Springer.

[4] Granular data on the market structures and the exact properties of custody chains is largely lacking. Data on cross-border investments of German UCITS funds, stemming from a survey conducted by Deutsche Bundesbank, is presented and analysed in Droll et al (2016), Out of sight, out of mind? On the risk of sub-custodian structures, Journal of Banking & Finance 68, 47–56; https://www.sciencedirect.com/science/article/pii/S0378426616300073.

involves changing the recordings in all accounts involved.

The legal and regulatory environment governing this post-trade system is complicated and dominated by national law. On the international level, efforts to harmonise the conflict-of-law-rules as well as key areas of substantive law have largely failed: The Geneva Securities Convention[5] (dealing with substantive law) was only ratified by Bangladesh and therefore never entered into force. And the Hague Securities Convention[6] (dealing with conflict-of-law-rules) was only ratified by Switzerland, Mauritius and the USA. In the EU, in 2001, the Giovannini group[7], mandated by the EU Commission, identified differences in national substantive securities laws (so-called barrier 13) and in conflict-of-law rules (barrier 15) as key barriers that were hampering cross-border settlement. Conflict-of-law rules were subsequently harmonised to some degree in the EU but, after several unsuccessful attempts, the EU Commission has given up its plans to harmonise substantive laws. As a consequence, the legal framework in the EU currently consists of the following main elements:

- National laws defining the legal position of the holder of a security, e. g. as shared or common property in a pool of chattels under German law;
- National insolvency laws, EU-wide harmonised resolution laws for banks;
- EU (e. g. Rome I Regulation and parts of the Settlement Finality Directive) and national conflict-of-law rules;
- Mostly national law defining the liability of intermediaries in case the securities are lost, EU-wide harmonised rules defining the liability of the depositary for UCITS and AIF;
- EU norms on the regulation and supervision of CCPs (EMIR), CSDs (CSDR)

[5] UNIDROIT Convention on Substantive Rules for Intermediated Securities, adopted in 2009; https://www.unidroit.org/instruments/capital-markets/geneva-convention/

[6] Convention of 5 July 2006 on the Law Applicable to Certain Rights in Respect of Securities held with an Intermediary; https://www.hcch.net/en/instruments/conventions/full-text/?cid=72

[7] Giovannini Group (2021), Cross-Border Clearing and Settlement Arrangements in the European Union, https://ec.europa.eu/info/sites/default/files/first_giovannini_report_en.pdf, pages 53 ff.

and intermediating banks (CRR, CRD);

- Eurosystem Oversight Standards as regards CCPs and CSDs.

2.2. Shortcomings result mainly from the layered, complex structures of current post-trade systems and, in particular, relate to the following:

i) negative effects on shareholder rights and corporate governance (shortcoming 1),

ii) risk to "lose" securities, e. g. in case of insolvency of an intermediary in the holding chain (shortcoming 2), and

iii) inefficient processes – in particular long settlement times, which could ultimately contribute to (systemic) liquidity risks (shortcoming 3).

Negative effects on shareholder rights can stem from the fact that the ultimate investor in a share only has a direct, legal, relationship with his custodian, but not with the other intermediaries in the chain and also not with the issuer. This can negatively affect the possibility of ultimate investors to exercise their voting rights or to enforce other rights against the issuer. These negative effects are in particular well documented for the UK.[8]

From the perspective of the ultimate investor there are risks that he/she might temporarily or even definitely "lose" his/her security interest, broadly defined. E. g., there is a risk that because of insolvency or resolution proceedings involving a sub-custodian, he/she will not be able to access his/her securities for some time or might even lose them indefinitely, in case his/her legal claim does

[8] Law Commission (2020), Intermediated securities: who owns your shares? A Scoping Paper; https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2020/11/Law-Commission-Intermediated-Securities-Scoping-Paper-1.pdf, Micheler (2021), The No-look-through Principle: Investor Rights, Distributed Ledger Technology, and the Market; LSE Law, Society and Economy Working Papers 11/2021; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3871369, Micheler (2015), Custody chains and asset values: why crypto-securities are worth contem-plating, Cambridge Law Journal (2015), pp 509 ff., Gullifer, Payne in Binder, Saguato (eds.) (2021), Financial Market Infrastructures, Oxford University Press, pp. 396 ff.

not hold up in these proceedings. There is also the risk of fraud ("Madoff risk"[9]). There is finally the risk of a cyber-incident at a CSD or other intermediary involved, leading to a temporary or even definitive loss of his/her security interest. Whether an ultimate investor will successfully be able to seek compensation from the depositary for his loss is ex ante difficult to establish and, in the EU, depends to some extent on the type of investment: Investors in investment funds are, in general, most protected, since depositaries of both UCITS and AIFs are in general subject to a (near) strict liability, where they have to return identical financial instruments or the corresponding amount in case they cannot prove that the loss has arisen as a result of an external event beyond its reasonable control (Article 21 (12) AIFMD, Article 24 (1) UCITS Directive). Investors in an AIF may however, sometimes, be in a less comfortable situation as the depositary may, pursuant to Article 21(13) AIFMD, under certain circumstances, discharge its own liability by transferring the liability contractually to a sub-custodian. All other investors need to rely on national liability laws. In Germany, the depository bank is only liable in case of negligence. This uncertainty about liability for losses does not only exist in the relationship between the depositary and the ultimate investor but is also prevalent with regard to the other bilateral relationships in the holding chain. As can be seen from this short overview, it is often ex ante unclear which actor in the holding chain will ultimately bear the losses. This lack of clarity is in itself a cause for concern as it might lead to market participants underestimating custody risks ex ante and as it could also lead to uncertainty and lack of trust ex post (i. e. after a loss event).

Current discussions among market participants and regulators mainly relate to potential inefficiencies of the current system. Settling a transaction involves intermediaries in both custody chains (from the buyer and the seller). Because of this, settlement of transactions is a complex and cumbersome process, which contributes to the current long settlement cycles (in general T+2 in the EU). These

[9] In this case, investors in investment funds, including European feeder funds, faced losses of assets allegedly held in custody at one of Madoff's entities. See Droll et al (2016), page 47.

long processes hinder the liquidity management of individual market participants who, as will be described in subsection 3.2, often have to post cash or high quality liquid securities at very short notice to CCPs and other counterparties. These inefficiencies for individual entities can ultimately contribute to risks to financial stability, on a macro-level.

The fact that the legal frameworks are, to a high degree, national and not harmonised, might contribute to the shortcomings described above. This is in particular the case with respect to the second shortcoming (loss of security): There might be uncertainty in determining the applicable laws, the legal soundness of the applicable law might be uncertain or untested and also the different national laws involved might be legally incompatible.[10] However, there are differences of opinion on how material this issue is in practice.[11] Since there are, to date, not many real-world cross-border cases (e. g. involving the insolvency of a major custodian) it is difficult to ascertain who is right in this debate. However, it is safe to say that there are certainly legal tail-risks stemming from the interplay of different national laws.

3.

3.1. Currently, both industry and policy efforts to further improve the traditional post-trade infrastructure and address the three shortcomings described above by using new technologies are rather limited in scope.[12] In

[10] See Thevenoz (2007), Intermediated Securities, Legal Risk, and the International Harmonisation of Commercial Law, Duke Law School Legal Studies Paper No. 170, Stanford Journal of Law, Business, and Finance, Vol. 13 (2008), pp. 284 ff.

[11] E.g. Paech (2016), Securities, Intermediation and the Blockchain - An inevitable Choice between Liquidity and Legal Certainty?, LSE Legal Studies Working Paper 20/2015 (update 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2697718&msclkid=5826f876a9ea11ecab4655aa483793fa# argues that these legal certainty risks are material. In contrast, Schwarz (2016) argues that the national laws analysed by him (US, Belgian, Luxembourg and German law) are, from a functional point of view, very similar, which might reduce incompatibility risks.

[12] Of course, there are important improvements that do not include the use of technology, such as the Settlement Discipline Regime, that are (therefore) not covered in this article. On this regime,

particular, there are currently no plans to shorten settlement cycles in traditional post-trade structures in the EU (but there is in the US, where the industry is moving from T+2 to T+1[13]) and there are no major initiatives to reduce frictions in cross-border cases. This is in stark contrast to the dynamic developments that are happening in the payments sphere: Here, more and more banks offer their customers the possibility to use instant payments, i.e. payments that are settled in a few seconds, often 24 hours a day, 365 days a year. The trend to offer fast payments started in the early 2000s.[14] The Eurosystem has launched its Target Instant Payments Settlement (TIPS) service in November 2018 and now, in April 2022, most Eurosystem banks are participating in TIPS[15]. In addition, a lot of industry and policy effort is put into improving the efficiency of cross-border retail payments, including remittances: In 2020, the FSB, CPMI as well as other standard-setting bodies developed an ambitious roadmap, which was endorsed at the G20 Summit in November 2020.[16]

In the following subsections, we will describe two important examples of technological improvements that aim at reducing shortcomings 2 and 3, to some extent, and the respective legal developments.

3.2. Market-led developments and regulatory reforms that were instigated after the financial crisis of 2008/2009 have resulted in a much more central role for CCPs in financial markets. Today, most financial instruments, in particular the majority of derivatives, are being centrally cleared. Overall, CCPs make the financial system safer by reducing counterparty credit risk in the system. They do

see e. g. Wymeersch (2021), Central securities depositories and reform of the settlement process, Journal of securities operations & custody, 14 (2021/2022), 1, pages 13 – 41.

[13] See SIFMA, ICI, DTCC (2021), Accelerating the U.S. Securities Settlement Cycle to T+1; Report; https://www.sifma.org/resources/submissions/accelerating-u-s-securities-settlement-cycle-to-t1/?msclkid=8ca108dda6b711ecbabe2be1d1b9f772.

[14] See the documentation in Bech et al (2017), The quest for speed in payments, in: BIS Quarterly Review March 2017, pp. 57 ff.

[15] A list of participating banks can be found on the ECB website; https://www.ecb.europa.eu/paym/target/tips/facts/html/index.de.html.

[16] https://www.fsb.org/2020/10/enhancing-cross-border-payments-stage-3-roadmap/

so mainly by calling initial margin from both counterparties, via collateral haircuts and by channelling variation margin. These practices are however highly cyclical, in that initial margin requirements, variation margin flows and collateral haircuts will increase – sharply and suddenly – in times of stress.[17] Because of this, clearing members and, indirectly, clients of clearing members are often faced with large margin calls, which they have to meet by transferring cash or high quality and highly liquid assets (mostly government bonds) to the CCP, at short notice. The fact that these practices can cause or amplify liquidity stress for clearing members and clients and that they can ultimately contribute to severe liquidity stress for the financial system as a whole has long been understood on a theoretical level[18]. The real-life stress-test in March 2020, ultimately caused by the Covid-19 outbreak, confirmed these theoretical insights:[19] Both initial margin requirements and variation margin flows spiked sharply, which put clearing members and clients under (additional) stress and thereby contributed to the "dash for cash" experienced at this time. In March 2022, because of the war launched by Russia against Ukraine, margin calls again spiked sharply – this time most pronounced at energy market CCPs. One of the underlying vulnerabilities that shaped both events was that clearing members and, even more so, their clients were often not able to adequately predict the dynamics of CCPs' initial margin models.

To improve the transparency of CCPs' initial margin models and their possible dynamics in times of stress, several solutions are being considered. One possible, technologically rather advanced, solution proposed by some clearing

[17] This is of course, to some extent, already targeted in EU law, cf. Art 41 (1) of EMIR and Art. 28 (1) of RTS 153/2013.

[18] The different dynamics are thoroughly described in an ESRB publication that was published just before the Covid-19 events, in January 2020; see ESRB (2020), Mitigating the procyclicality of margins and haircuts in derivatives markets and securities financing transactions, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report_200109_mitigating_procyclicality_margins_haricuts~0f3e9f9e48.en.pdf.

[19] See the evidence compiled in BCBS-CPMI-IOSCO (2021), Review of margin practices, https://www.bis.org/bcbs/publ/d526.pdf. Evidence for the EU can also be found in ESRB (2020), Liquidity risks arising from margin calls, https://www.esrb.europa.eu/pub/pdf/reports/ esrb.report 200608_on_Liquidity_risks_arising_from_margin_calls_3~08542993cf.en.pdf?8380a2a90041200 ca6e5c008138a127e.

members is for CCPs to provide advanced "margin calculators" that allow clearing members and clients "what-if" analysis of how initial margin requirements for their portfolios might evolve under various simulated conditions. These simulators could, in those clearing members' view, be in the form of "what-if" Application Programming Interfaces (APIs) that would take into account all components relevant to the dynamics of initial margin requirements. According to BCBS-CPMI-IOSCO (2021)[20], about one fifth of CCPs in their sample reported that they do already provide some form of margin calculator to clearing members/clients.

The initial policy reaction to the events in March 2020 (rightly) focused on limiting the cyclical effects of current CCP practices. For example, and possibly most prominently, the ESRB recommendation 2020/06, addressed to EU supervisory authorities, contains several sub-recommendations aiming at CCP margin practices but does not include any sub-recommendations on improving their transparency. In the meantime, however, transparency of initial margin models has become a prominent topic on the policy agenda.

On the international level, in October 2021, the BCBS, CPMI and IOSCO published a joint consultative report that outlined six areas where these standard setters were considering further policy work and invited feedback from the financial industry and other stakeholders until 26 January 2022. One of these six areas contains ideas that aim at "increasing the transparency in centrally cleared markets". The provision of "tools/simulators" is explicitly mentioned. At the time of writing this contribution, it was however too early to predict whether/in what form international standards, that are being developed, will eventually include the provision of simulators or not.

3.3. Cyber risk has emerged as a key concern for market participants and the regulatory community: E. g., the Allianz risk barometer 2022 lists cyber risk as

[20]BCBS-CPMI-IOSCO (2021), Review of margin practices, https://www.bis.org/bcbs/publ/d526.pdf, page 28.

the most important global business risk.[21] More specifically to the topic of this article, ESMA, from a microprudential perspective, categorises cyber risk as a key risk for EU market infrastructures in its latest Report on Trends, Risks and Vulnerabilities.[22] And from a macroprudential perspective, the ESRB argues that cyber incidents "[…] could pose a systemic risk to the financial system given their potential to disrupt critical financial services and operations and thereby impair the provision of key economic functions".[23]

To limit these risks, from a microprudential perspective, the cyber resilience capacities of a custodian bank, of a CCP and of a CSD should consist of several elements relating to[24]

- governance (the arrangement an entity has put in place to establish, implement and review its approach to managing cyber risks),
- identification (an entity should identify its critical business functions etc. that should be protected, including its services which have been outsourced to third party service providers in the cyber area, e.g. to cloud service providers),
- protection (the entity should implement (IT) practices to prevent, limit and contain the impact of a potential cyber incident),
- detection (an entity should implement monitoring and process tools that would enable it to detect cyber incidents as early as possible),
- response and recovery (the entity should put arrangements in place that enable it to resume critical operations rapidly).

[21] https://www.agcs.allianz.com/news-and-insights/reports/allianz-risk-barometer.html

[22] ESMA (2022), Report on Trends, Risks and Vulnerabilities, No 1 2022; https://www.esma.europa.eu/file/122881/download?token=rjth9Skk.

[23] ESRB (2020), Mitigating the procyclicality of margins and haircuts in derivatives markets and securities financing transactions,https://www.esrb.europa.eu/pub/pdf/reports/esrb. report_200109_mitigating_procyclicality_margins_haricuts~0f3e9f9e48.en.pdf; ESRB (2020), Liquidity risks arising from margin calls, https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200608 _on_ Liquidity_risks_arising_from_margin_calls_3~08542993cf.en.pdf?8380a2a90041200ca6e5c008138a127e.

[24] Krüger, Brauchle (2021), The European Union, Cybersecurity, and the Financial Sector: A Primer; https://carnegieendowment.org/files/Krueger_Brauchle_Cybersecurity_legislation.pdf.

All these elements should be regularly tested by the entity.

The regulatory framework for post-trade entities aims to ensure all these elements. Currently, in the EU, the framework is very complex. It encompasses, on the one hand, legislation that is aimed at critical infrastructures from all relevant sectors (in addition to the financial market sector, e. g. energy, telecommunication, water/food are also included). There is both legislation on the EU level (the NIS directive) and on the national level, e. g. in Germany the BSIG[25] and the BSI-KritisV[26]. On the other hand, there are European and national regulatory rules that are specific to financial markets participants. We will now give a short overview of the latter.

Currently, there are different rules in place for the different financial sectors. As regards the sectors relevant for this analysis, the following main legal norms apply:

- Banks (as custodian banks): Article 74 CRD requires banks to have robust governance arrangements and a clear organisational structure with well-defined, transparent and consistent lines of responsibility and effective processes to identify, manage, monitor and report the risk they are or might be exposed to. EBA Guidelines[27] specify these requirements further with regards to ICT[28]- (including cyber risk-) management. These guidelines include detailed rules on, inter alia, i) governance and strategy, ii) ICT and security risk management frameworks, iii) information security and iv) business continuity management.

[25] Gesetz über das Bundesamt für Sicherheit in der Informationstechnik.
[26] Verordnung zur Bestimmung Kritischer Infrastrukturen nach dem BSI-Gesetz. Section 7 of this regulation defines clearing and settlement as critical services.
[27] EBA (2019), Guidelines on ICT and security risk management. In Germany, these guidelines are transposed in a BaFin circular from 2021, the "Bankaufsichtliche Anforderungen an die IT (BAIT)".
[28] Information and Communications Technologies.

- CCPs: For those EU CCPs that are also credit institutions[29] the same rules as for banks apply. In addition, Article 9 of RTS 153/2013 contains CCP-specific rules for their IT systems, which includes the requirement to provide sufficient redundant capacity to process all remaining transactions before the end of the day in circumstances where a major disruption occurs (Article 9 (1)) and to maintain a robust IT security framework (Article 9 (3) and (4)) that, inter alia, safeguards against "intrusions". Lastly, the ECB Cyber Resilience Oversight Expectations for financial market infrastructures[30] apply, which – in addition to governance issues (which are also covered in the legal norms referred to above) – include detailed rules on identification, protection, detection, response and recovery, and testing.
- CSDs: For those EU CSDs that are also credit institutions[31] the same rules as for banks apply. In addition, RTS 2017/392 contain specific rules on CSDs, in particular on i) risk monitoring (Articles 47 ff.), on ii) "IT tools", which includes rules on redundant capacity and a reference to cyber incident detection, prevention and response (Article 75) and iii) on business continuity (Articles 76 ff.). Also, the ECB Cyber resilience oversight expectations apply to CSDs.

Besides these norms on cyber risk management there are also reporting frameworks in place, such as the ECB SSM cyber incident reporting frameworks; and TIBER-EU[32] provides for a common framework for "Threat Intelligence-based Ethical Red Teaming", an advanced art of testing that involves mimicking real-life threat actors.

[29] On this see Papathanassiou in Binder, Saguato (eds.) (2021), Financial Market Infrastructures, Oxford University Press, pp. 46 ff.

[30] https://www.ecb.europa.eu/paym/pdf/cons/cyberresilience/Cyber_resilience_oversight_expectations_for_financial_market_infrastructures.pdf

[31] Papathanassiou in Binder, Saguato (eds.) (2021), Financial Market Infrastructures, Oxford University Press, pp. 46 ff.

[32] See ECB (2018), Tiber EU-Framework, How to implement the European framework for Threat Intelligence-based Ethical Red Teaming, https://www.ecb.europa.eu/pub/pdf/ other/ecb.tiber_eu_ framework.en.pdf.

In the future – when the EU regulation DORA (Digital Operational Resilience Act) will be applicable –, these legal rules (with the exception of the oversight expectations) will be harmonised, further specified and also expanded in scope[33]. At the time of writing this article, the act is still debated by the EP, the Council and the Commission, in the trilogue phase. DORA will likely include detailed ICT risk management requirements, ICT incident reporting requirements, resilience testing requirements and ICT third party risk management rules. On a more macroprudential level, DORA will also likely include a role for the European Supervisory Authorities (ESAs) to gradually enable an effective Union-level coordinated response in the event of a major cross-border ICT incident. In January 2022, the ESRB has published a related recommendation[34] for the establishment of a pan-European systemic cyber incident coordination framework (EU-SCICF), addressed to the ESAs.

4.

4.1. Because of the inefficiencies of current account-based systems several banks, financial market infrastructure providers, but also new entrants, are experimenting with DLT-based solutions. A report by ECB advisory groups published in 2021[35] provides a comprehensive discussion of current projects. In the following, we use this report's taxonomy which classifies the different real-world projects into the following four categories:

- Model 1: In this model, securities are issued as native digital assets. Securities do not have any other representation outside the DLT network – the ledger where the native digital assets are recorded constitutes the only book-keeping system.

[33] It will also include the regulation and supervision of critical third-party service providers.

[34] Recommendation of the ESRB of 2 December 2021 on a pan-European systemic cyber incident coordination framework for relevant authorities (ESRB/2021/17).

[35] ECB Advisory Groups on Market Infrastructures for Securities and Collateral and for Pay-ments (2021), The use of DLT in post-trade processes, https://www.ecb.europa.eu/pub/pdf/other/ecb.20210412_useofdltposttradeprocesses~958e3af1c8.en.pdf.

- Model 2a: In this model, the securities are initially issued, recorded and held in a traditional account-based system. Subsequently, custody and settlement of the assets are migrated, in different steps, to a DL. After this migration, the traditional system would then only be responsible for processing lifecycle events.
- Model 2b: In this model, securities are issued and recorded using a traditional account-based system, while subsequently, there are parallel processes in both the traditional and the DLT-based system. It might be possible to use both systems in parallel for all post-trade process or alternatively, to use only one system for specific post-trade processes.
- Model 2c: In this model, securities are recorded in the conventional system but referenced by a token in a DLT-environment. Such tokens, linked to bonds, could e. g. be created by traditional market participants with the aim of improving collateral management efficiency[36]. There are several ways to link the tokens to the traditional securities.[37] For example, tokens could merely carry information pertaining to the traditional securities. Or, more far-reaching, information on the DL could take precedence over the information stored in the traditional system.

Both the custody as well as settlement of transactions as regards the digital assets in the various models differs fundamentally from the traditional account-based systems. In essence: Settlement takes place centrally on a DL/blockchain instead of in accounts. And the equivalent to the traditional custody function are

[36] See e. g. the concept study of Deutsche Börse, Deutsche Bundesbank (2020), How can collateral management profit from DLT Project BLOCKBASTER, https://www.deutsche-boerse.com/resource/blob/1738116/946044d7f949f27cb373e6c7a7e32749/data/20200123-dlt-buba.pdf; a list of other projects and real-world examples can be found in Bech et al (2020), On the future of securities settlement, BIS Quarterly Review, March 2020, pages 81 ff. (Annex); https://www.bis.org/publ/qtrpdf/r_qt2003i.pdf.

[37] Deutsche Börse, Deutsche Bundesbank (2020), How can collateral management profit from DLT Project BLOCKBASTER, https://www.deutsche-boerse.com/resource/blob/1738116/946044d7f949f27cb373e6c7a7e32749/data/20200123-dlt-buba.pdf, page 13.

wallets, in which the private keys of token holders can be stored.

When setting up the DL/the blockchain, there are various design options. One important con-sideration is the degree of centralisation - Who can validate transactions? Who can initiate transactions? Who can read the information on the ledger? Concerning the validation of transactions there are various mechanisms that can be used. Some consensus mechanisms work better in highly centralised, others in more decentralised systems; some prioritise speed and scalability, others security.[38] The following table lists these design options. There are of course a lot more design options than the one listed here but we deem these to be the most important options for the purposes of this analysis. [39]

Table 1: Distributed ledger/Blockchain design options

How are transactions validated?	Permissionless	Anyone can validate	Common mechanisms: Proof-of-Work, Proof-of-Stake, Delegated Proof-of-Stake
	Permissioned	Only trusted parties can validate	Common mechanisms: Practical Byzantine Fault Tolerance, Federated Byzantine Fault Tolerance, Diem Byzantine Fault Tolerance, Proof-of-Elapsed-Time
Who can initiate transactions on the DL?	Public	Anyone can initiate transactions	
	Private	Only trusted parties can initiate transactions	

[38] A good discussion of consensus mechanisms is provided by Bain (2022), Blockchain Consensus Mechanisms:A Primer for Supervisors, IMF Fintech Note, https://www.imf.org/en/Publications/fintech-notes/Issues/2022/01/25/Blockchain-Consensus-Mechanisms-511769.

[39] Examples of other design options include: i) anonymous vs non-anonymous distributed ledger, ii) traceable vs non-traceable distributed ledger, iii) allowing for execution of smart contracts or not.

Who can read the information on the ledger?	Non-hierarchical	Anyone can read the information
	Hierarchical	Only some parties can read the information

Source: Inspired by Bech et al (2020), page 72 and Bain (2022), pages 8 ff

Most projects concerning traditional financial instruments in a DLT-environment, at least those involving traditional financial market participants[40], have opted for some form of permissioned, and sometimes also private and hierarchical setup. It is often argued that this centralisation is because of efficiency and scalability reasons, as the number of nodes can affect the speed and complexity of consensus building. Also, the need to comply with existing laws/regulations (e. g. KYC, AML requirements) might be an argument for more centralisation.[41]

There also different types of wallets: In a DLT environment, verification of the sender of a message (such as an instruction to initiate a transfer of a token) involves double-key encryption: The sender encrypts his message with his private key, which can be likened to digitally signing the message, although, legally speaking, it does not qualify as a qualified electronic signature in EU law.[42] The message then becomes legible by the use of a public key. Securely storing their private keys therefore is a key priority for holders of assets on a DL. There are different ways how to do it, e. g. in "hot" wallets that are connected to the internet or in "cold" wallets that are not connected to the internet. There are also different ways service providers might be involved: In so-called custodial wallets, these service providers keep the private keys for their clients (which is analogous

[40] Outside the EU, there are also projects of new entrants (which could be considered part of the crypto ecosystem rather than part of the traditional financial system). Examples include tokenised shares that are traded on the FTX exchange.

[41] On both see Bech et al (2020), On the future of securities settlement, BIS Quarterly Review, March 2020, pages 81 ff. (Annex); https://www.bis.org/publ/qtrpdf/r_qt2003i.pdf.

[42] Pursuant to Regulation (EU) No 910/2014, a qualified electronic signature system has to be centralised, in particular have a central entity (certification service provider) that is in charge of the key register.

to traditional custody).[43] In non-custodial wallets, users hold their private keys themselves. Because of their higher convenience, holders of traditional securities in a DL environment might opt for custodial wallets, which introduces some level of counterparty and operational risk similar to traditional custody.

Despite the fact that current DLs/blockchains tend to be permissioned, and are also often private, and despite the fact that the private keys will likely be stored in custodial wallets, the emerging new systems will likely be less centralised and will involve less intermediation than the current account-based system[44]. Because of this, settlement times will likely be lower. Also, the risk profile of the new system will likely differ from the current account-based system: Overall, counterparty risk might be reduced, since there are less entities intermediating custody and settlement (i.e., custody chains will be reduced in length or entirely disappear). However, other risk categories, e. g. operational and legal risks, might become more important.

4.2. When trying to determine which legal rules apply to the post-trade phase of such tokenised traditional financial instruments, a distinction has to be made between private law (which e. g. relates to the legal nature of the assets and how they can be transferred, on this see subsection 2.1 above) and public/regulatory law. Whereas private law is mostly the remit of national laws, public/regulatory law is dominated by EU law[45].

Concerning the latter, the key issue that has to be assessed is whether the respective tokens that are created (in the models 1 to 2c described above) can or cannot be classified as tradeable securities or another kind of financial instrument pursuant to Article 4(1) and Annex I Section C of Directive (EU) 2014/65 (MiFID II).

[43] In Germany, entities that offer the custody of private keys for tokenised traditional assets are already, since January 2020, regulated and supervised (section 1 (1a) sentence 2 no. 6 of the German Banking Act (KWG)).

[44] Bech et al (2020), On the future of securities settlement, BIS Quarterly Review, March 2020, pages 81 ff. (Annex); https://www.bis.org/publ/qtrpdf/r_qt2003i.pdf , page 74.

[45] See Amtenbrink, Herrmann (2020), The EU law of Economic and Monetary Union, Oxford University Press.

If this is the case, then, in essence the same legal norms as for traditionally issued financial instruments (see section 2 above) apply. If this is not the case, however, no specific post-trade regulatory rules will apply. This situation will also not fundamentally change once the forthcoming MiCA regulation will be in force, since this regulation will only include rules on wallet providers (see, e. g. Articles 53 ff. of the Council version[46]) but not on other post-trade aspects.

MiFID II defines "financial instrument" by providing a list of assets that includes, inter alia, transferable securities, money-market instruments, units in collective investment undertakings, and derivatives (such as options, futures, swaps, forward rate agreements and any other derivative contracts relating to a wide range of underlying assets). Overall, the category of transferable securities is an open category, including not only specific securities (like shares and bonds) but also any securities having equivalent features to them. Accordingly, digital assets granting the same rights that would be typically attached to a share (i.e. profit-sharing rights accompanied or not by administrative rights) or a bond (i.e. right to the reimbursement of the capital plus a remuneration) will likely be classified as transferable securities and, thus, as financial instruments.[47]

As regards the digital assets in the four models described above the following high-level observations can be made: It is highly likely that assets in a Model 1 environment will be classified as transferable securities. After the migration to the DL is completed, the same is true for assets in a Model 2a environment. Concerning the assets in Models 2b and 2c, classification will likely be dependent on the exact link between the DLT-based asset and the traditional security. The more the digital asset represents the rights associated with the respective security and the more holding and transferring these assets determines the de facto ownership, the likelier it seems that the digital assets themselves will also be classified as transferable securities or another type of financial instrument.

[46] https://www.consilium.europa.eu/media/53105/st14067-en21.pdf

[47] See Veil in Binder, Saguato (eds.) (2021), Financial Market Infrastructures, Oxford University Press, page 88.

In the following subsection we will describe

4.3. The legal norms applying to financial instruments were created with an account-based system in mind and since also the jurisprudence and legal literature relates to an account-based system there is considerable legal uncertainty for anyone involved in a DLT-based project.[48] E. g., it is unclear how settlement finality can be determined in a DLT-based system. And the uncertainty does not only relate to substantive rules but also to conflict-of law rules. As argued by Spindler (2019)[49], since tokens are not registered in the accounts of intermediaries, the PRIMA[50] approach used in most relevant EU (e. g. in the Settlement Finality Directive) and national conflict-of-law norms (e. g. in the German Depotgesetz) is often not appropriate for assets on a DLT.

Therefore, there is a case for enabling legislation that would provide the necessary legal certainty. In the following, we will describe two such legislative projects in some more detail: i) the German Electronic Securities Act (Gesetz zur Einführung elektronischer Wertpapiere – eWpG) that entered into force in June 2021, and ii) the future EU Regulation on a pilot regime for DLT market infrastructures.

Since the introduction of the eWpG, it is in Germany now possible to issue bearer bonds as crypto securities (Kryptowertpapiere) that are entered into crypto securities registers (Kryptowertpapierregister). Other types of securities, in particular shares, are not within the scope of this act. From a private law perspective, these crypto securities have the same legal status as traditionally issued securities under German law. In particular, the same rules on how they are transferred, including on the possibility to acquire in good faith, apply. As regards

[48] See Veil in Binder, Saguato (eds.) (2021), Financial Market Infrastructures, Oxford University Press, pp. 99 ff.

[49] Spindler (2019), Fintech, digitalization, and the law applicable to proprietary effects of transactions in securities (tokens): a European perspective, Uniform Law Review, Volume 24, Issue 4, December 2019, Pages 724–737.

[50] Place of Relevant Intermediary Approach.

regulatory aspects: Some principles-based technical requirements for these crypto security registers are laid down in section 16 (1) eWpG – data needs to be logged chronologically and stored in a way that protects against unauthorized deletion and subsequent modification. Section 18 includes rules on the circumstances which must be fulfilled before changing the records in the register (e. g. it can be based on an instruction by the holder of the crypto security). More specific requirements (but likely still rather principle-based and technology-neutral) will be laid down in a regulation to be published by the Federal Ministry of and the Federal Ministry of Finance. A first draft regulation was published for consultation in August 2021[51] and a second draft in January 2022[52]. In our opinion, it is very noteworthy how the eWpG ensures effective supervision and enforcement: Pursuant to section 16 (2) eWpG, there has to be one entity that is designated as a registrar (registerführende Stelle) by the issuer.[53] The registrar is responsible for all legal obligations resulting from the eWpG. Registrars are prudentially regulated and supervised by BaFin and Deutsche Bundesbank. There is, of course, an obvious tension between this legal solution (one entity is responsible) and the way DLT systems are generally set up (involving several nodes).[54] How much this legal solution will influence the specific design of the DLT/blockchain in practice remains to be seen.

As part of a package of measures to further enable and support the potential of digital finance, the European Commission has, in the form of a regulation, proposed a pilot regime to enable regulated institutions to develop DLT-based infrastructures for trading and settlement of financial instruments. In December 2021, the Council and the EP reached a provisional agreement, on

[51] https://www.bmj.de/SharedDocs/Gesetzgebungsverfahren/Dokumente/RefE_VO_Wertpapierregister.html;jsessionid=7F719D1C8D8EA8FBDCD377215B1CAC7C.1_cid289?nn=6712350

[52] https://www.bmj.de/SharedDocs/Gesetzgebungsverfahren/Dokumente/RefE_VO_Wertpapierregister_Synapse.html;jsessionid=7F719D1C8D8EA8FBDCD377215B1CAC7C.1_cid289?nn=6712350

[53] In case the issuer does not designate another entity, the issuer itself will be deemed to be the registrar.

[54] See the discussion in Müller/Pieper (2021), eWpG, Commentary, C.H.Beck, Preamble (authors: Müller/Pieper) and pages 245-246 (author: Kell).

which the following discussion is based.[55] The PilotR provides for a regulatory sandbox, that is however limited in scope. As regards the settlement part the following main restrictions - that are albeit substantially less stringent than the ones stipulated in the Commission's proposal[56] -, apply:

- Only CSDs that are authorized pursuant to the CSDR can benefit from the sandbox and experiment with DLT securities settlement systems (Article 8(1)).
- Pursuant to Article 2(4), a DLT settlement system must allow "[…]at least the initial recording of DLT financial instruments or the provision of safekeeping services in relation to DLT financial instruments". While most of the use cases described above will meet this standard, it cannot be excluded that some of the Model 2b and 2c projects, as currently devised, would not meet this standard.
- There are also several market and entity-specific size limits laid down in Article 3. For instance, pursuant to Article 3(1)(a), a share may only be recorded on a DLT market infrastructure if the issuer has a market capitalisation or a tentative market capitalisation of less than EUR 500 million. And pursuant to Article 3 (3), the total market value of DLT financial instruments recorded on a DLT market infrastructure shall not exceed EUR 6 billion.

Those CSDs that qualify with their projects can request exemptions from existing CSDR provisions that are listed in Article 5 paragraphs 2 to 6. They have to comply with some additional requirements pursuant to Article 6 that, for instance, relate to i) disclosure and documentation, ii) IT and cyber security arrangements and iii) custody arrangements.

It is hoped, that, based on the experiences gained within the pilot regime, the European legislators will in the future be in a better position than today to decide on what a future legal framework for settlement on a DLT should entail.

[55] The text can be found on the Council's website, see https://www.consilium.europa.eu/media/53681/st14993-en21.pdf

[56] The very narrow scope of the Commission's proposal was, e. g., criticised by Zetzsche, Woxholth (2021), The DLT Sandbox under the Pilot-Regulation, EBI working paper no. 92, 2021, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3833766.

NFTS AND CRYPTO ART MARKETPLACES: NEW RISKS FOR INVESTORS AND FINANCIAL MARKETS?

Allegra Canepa [*] - Kaushal A. Shah [**] - Andrea Visconti [***]

ABSTRACT: The art market is undergoing transformations that affect not only operators, market dynamics, and users but also the design of the goods and the possibility of creating entirely digital works and marketing them through NFT and blockchain. The work examines the platforms and marketplaces currently operating in the Crypto art market and their relevance to the market thanks to the algorithmic analysis of data and mainly digital wallets and the offer of ancillary services such as the creation of NFTs. The analysis outlines a lock-in process for artists through the recognition of royalties and in the application phase to collectors. The article continues with a survey of operators interested in the Cryptoarte market. Specific attention social media deserve, given their progressive introduction of features for the exhibition and exploitation of NFTs and the marketing of collections created exclusively for these platforms by the artists. In this context, as highlighted in the second part of this work, given the growing volume of transactions and the complex legal nature of NFTs, considerable risks are outlined for making conscious and informed choices of collectors and investors both for the financial market stability.

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The whole work has been thought about and discussed by all the authors as a whole; however, paragraphs 1 and 2 are attributable to Kaushal Shah and Andrea Visconti, while paragraphs 3, 4, 5 and 6 are attributable to Allegra Canepa.

artists and their works 5. The artistic NFT market and the risks for users between collecting and financial investment 6. A look to the future: towards social media paying a role in marketing artistic NFTs?

1. The expedition of Blockchain can be traced back in history to the invention of the database. When IBM created relational databases in 1970, it revolutionized the storage and retrieval of data[1]. Those databases are now used in almost every industry. However, the trust factor brings a change in this landscape, which we term Blockchain. The most basic instance of trust in our everyday lives can be in ATMs. Although a single institution operates an ATM, it accepts cards from multiple networks. The complexity of coordinating with banks is generally carried out by third parties, mostly VISA[2]. Therefore, banks and people trust VISA to hold their transactional data. Now, imagine a world where you do not require a trusted third party to carry out your transactions, and technology itself will do the heavy lifting for carrying them out. Moreover, the traditional banking system also suffers from the centralization problem because all the data resides at a central point, and if that goes down, everyone would be in trouble[3]. Consequently, due to centralization, there is no way to ensure that data was unaltered, or confirm that system is not compromised. These problems bring the need to evolve a new technology termed Blockchain.

Blockchain is a decentralized, distributed, immutable ledger that is infeasible to hack and alter[4]. Precisely, it contains a chain of blocks where data is recorded in the form of transactions. These transactions are secured using cryptography and stored on the ledger that is maintained by a network of nodes. The concept of Blockchain became widely known after the introduction of "Bitcoin" by Satoshi

[1] KIM, *Relational database systems.* ACM Computing Surveys (CSUR), 11(3), 1979, 187-211.
[2] WONGLIMPIYARAT, *E-payment strategies of bank card innovations*, Journal of Internet Banking and Commerce, 12(3), 1970, 1-17.
[3] SOLOMON. *Rethinking our centralized monetary system: The case for a system of local currencies*, 1996, Greenwood Publishing Group.
[4] PATEL, KHATIWALA, SHAH, & CHOKSI, *A review on blockchain technology: Components, issues and challenges*. ICDSMLA 2019, 1257-1262

Nakamoto in 2009[5]. Bitcoin aims to create a decentralized peer-to-peer world where participants are anonymous, and there is no central authority[6] Bitcoin represents identities as addresses and governance as consensus. It consists of nodes where each node maintains a copy of the global ledger. Therefore, nodes can independently verify and audit transactions. The process of grouping transactions in a block and chaining them together is called mining[7]. Since mining is a computationally expensive process, miners are rewarded with cryptocurrency for being a part of the operating network. Although Bitcoin popularized the concept of Blockchain, due to its complex nature and limited use cases, it requires improvement.

In 2015, Vitalik Buterin introduced timestamp-based transactions that established the Ethereum blockchain[8]. It has the functionality of writing smart contracts in Solidity, a Turing-complete language. The smart contracts run on Ethereum's native cryptocurrency, named "Ether". Consequently, the smart contract brought the concept of automation whereby more applications are empowered using blockchain technology, not just cryptocurrencies. Ethereum aims to store computer code on the Blockchain to create inviolable contracts. The applications powered by smart contracts also brought in a new phase of the internet, termed Web3[9]. An illustration of the working of blockchain technology is represented in Fig. 1[10].

[5] NAKAMOTO, *Bitcoin: A peer-to-peer electronic cash system*, Decentralized Business Review, 2008, 21260.

[6] THAKKAR, PATEL, N., PATEL, C., & SHAH, K. *Privacy-Preserving E-voting System through Blockchain Technology*, IEEE International Conference on Technology, Research, and Innovation for Betterment of Society (TRIBES), 2021, December, pp. 1-6.

[7] SHAH, *An Efficient Implementation of a Blockchain-Based Smart Grid*. In *Handbook of Research of Internet of Things and Cyber-Physical Systems* 2022, pp. 169 ss. Apple Academic Press, 2022.

[8] BUTERIN, *A next-generation smart contract and decentralized application platform*. White paper, 2014, *3*(37), 2-1.

[9] LEE, *Using the web3.js APIs.* In *Beginning Ethereum Smart Contracts Programming* 2019, pp. 169-198. Apress, Berkeley, CA.

[10] SHAH, *Blockchain Enabled Product Tracking for Supply Chain Management.* In *Security and Privacy-Preserving Techniques in Wireless Robotics* pp. 225-234, CRC Press, 2022.

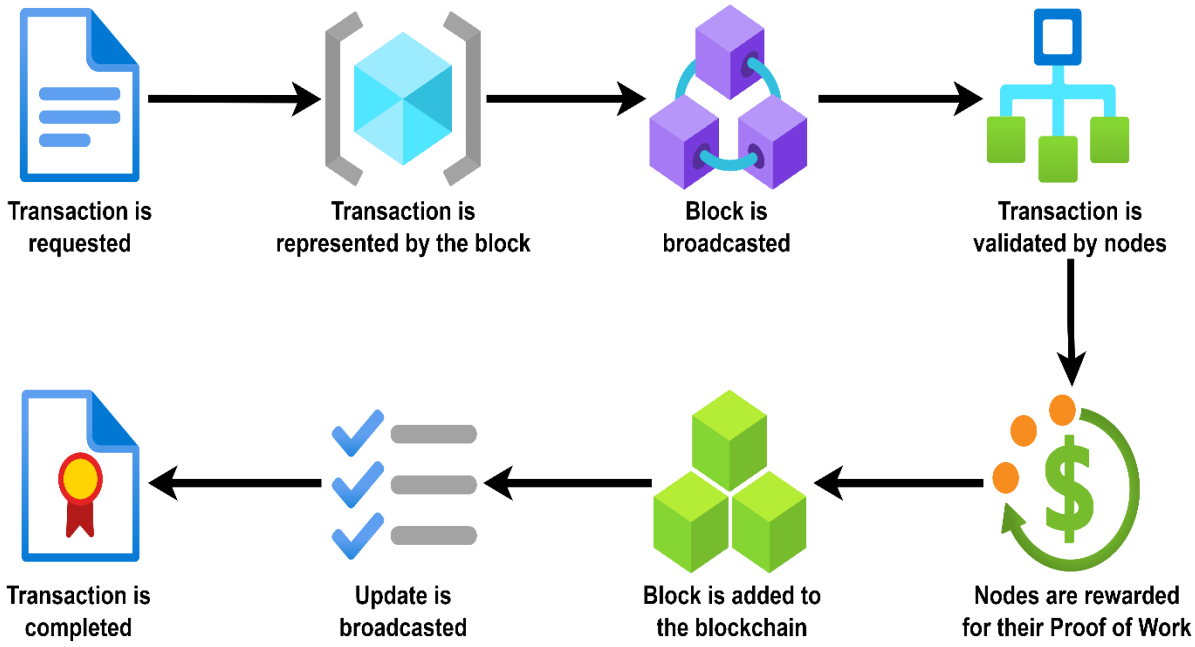

Fig. 1. An illustration of the working of Blockchain.

The advantages of Blockchain[11] are the following:

- Transparent – Transaction history is visible to the entire network because each node maintains a copy of the ledger. Therefore, any alterations made will also be discernible to all the participants;
- Immutability – All the data stored on Blockchain is tamper-proof; therefore, neither fraudulent transactions can proceed, nor malicious nodes can change the on-chain data;
- Permanent: Records or information are stored in several trustworthy nodes, i.e. at each local node of the Blockchain;
- Traceability – The data is distributed over the entire network, making it

[11] GOLOSOVA, & ROMANOVS, *The advantages and disadvantages of the blockchain technology*, IEEE 6th workshop on advances in information, electronic and electrical engineering (AIEEE), 2018, November, pp. 1-6; NIRANJANAMURTHY, NITHYA, & JAGANNATHA, *Analysis of Blockchain technology: pros, cons and SWOT*, Cluster Computing, 22(6), 2013, 14743-14757; ALI., JARADAT, KULAKLI, & ABUHALIMEH, *A comparative study: Blockchain technology utilization benefits, challenges and functionalities*. IEEE Access, 9, 2021, 12730-12749; LEPORE, CERIA, VISCONTI, RAO, SHAH, & ZANOLINI, *A survey on blockchain consensus with a performance comparison of PoW, PoS and pure PoS*. Mathematics, 8(10), 2020, 1782.

cryptographically traceable as there is no single point of failure;

- Financially Efficient – Since Blockchain is free of third-party interventions, it remains unbiased. It leads to greater financial efficiency because transactions can be carried out smoothly and tightly;
- Censorship Resistant – Blockchain has nodes for validating transactions and miners for approving those transactions. This process doesn't involve the control of any single authority; therefore, it is free from censorship;

and its main limitations are:

- Energy Consuming – Each miner tries to solve the cryptographic puzzle, which consumes a huge amount of electricity in the process. Although this redundancy factor contributes to the attestation of transactions, its energy consumption makes it environmentally unfriendly;
- Storage Requirements – Since anything that goes on-chain remains immutable till the existence of the Blockchain, it eventually leads to exponential storage requirements for an increasing number of users. Thus, it will exhaust the hard-disk space of miners and ultimately lead to their decline;
- Scalability – Due to fixed block size, a block cannot be resized according to requirements, making it unscalable because it cannot go beyond a computationally defined threshold number of transactions;
- Time Inefficient – Consensus needs to be reached among the miners, which involves computation complexity and increases the time duration. It makes their application infeasible for large-scale industrial uses where time is of the essence;
- Development Difficulty – Due to the immutability factor of Blockchain, decentralized applications need to be developed error-free as modifications won't be possible after deployment of them on-chain.
- Elimination of Errors: The application must be updated on each node of the network. If any part of the nodes doesn't accept the amendments, a fork is

required.

2. One of the novelties of Web3 is the foundation of non-fungible tokens (NFTs). They addressed the problem faced with physical ownership, where an asset's ownership can always be independently authenticated and verified[12]. NFTs are like digital assets but stored on Blockchain, which helps to track the owner and its authenticity. With their evolving popularity and smart contract development, NFTs are now not just limited to JPGs or PNGs; they also have their own utilities. For instance, when you buy a bored ape NFT from "Bored Ape Yacht Club", you are also entitled to exclusive community perks and benefits that only their corresponding NFT owner can claim[13]. NFTs have also paved the way for decentralized autonomous organizations (DAOs) that consist of a closed community, and only current owners of that community can introduce or vote on new changes happening within the community[14]. Moreover, NFTs revolutionized the gaming industry altogether as now NFTs can be represented as digital assets. One successful implementation of this can be found in the case of "CryptoKitties" where they represented cats as NFTs, which can be further glamorized and bred based on the number and type of NFTs a person owns[15]. Indeed, NFTs have come a long way in making a decentralized future for asset ownership, but they still need substantial changes for their wide-scale adoption. An illustration of the working of blockchain technology is represented in Fig. 2[16]

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[12] CHOHAN, *Non-fungible tokens: Blockchains, scarcity, and value.* Critical Blockchain Research Initiative (CBRI) Working Papers, 2021.

[13] SUCHOW, & ASHRAFIMOGHARI, *The Paradox of Learning Categories From Rare Examples: A Case Study of NFTs & the Bored Ape Yacht Club*, 2022, Available at SSRN 4082221.

[14] WANG, DING, LI, YUAN, OUYANG, & WANG, *Decentralized autonomous organizations: Concept, model, and applications, IEEE Transactions on Computational Social Systems*, *6*(5), 2019, 870-878.

[15] SERADA, SIHVONEN, & HARVIAINEN, *CryptoKitties and the new ludic economy: How Blockchain introduces value, ownership, and scarcity in digital gaming. Games and Culture*, *16*(4),2021, 457-480.

[16]KIREYEV, *NFT Marketplace Design and Market Intelligence*, INSEAD Working paper 2022/03/MKT, 2022 available on www.ssrn.com.

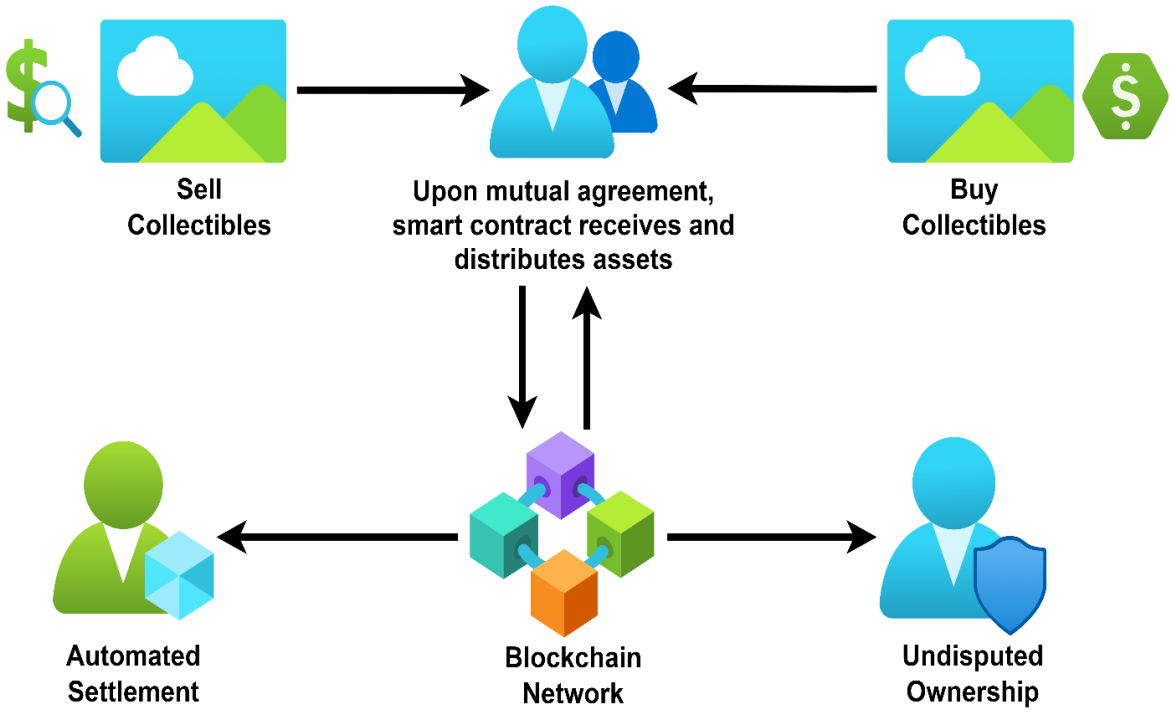

Fig. 2. An illustration of the working of NFTs.

The advantages of NFTs[17] are the following:

- Actuality – NFTs can be used to fractionalize physical asset ownership such as artwork, real estate, and expensive jewellery. They are also utilized as membership tokens, DAO integrations, and land entitlements or traded in gaming applications;
- Provenience – Since NFTs are stored on Blockchain, they also inherit its traceability factor leading to the immutability of transactions. Therefore, the authenticity of NFTs can be claimed and verified without the requirement of a third party;
- Perpetual – Once NFTs have been minted, they cannot be unaltered or hidden, which empowers their eternal nature and makes them permanent and

[17]SHAH, KHOKHARIYA, PANCHOLI, KUMAR, & PARMAR, *Securing Cookies/Sessions Through Non-fungible Tokens*, International Conference on Database Systems for Advanced Applications, Springer, 2022, pp. 135-146; CHAM; KUGLER, *Non-fungible tokens and the future of art. Communications of the ACM*, 64(9), 2021, 19-20; KHOKHARIYA, SHAH, PANCHOLI, & KUMAR, *DAMBNFT: Document Authentication Model through Blockchain and Non-fungible Tokens. Smart Trends*, Computing and Communications: Proceedings of SmartCom 2022, 396, 347; RAFLI, *NFT Become a Copyright Solution.* Journal of Digital Law and Policy, 1(2), 2022, 43-52.

immutable;

- Royalties – Royalty collection is now an inherent feature of NFTs where smart contracts automatically pass on the royalty income at the time of sales without requiring any middleman;
- Eminence – NFTs have opened a pathway where even smaller artists have a platform for showcasing their work and help them reach a much wider audience;

and their main limitations are:

- Gas Fees – The addition of gas fees to each transaction makes the price of NFTs comparable to that of transaction fees, limiting its wide-scale adoption due to losses;
- Legality – Since NFTs are a new shift digital asset paradigm, they lack substantial legal laws to prevent someone from minting artworks before the original owner does;
- Volatile – the market for NFTs is not very liquid, indeed the number of potential buyers and sellers is small. This means NFTs may be very difficult to trade and this affects their prices, in particular during periods of distress.
- Chain-limited – NFTs only exist on the chain they are minted on. Therefore, an NFT minted on one chain cannot be transferred to other chains; consequently, their value nullifies with respect to the outside chain;
- Off-chain storage – Most NFTs are uploaded to a decentralized storage network like IPFS, and their corresponding URL is stored on-chain. Thus, if the off-chain storage goes down, then NFT would lose its value too;
- Popularity – The value of NFT is decided by its popularity amongst the community. If its popularity goes down, so will its value; therefore, they possess a high investment risk.

Notice that the impossibility to transfer NFTs to other chains and volatile issues is valid reasons to be wary of investing in tokenized assets. On the contrary,

the possibility to fractionalize physical asset ownership, traceability, and immutability are driving forces for medium and long-term growth. Pros and cons described in Sections 1 and 2 play a key role in understanding changes in the structure of the markets in recent years, in particular the relationships between existing operators and users. These transformations will be addressed in the following Sections.

3. The transformations previously mentioned concerned all market segments and, in particular, that of art. These changes have affected not only operators, market dynamics, and users but also the design of the goods. Alongside works of art in the classical sense, there has also been a rapid growth in digital works, exclusively the digital version. This is the only one that can be purchased and held. Non-Fungible Tokens (NFT) [18] guaranteed the uniqueness and ownership of such works as a new way of representing assets, legal relationships, and negotiating rights based on blockchain technology. The combination of tokenization and certification via blockchain has become increasingly significant in the crypto art market establishing differentiated marketing between digitally created works, sets of collectibles[19], and fractions of assets.

The types of marketable goods, the rapid growth in demand, the volume of transactions for such goods[20], and the problems generated by Covid-19[21], have led to

[18] On the uncertain legal nature and classification of NFTs see ANNUNZIATA, *Speak, If You Can: What Are You?. An Alternative Approach to the Qualification of Tokens and Initial Coin Offerings*, ECFR, vol. 17, 2, 2020; ANNUNZIATA, CONSO (edited by), *NFT L'arte e il suo doppio*, Montabone, Milano, 33 ss.

[19] The purchase does not concern an asset meaning the work itself but a token on the blockchain capable of certifying ownership of the work and allowing it to be marketed. Collectables can be identified as authenticated and limited edition digital assets. Here we will consider token art and collectibles as a single category included in crypto art.

[20] The "Everydays: the First 5000 Days" by Mike Winkelmann (alias Beeple), a collage of all the works created in the 5000 days after his first work was sold for 69.3 million dollars (the third highest Price For A Living Artist) by Christie's on March 2021. See RIEGELHAUPT, *Beeple's Purely Digital NFT-Based Work of Art Achieves $69.3 Million at Christie's*, March 2021, www.christies.com/about-us/press-archive/details?PressReleaseID=9970&lid=1#:~:text=This%20work%20is%20unique.,the%20development%20of%20digital%20art.

the spread of specialist operators and marketplaces[22]. Some platforms, such as OpenSea[23], have quickly established a strong position in the market of NFTs, including artistic ones, thanks to the offer of ancillary services such as creating an NFT, certification through blockchain[24], holding, and custody[25]. In this regard, two particularly interesting aspects consist of the design of these marketplaces with a view to understanding what effects they generate on market dynamics and whether they only market works of art or if they also facilitate financial investment.

The latter aspect is also relevant given the growing publicity of these NFTs on social media, including the action of so-called fin-influencers[26]. The combined action of marketplaces and social media platforms increases the risks because NFTs, including artistic ones, are characterized by strong volatility, sometimes stronger than many financial products[27]. The lack of qualification as financial instruments

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[21] On the effects of the pandemic, including financial , for the future of the younger generations see CAPRIGLIONE, *Il Covid 19 e la faticosa ricerca di nuovi paradigmi operativi*, in Diritto Bancario, 2021, p. 13 ss.

[22]To name just a few leading marketplaces OpenSea, SuperRare, Nifty Gateway, Rarible e Markespace.

[23] Founded in 2017 as a marketplace for the marketing of NFTs of digital works of art, it has subsequently expanded its business to include musical NFTs, domain names, virtual lands, collectibles, etc.

[24] On the use of blockchain and NFTs in the art market and open questions see M. D. MURRAY, *NFTs and the Art World – What's Real, and What's Not*, UCLA Entertainment Law Review, vol.29, 2021, 1 ss.

[25] The Consob final consultation report identifies that «the dominant operating model for crypto-asset trading systems is constituted by so-called centralized exchange platforms, which operate both as a trading platform and as a provider of the custodial wallet service» The consultation was launched with a discussion document published on 19 March, 2019. See SCIARRONE ALIBRANDI, *Offerte iniziali e scambi di cripto-attività: il nuovo approccio regolatorio della Consob*, in Diritto Bancario, april 2019.In addition, in March 2019, the Bank of Italy published the document "Aspetti economici e regolamentari delle «cripto-attività» and ESMA Report with advice for the European Commission on crypto-assets of the Eba, Advice - Initial Coin Offerings and Crypto-Assets.

[26] See ESMA, Final report on European Commission mandate on certain aspects relating to retail investor protection, identifies fin-influencer as "influencer generates content on financial topics such as investments". ESMA 35-42-1227, del 29 aprile 2022, p.9. See CANEPA, *Social media e fin-influencers come nuove fonti di vulnerabilità digitale nell'assunzione delle decisioni di investimento*, Riv. Trim. dir. ec., 2022, p.

[27] As noted by Lemma with regards to Fintech experimentation, "the spontaneous course of Fintech could lead to the creation and distribution of highly structured financial instruments anchored to

determines the absence of adequate information as the obligations on information protection and transparency for the protection of identifiable investors do not apply "among the guidelines that must guide the organization of the market."[28]. This absence of complete information is crucial, particularly for younger generations who may simultaneously have less financial expertise but use social media and apps more fervently.

Let us consider the phenomenon of social commerce already consolidated in China by WeChat[29] and implemented on Meta. It appears that the goal may also be to market NFTs on social media including Twitter, Instagram, Facebook, and Reddit which are making applications available to users heading precisely in the described direction.

The remainder of this article is structured as follows. The fourth section analyzes the development of marketplaces for the sale of crypto art and highlights how their royalties have advantages for artists and particularly for the platforms; the fifth analyzes the difficulties involved in protecting users considering the legal classification of NFTS. Finally, the sixth section focuses on the different methods used by individual social media platforms to introduce NFTs marketing to the social space.

4. The Crypto Art market is exclusively digital, and its operators are platforms

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algorithms and computational systems capable of generating hitherto unknown levels of complexity. V. LEMMA, *la regolazione del Fintech tra "same supervision" e "sanbox"*, PASSALACQUA (edited by), *Diritti e Mercati nella transizione ecologica e digitale*, Cedam, Padova, 2021, 390.
The MiCA proposal, as amended, underlines the specificity of NFts in recital 66: "Such assignment addresses the very specific nature of risks posed by crypto and should not set any precedent for any other areas of financial services legislation". See the amendment proposed by Council, recital 66, 7694, April 2022.

[28] CAPRIGLIONE, *Intermediari finanziari, Investitori, Mercati. Il recepimento della Mifid. Profili sistematici*, Cedam, Padova, 2008, 149.

[29] On the design and the services offered by WeChat, see MONTAG, BECKER, GAN, *A Multipurpose Application WeChat,: A Review on Recent Research*, 9 Front Psichol. 2247 (2018), 1.; KLEIN, *China's Digital Revolution* (April 2020), www.brooking.edu; CANEPA, *The Role of Payment Services in the Development of the Big Tech Ecosystem*, Eur. Business Law Rev., 2022 forthcoming.

equipped with a marketplace.

Based on the services offered, platforms can be divided into search engines, as their activity supports the search for offers on the market and "multi-service" platforms. The latter also provides marketing services such as NFT creation or custody. This second type appears worthy of greater attention for two reasons: the existence of an algorithmic analysis process of digital wallets and the ancillary services offered.

It may be helpful to describe the ways in which OpenSea marketplace operates in order to understand this second type of platform. As soon as an account connects a portfolio of NFTs, this platform examines its content and performs a predictive analysis of the data and on the NFTs owned by other users to suggest and encourage sales.

The platform suggests some NFTs that users can view in a shop window those exclusive to the platform or the most successful ones. There is also a search system, and the results are displayed in descending order based on user searches.

The placement highlights some works and generates an increase in their price. It was precisely for this reason that, in the United States, the District Court of New York opened an investigation into electronic fraud against one of OpenSea's former employees. This individual managed the insertion of NFTs into the window and had purchased dozens of them before they were included in the marketplace. It should be noted that the showcase is changed several times weekly, and the exposure increases its value; therefore, any advance purchase allows them to be resold at significantly higher prices once displayed[30]. The former employee had therefore exploited the confidential information in his possession on the NFTs intended for the showcase for this purpose. The opening text of the proceeding states that "this case

[30] Specifically, N. Chastain would have exploited the confidential information possessed in the period between May and September 2021, and this would have allowed him to sell, e.g., on 2 August 2021, the NFT the Brawl 2 at a price double the purchase price and on 9 August the NFT "Flipping and Spinning" even at a price 250% higher than the purchase price. The procedure is the 22 CRIM 305 available on https://www.justice.gov/usao-sdny/press-release/file/1509701/download.

concerns insider trading in NFTs." The charge, however, is classified as electronic fraud as NFTs are not currently considered financial instruments[31].

The offer of ancillary services has a dual purpose: the first is to enable and support marketing; the second less evident is to create a lock-in mechanism for artists and works of art capable of strengthening their position on the market. The service of NFT creation correlates closely with the first sale on the market, particularly for subsequent ones on the secondary market capable of generating additional royalties for the artist[32].

In fact, in smart contracts, used to conclude the transaction automatically and immediately[33], the platform can arrange for royalties to be attribute to the artist for a certain number of years, or the entire duration of the relationship, of royalties when the work is resold[34]. The system recognizes and transfers the sums that are due.

This forecast is undoubtedly an advantage for artists as, in the presence of good circulation on the secondary market, it guarantees usable resources for their activity.

At the same time, however, it helps to consolidate the platform's strength on the market. In fact, the platform establishes whether the royalties consist of a fixed

[31] Proposal for a Regulation Of The European Parliament And Of The Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937. The article 4 (2) provides for the non-applicability of the rules introduced to digital activities, which are unique and non-fungible.

[32]On the different models envisaged for the attribution of royalties see VAN HAAFTEN-SCHICK, WHITAKER, *From the Artist's Contract to the Blockchain Ledger: New Forms of Artists' Funding using NFTs, Fractional Equity, and Resale Royalties*, December 2021, www.ssrn.com; VAN HAAFTEN- SCHICK, WHITAKER, *From the Artist's Contract to blockchian Ledger: New Forms of Artists' Funding Using NFTs, Fractional Equity and Resale Royalties*, January 2022, www.ssrn.com.

[33] On the evolution of negotiation through Smart Contracts see DI CIOMMO, *Smart contracts and (non-) law. The case of financial markets*, Law and Economics Yearly Review, 7, 2018, 291 SS; ROBUSTELLA, *Verso le transizioni algoritmiche: gli smart contracts e i modelli negoziali intelligenti*, PASSALCQUA (edited by), *Diritti e Mercati*,, cit., Cedam, Padova, 2021, 371.

[34]The standard used for NFTs is ERC-721 developed on the Ethereum blockchain which is the blockchain used by most NFT marketing platforms not only for artistic asset. See MURRAY, *NFTs Rescue Resale Royalties? The Wonderfully Complicated Ability of NFT Smart Contracts to Allow Resale Royalty Rights*, July 2022, eee.ssrn.com.

percentage or if there is any artist's discretion (for example, in the case of OpenSea[35]). This discretion can influence the marketplace's choice as royalties are correlated to the price of the work and the speed of its sale. In addition to this is an issue of interoperability. The standard used for the smart contract affects the attribution and accreditation of royalties from subsequent sales as royalties and fees are only automatically transferred if the sale occurs through the original marketplace.

The combination of these two elements encourages a substantial lock-in of the artists and their works with the platform that creates the first, the NFT[36], and guarantees the availability to create works exclusively for the marketplace. Some platforms, such as e.g. SuperRare, anchor royalties to the duration of the relationship between the individual artist and the platform[37]. Such a dynamic generates a lock-in of artists and their works and involves the artist in retaining users. The interest in an artist, perhaps already known, pushes his followers to visit the platform on which he first markets his works probably on an exclusive basis.

In this sense, the payment of royalties appears to be a "customizable" accessory service, constituting a method of consolidating the role of the platform on the market and forming an essential element for any new entry into the Crypto art market[38].

The low mobility of artists makes it difficult for new players to enter this market. Those who are already well known are unlikely to change marketplaces, given the related loss of royalties, and due to the fact that part of their target audience is already loyal to the current platform. For this reason, new operators

[35]In this case, the percentage can be set at the artist's discretion and can reach up to 10% of the work. The credit usually takes place in 2-4 weeks and a percentage is due to the platform.

[36] On the platform strategies used to encourage the lock-in see SATO, *Usage lock-in and platform competitio*n, June 2021, available on www.ssn.com.

[37] The amount varies from 10% for those who have been linked to the platform for the longest time up to 3% for those who joined so more recently. See the platform's website.

[38] Monegraph's initially established a royalties of 15% while the figure can now be agreed between the parties, as this is a platform through which tunnels operate.

attempt to attract to unknown artists, waging on their success and on the promise of potential high royalties.

However, this element affects the price and could reduce or delay sales. In addition, platforms with a major role in the market, given the number of already loyal users, can offer greater chances of success even to little-known artists. Furthmore, some platforms are introducing increasingly stringent entry selection mechanisms to identify emerging artists having greater chances of success. In particular, SuperRare firstly introduced rules for the selection of artists through an invitation mechanism. It then went on to established two additional conditions which must be met, a positive preliminary assessment of the individual's artistic profile, including his notoriety on social media, and a marketing exclusivity clause[39]. The selection process appears to be characterized by considerable discretion, a lack of transparency in terms of the criteria used for the evaluation, and an evident willingness of the platform to choose artists with both artistic and communicative potential.

Moreover, the number of commercial works proposed for marketing must be limited. The ultimate aim is to promote a well-known artist of interest to users and collectors, but with only a few of his works being put on sale, so as to ensure there is artificial scarcity on the market which has direct effects on prices.

In this way, as a private regulator[40], the platform not only uses ex-ante

[39]The SuperRare platform only markets crypto art and has established for an increasingly selective procedure for artists with the introduction of the aforementioned conditions in April 2022 see https://help.superrare.com/en/collections/2817684-joining-as-an-artist and HORKY, RACHEL, FIDRUMUC, *Price Determinants of Non-fungible Tokens in the Digital Art Market*, May 2022, 222.ssrn.com.

[40] The characterization of private regulators is not attributable only to platforms with an ecosystem but also to others such as social media albeit with some differences in terms of the types of rules adopted. See particularly WIELSCH, *Private law Regulation of Digital Intermediaries*, January 2019, available on www.ssrn.com. More generally on private law regulation MINTO, *Engaging private actors in the production of Eu financial regulation: the citizen's perspective,* Law and Economics Yearly Review, 8, 2019, 315 ss*;* NATOLI, *Il diritto privato regolatorio*, in Riv. Reg. Merc., no.1/2020, available on www.rivistadellaregolazioendeimercati.it and AMMANNATI, *I signori nell'era dell'algoritmo*, Riv. diri. Pubbli. ,2021, 381 ss.

regulation tools to govern access to the artists' market just like the public regulator but it also influences the trend of prices.

The picture outlined above is supplemented by a recent innovation introduced by SupeRare, aimed at expanding the use of royalties also for collectors. More specifically, last year, the SuperRare platform launched a royalties recognition project for collectors[41] with the stated goal being to increase sales in the secondary market, bringing advantages to artists and to the platform from the perspective of other royalties. In this way, the platform strengthens the loyalty of its users, who can gain an immediate monetary advantage from their purchases. It also drives them to make purchasing decisions more quickly as the system applies for a reduction in the royalty at each subsequent sale until it is zeroed.

5. The collector's figure and, more generally, the buyer is worthy of further attention. Firstly, it is important to emphasize the distinction between collectors and users generated by NFTs and the transition from purchasing a "physical asset" to the right of ownership of the original file[42]. The target audience is thus also composed of those intending to buy for investment purposes as given their possible value, they consider NFTs to be investments, due to the growing attention they have attracted on social media in recent years. A recent case before the Singapore High Court involved evidence of their purchase as an investment and retainer of value. The Court issued an injunction to block the sale of a Crypto Art token used on a platform specializing in token-backed loans, the NFTti, to obtain one. The sale was blocked precisely due to the difference between the market value of the NFT and the loan to

[41] The platform declares that the resources for the payment of these royalties derive from the affiliation fee on OpenSea. See the communication of the SuperRare Labs Team of 13 July 2021, https://medium.com/superrare/the-art-royalty-revolution-6c0d13a6912a. On property rights see ALLEN, WEELLS, MAUER, *Cryptoassets in Private Law: Emerging Trends and Open Questions from the First 10 Years*, SMU Centre for AI & Data Governance Research Paper No. 06/2022.

[42] On this evolution see FRYE, *After Copyright: Pwning NFTs in a Clout Economy*, 45 Colum. J.L.& Arts 2022, 341; ID. *How to Sell NFTs Without Really Trying*, 13 Harv. J. Sports & Ent. L., 2022, 113.

be repaid, which would have given rise to an unfair enrichment[43].

The investment purpose also relates to the payment methods of NFTs as many platforms only accept cryptocurrencies thereby ensuring that users even those who have never bought them before enter the cryptocurrency market. At the same time, those who already own them are interested in diversifying their portfolio, given the criticalities that have emerged in recent months[44]. A similar trend is found in the art market. However, it can also generate a possible link between the trend of the cryptocurrency market and crypto art[45] as further evidence of the financial dimension of the latter.

Moreover, those intending to make a financial investment and or to "convert" part of their cryptocurrencies into an NFT and more inexperienced persons appear more willing to make the purchases suggested by the platform.

Communication plays an important role in strengthening the direction of user choices, communication plays an important role, specifically through social media, which can reach many users in a limited period of time and guide them in purchasing artistic NFTs.

The social context generates a sort of "framing effect" capable of correlating an investment decision to the "context in which the decision is made; in particular, how the option to be chosen is presented to the subject"[46].

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[43]Specifically, in the case of Janesh s / o Raijkumar, the latter had entered into a loan agreement and subsequently a refinancing agreement where he had pledged an NFT as collateral Bored Ape Yacht Club NFT no. 2162. On this case see KAYYALI, *Court in Singapore Enjoins Transfer of Bored Ape NFT*, https://www.afslaw.com/perspectives/alerts/court-singapore-enjoins-transfer-bored-ape-nft.

[44] The urgency for more effective regulation on crypto-assets is underlined by the Financial Stability Board, FSB Statement on International Regulation and Supervision of Crypto-asset Activities, 11 july 2022, www.fsb.org.

[45] See G. ANSELMI, G. PETRELLA, *Non Fungible Token Artworks: More Crypto than Art?*, July 2022, www.ssrn.com

[46] See MORERA, MARCHISIO, *Finanza, mercati e regole….ma soprattutto persone*, AGE, 2012, p. 5. See also TVERSKY, KAHNEMAN, *The Framing of Decision and the Psicology of Choice*, Science, 1981, p. 453 ss.; ROSZKOWSKI, SNELBECKER., *Effects of "Framing" on Measures of Risk Tolerance: Financial planners are not immune*, Journal of Behavioral Economics 1990, n. 3, p 237 ss.; LINCIANO, *Le distorsioni comportamentali e la consulenza finanziaria*, AGE, 2012, p. 1 ss.

The social space generates multiple effects, and the combination of these effects makes them different from any other digital media. Consider profiling, marketing techniques, and the recent affirmation of professional figures active on social networks, acting as influencers, who are capable of making any product reliable and attractive by the mere fact of being one of their recommendations. [47]. Add to this the presence of a "self-loyalty" context for the choice of building networks of contacts that are increasingly homogeneous in terms of interests and preferences. In this case, it is clear to see why social media now appears to be the ideal place for advertising any product, including financial ones[48]. Furthermore, the presence of friends and acquaintances encourages the so-called network effect[49], consisting of the ability to attract an increasing number of users in the presence of others. This attracts the attention of users which is limited in time thanks to the messages from the relevant network[50].

These features demonstrate that social media can increase the risks inherent in the uncertain nature of Crypto Art NFTs [51]. The information on advertised NFTs is

[47] On this point see LAFFERMAN, *Do Facebook and Twitter make you a public figure?How to apply the Gertz Public Figure Doctrine to Social Media*, Santa Clara High Technology Law Journal, 2012, 209 ss.

[48] The critical issues arising from the presence of platforms in the financial field have also been highlighted recently by the Deputy Director of the Bank of Italy, see CIPOLLONE, Conference on Digital Platforms and Global Law, 29 April 2022.

[49] The network effect generally refers to the fact that the increase in the number of users correlates directly with the value and quality of the service and operators with users benefiting from this increase.

[50] As summarized by Evans some years ago "*When it comes to attention seeking, there are few winners that "take all" in practice*". See EVANS, *Attention Rivalry among Online Platforms*, Coase – Sandors Working Paper Series in Law and Economics,, 2013, p. 3, www.chicagounbound.uchicago.edu. On the design and characteristics of markets attention there is widespread literature see BORDALO, GENNAIOLI, SHLEIFER, *Competition for attention*, Rev. Econ. Studies, 2016, p. 481 ss.; T. WU, *Blind Spot: The Attention Economy and the Law*, Antitrust Law Journal, 2019, p.771 ss.
The ability of social media to facilitate attention grabbing also results from the data found from numerous experiments conducted see particularly ARIDOR, *Drivers of Digital Attention: Evidence from a Social Media Experiment*, 27 december 2021, www.ssrn.com.

[51] On the configurability of a utility token offered to the market as a financial product, see CALONI, *Deposito di criptoattività presso una piattaforma exchange: disciplina e attività riservate*; Giur.

even more concise than that on marketplaces, although there are references to a specific link to obtain more details. Moreover, there is also a dangerous mix between information and communication for marketing purposes, making it difficult to distinguish what is essential and impartial information from what is not. An additional risk profile derives from hidden advertising by influencers or so-called fin-influencers[52].

Social media can boast one more element than marketplaces: users' trust in those who publish on their network. For this reason, in selecting their artists, platforms, such as SuperRare, include the requirement of having profiles already active on leading social media among the criteria for being admitted to the marketplace. One of the key elements in guiding user behavior, including many individuals making identical decisions in a short space of time[53], is digital trust. Trust is the result of an emotional component based on feelings and it is strengthened by sharing the contents and moments of one's private life.

On social media, the emotional aspect, which is fundamental for making any decision, including that of exchange, is strengthened by the coincidence of interests and actions with the other members of the network. Another critical element is the ability of social networks to influence the marketing and, consequently, the prices of NFTs. This aspect is important due to its connection with the trend of the cryptocurrency market and its ability to generate, through a coordinated mass decision, unexpected and unpredictable existences on the financial markets as occurred in the Gamestop case[54].

Comm. 2020, 1073 e GITTI, *Emissione e circolazione di criptoattività tra tipicità e atipicità nei nuovi mercati finanziari*, in Banca, borsa, tit. cred., 2020, 13.

[52] The ESMA, Final report on European Commission mandate on certain aspects relating to retail investor protection, states that a fin-influencer is an "influencer generates content on financial topics such as investments". ESMA 35-42-1227, 29 April 2022, p.9.

[53] See VON METTENHEIM, WIEDMANN, *The complex triad of congruence issues in influencer marketing*, J. Consumer Behav., 2021, p. 1277 ss.

[54] On the specific ability of social media to play an instant coordination role of coordination beetween a large number of subjects see CAMPANTE, DURANTE, TESEI, *Media and Social Capital*, september 2021, www.nber.org. On the Gamestop case see LUCANTONI; *Negoziazioni ad alta*

These dynamics highlight new vulnerabilities for the individual from the social environment and the lack of a security perimeter to protect the saver in relationships with an authorized and supervised entity. These risks not only concern the individual but also the functioning of the market, as evidenced by the recent establishment of start-ups such as Santment wich aggregate social and financial data to evaluate individual cryptocurrencies and their fluctuations in value. These platforms believe that the discussions and opinions expressed on social networks can guide users' decisions and, consequently, the value of cryptocurrencies[55].

The European Securities Markets Authority (ESMA) and the European Supervisory Authorities (ESAs) have recently addressed this phenomenon.

Two press releases, the first from ESMA[56] and the second a joint release between the three supervisory authorities[57], underline the risks generated by social media in making investment decisions and purchasing crypto-assets.

They point out that any information, explicit or implicit, usable for investment strategy, including opinions on present or future value or price, constitutes an investment recommendation. From this point of view, social media demonstrate multiple different critical instances of "misleading investors" deriving primarily from the difficulty of perceiving the difference between a "simple communication" or a recommendation and from the greater dependence on the first information received compared to the subsequent ones (knows as anchoring bias).

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frequenza tra oclocazione dell'algoritmo e "gamefication"del contratto d'investimento, Riv. trim. dir. ec., 2021, n.3 suppl.; ARRIGONI, *La tutela dell'investitore alla luce del caso Gamestop. Verso un nuovo regime per la prestazione dei servizi di investimento esecutivi*, Orizzonti del diritto commerciale, n.2/2021, p. 941 ss.

[55] Several years ago, well before social media had gained its current popular footing, Lemma highlighted the existence of growing problems in a society "increasingly aggregated according to innovative models of participatory freedom referring to the wired society and the network society", see LEMMA, *Informazione finanziaria e tutela dei risparmiatori*, in CAPRIGLIONE (edited by), *I contratti dei risparmiatori*, Giuffrè. Milano, 2013, 264.

[56] See the ESMA Statement on Investment Recommendations on Social Media, ESMA70-154-2780, 28 October 2021.

[57] See ESAs, EU financial regulators warn consumers on the risks of crypto-assets. ESA 2022 15, del 15 March 2022.

The initial intervention that needs to be made concerns the increase in transparency of the contents and the competence of those who publish[58]. Crypto-assets require increased transparency due to their complex "highly risky and speculative" nature and their ability to determine a "very real possibility of losing all their invested money if they buy these assets" for buyers"[59]. The ESAs press release and the subsequent report on retail investor protection of April 2022[60] underline how these products "typically fall outside existing protection under current EU financial services rules." To increase the purchase of them, social media and especially influencers only highlighted the potential benefits and not the significant risks, establishing an untrue perception of the suitability of such products for all consumers[61].

The centrality of transparency on crypto-assets also emerges from the proposed regulation on the matter, albeit concerning crypto-assets other than tokens linked to assets. This regulation emphasizes that marketing communication must comply with certain requirements in terms of information and clarity requirements[62]. Even such a forecast, as demonstrated by influencers' activity, may not be sufficient as communications for marketing purposes are not always immediately recognizable.

[58] On transparency and cryptocurrencies see PELLEGRINI, *Trasparency anc circulation of cryptocurrencies*, Open Review of Management Banking and Finance, 2021, p. 1 ss.

[59] See ESAs, EU financial regulators warn consumers on the risks of crypto-assets. ESA 2022 15, 15 March 2022.

[60] ESMA, *Final report on European Commission mandate on certain aspects relating to retail investor protection*, cit.

[61] ESMA had already intervened on this aspect in its Report Trends, Risks and Vulnerabilities (TRV) published on 17 March 2021, and accompanied by the press release ESMA *Sees high risks for investors in non-regulated crypto-assets.* Moreover the document also hiahlights that the high number of available crypto-assets over 17,000 encourages widespread publicity.

[62] Art. 6 of the MiCA provides that a) marketing communications are identified as such b) the information contained in marketing communications is correct, clear and not misleading and in subsequent letters indicates the necessary consistency with the White Paper if required pursuant to art.4.

6. The role of social media in the Crypto Art market does not seem to consist of advertising and making artists and NFTs known. The volume of transactions and the progressive transformation of the leading social media platforms into social commerce platforms are triggering a rapid development of applications to encourage the use and exposure of NFTs in the social environment. In light of what is already in place, the goal seems to be, for some platforms, to play the role of competitors with the marketplaces already operating in Crypto Art's NFTs.

Even if the proposed functionalities differ, they have the common purpose of guaranteeing the exposure of owned NFTs in order to promote marketing among the interested parties without the mediation of the marketplace. This aspect highlights why OpenSea and SuperRare are using royalties to lock in artists and experimenting with the same system for collectors. However, given that the marketing in the secondary market outside the marketplace does not involve the attribution of royalties, this could see artists and potential buyers not making purchases outside the marketplaces so as not to lose out on these revenues.

Moreover, since January 2022, Twitter has been activated using an NFT as an image for each profile. There is also a link in NFT for viewing the entire owned collection along with the related information. This functionality based on the OpenSea API facilitates the display of owned NFTs, the verification of ownership, and above all, access to exclusive social groups reserved for owners of certain high-value Crypto Art NFTs or reserved events[63].

The Meta platform, first on Instagram and later on Facebook, provides methods for displaying its own Crypto Art NFTs and collectibles upon connection with the wallet. This connection allows Meta to acquire data deriving from the association of the wallet with each profile. Instagram and Facebook can thereby obtain information on the owned NFTs data on previous transactions (including the

[63] Examples are those of the Boerd Ape Yacht Club which allows access only after demonstrating possession of a Bored Ape NFT or of VeeFriends tokens which grant access to multi-day events. For more information see OH, ROSEN, LEE ZHANG, *Investor Experience Matters: Evidence from Generative Art Collection Blockchain*, August 2022, www.ssrn.com.

exchange used), any apps used, and the availability of cryptocurrencies. These data are fundamental for enhancing of user profiling processes, already active on Meta, and subject to specific regulation proposals in the Digital Markets Act[64]. In particular, the availability of this data is also potentially helpful in creating Super Apps for offering multiple social and financial services, such as WeChat.

The potential of Crypto Art and collectibles, given the growing interest and volume of transactions, are driving some social media to create and market themselves as collectibles to be offered to their users. The purpose is to offer users the sale for use as profile images if they do not already own an NFT and are interested in acquiring one belonging to an exclusive series. In particular, Reddit, in July 2022, promoted Avatars as user profile images with connected features, usable on other platforms.

These are collectibles, even if Reddit does not qualify them as NFT, characterized by some peculiarities: the use of Polygon[65], the sale without auction, a predefined price (from a minimum of 9.99 to a maximum of 99.99 dollars), and finally, the possibility of payment with credit cards and not in cryptocurrencies. The operation appears attractive as it produces a marketplace for creating and marketing avatars, which can be usable on other platforms. In fact, although the one presented is a limited edition, Reddit allowed artists who agree with the platform to create collectible avatars marketable through social media and viewable in their portfolios

[64] According to the Cons. 15 "constitutes an important access point and is managed by a company that can boast a significant impact on the internal market and a consolidated and lasting position, or by a company that is expected to boast such a position in the near future". Art. 3 defines the gatekeeper and the requirements for its identification including lock-in. In this regard, the case in question presents a peculiarity from the point of view of the tools used to implement it, as demonstrated by the system of royalties.Regulation of The European Parliament and of the Council On Contestable and Fair Markets in the Digital Sector and Amending Directives (EU) 2019/1937 And (EU) 2020/1828 (Digital Markets Act), 2020/0374, 14 September 2022.

[65] It represents one of the layer 2 solutions for Ethereum which currently show the greatest potential in terms of the ability to increase efficiency in the presence of a large number of transactions. Basically Polygon is a protocol for connecting blockchiain networks and creating new ones. Its peculiarity that it is connected to Ethereum. See CHEMAYA, LIU, *Cost of security of Layer 2 Network: Evidence from Polygon Network*, June 2022, www.ssrn.com.

on Reddit[66]. Artists can use the platform's service to create avatars and obtain the proceeds of the sale net of commissions and royalties for any subsequent sales in the secondary market.

The cited examples reveal that social media are developing different forms of marketing of NFTs and collectibles. Through their activity, social media communities can also influence the market of "artistic" NFTs in terms of demand and prices. In particular, the recently activated features create an increasingly strong bond between artists who create Crypto Art and social media from the point of view of the visibility, notoriety, and value of their works.

To give an idea of this, consider that an analysis carried out on the increase in tweets on Twitter relating to 18 NFTs projects included in the profiles led to a jump from 50 to 60,000 tweets per day[67]. Such a process of mixing social media, NFTs, and Crypto Art presents unknowns and risks to the transparency and protection of users, the structure of the financial markets, and the applicable rules. It favors a significant increase in the marketing of "tools" that are in many respects not subject to current regulation and capable of determining a high volume of transactions. for the most part, carried out in cryptocurrencies and through profiles characterized by an increasing level of anonymity even in terms of the account picture display. A similar process of mixing social media, NFTs, and Cryptoarte presents unknowns and risks to the transparency and protection of users, the structure of the financial markets, and the applicable rules.

The recent activation on the Robin Hood app of support for withdrawals and deposits of the Polygon token is emblematic of the increasing involvement of users and purchases of NFTs outside the traditional investment circuit. As is well known,

[66] Users will use their Vault i.e. a blockchain-based wallet on Reddit. A Vault offers users a specific digital wallet address which runs on Ethereum-compatible blockchains. For more details https://www.redditinc.com/blog/blockchain-backed-collectible-avatars-coming-to-reddit-via-new-storefront.

[67] CASALE BRUNET, ZICHICHI, HUTCHINSON, MATTAVELLI, FERRETTI, *The impact of NFT profile pictures within social network communities*, International Conference on Information Technology for Social Good, September 2022, https://arxiv.org/abs/2206.06443.

the correlation between Reddit and Robin Hood formed the crux of the Gamestop case, resulting in a rapid assumption of an identical "mass decision" on the financial markets and generating unexpected and unpredictable effects. In the case of Crypto Art's NFTs, there is no common purpose, such as the "survival" of an economic entity like Gamestop.

The only "engine" of the operations carried out is the trust in the contents and the membership of social networks, with a consequent increase in the difficulty of forecasting the effects on the markets.

In addition, investment is increasingly being identified as part of the consumer experience and social interaction[68]. For this reason, the ESMA has hypothesized the usefulness of adopting new guidelines capable of making operators more responsible, primarily when they act in a social environment and when "information" can lead to the purchase of financial products and crypto-assets[69]. This action could be accompanied by a pre-selection of information considered "vital," which is essential for the purposes of making the correct decision and not always reported in communication marketing. While appearing very useful in the abstract, this activity may be difficult to implement. Indeed it would require a careful evaluation of the different types (financial product, cryptocurrency, crypto-asset) in order to identify the "vital" information of each type to be provided to savers and also a simultaneous check not only on availability but also on their complete visibility even at a quick glance.

[68] CANEPA, *Chat & pay: fisionomia e ruolo dei servizi di pagamento offerti dalle Big Tech*, cit., p.168.

[69] ESMA, *Final report on European Commission mandate on certain aspects relating to retail investor protection*, cit.

THE «WILD WEST» OF DIGITAL FINANCE
– DO WE NEED AN(OTHER) EU «SHERIFF»? –

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«*Today we put order in the Wild West of crypto assets and set clear rules for a harmonised market*»

Stefan Berger
Member of the European Parliament

ABSTRACT: *This paper addresses two areas of regulatory deficiencies identified within the Digital Finance Package. Against the background of empirical data on market performance, we claim that the current legal framework which emerges from the Commission's Digital Finance Strategy fails to strike a balance between doing enough and doing too little. While the MiCAR regime unveils the risk of regulatory overkill, certain crucial aspects in the area of consumer protection remain untouched by any legislative activity.*

1. Financial markets have been traditionally permeable and receptive to digital innovation. Historically, the financial sector has reacted with ease and agility to

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technological advances with the development of new business models, and the provision of new products and services and the accommodation of existing structures, procedures, and transactional schemes. The second wave of digital transformation, fueled by the convergence and the synergetic combination of transformative and disruptive technologies (artificial intelligence, internet of things, platforms, big data, augmented reality, virtual reality, distributed ledger technologies, etc) is also swiftly and extensively permeating the market as evidenced by promising adoption rates among users, expanding presence of fintech[70] firms and the emergence of new market players, and the growing use of digital finance solutions by incumbents. The impact of this second generation of digital technologies is impacting on the business models, the market conditions, and the sector structure,[71] but it is also, and significantly, challenging regulatory strategies.[72]

On the one hand, a burgeoning, increasingly sophisticated, and dynamic fintech market has forced to reconsider the regulatory perimeters and the contours of the supervision sphere in the financial sector. A careful reflection is needed to strike the right balance between promoting innovation, and unleashing the benefits of digital finance. and ensuring market stability, integrity and transparency and protecting consumers' rights without raising undesired barriers to entry and creating inefficiencies. Emerging business models, actors, and products are challenging traditional regulatory perimeter. Whether expanding or not the regulatory perimeter to capture all emerging models constitutes a crucial policy decision with substantial

[70] Fintech is used as an umbrella term describing "technology-enabled innovation in financial services that could result in new business models, applications, processes or products, with an associated material effect on the provision of financial services" – FSB, Financial Stability Implications from Fintech 7 (2017), https://www.fsb.org/wp-content/uploads/R270617.pdf.

[71] World Economic Forum, *The Future of Financial Services. How disruptive innovations are reshaping the way financial services are structured, provisioned and consumed, An Industry Project of the Financial Services Community prepared in collaboration with Deloitte*, Final Report, June 2015.

[72] As described in RODRÍGUEZ DE LAS HERAS BALLELL, *The Layers of Digital Financial Innovation: Charting A Regulatory Response*, Fordham Journal of Corporate & Financial Law, vol. XXV, pp. 381-421, 2020.

effects on the European competitiveness, the social and economic growth and the citizens' rights and interests.

On the other hand, while the first wave of digital transformation has proved to complete a cycle from disintermediation to reintermediation – with the rise and expansion of digital (centralized) platforms -, the second wave is pushed by technologies that enable decentralized models and distributed schemes. Decentralization is a challenging feature to be embraced and effectively addressed by regulation (and legislation, generally). Decentralised schemes questioned many assumptions of legacy regulatory solutions. A fresh approach is needed and a prudent and thoughtful response is advisable. No action might not necessarily be the optimal policy option to be finally chosen. But certainly, there are issues to carefully pondered. Crypto markets are conspicuous examples of the decentralizing trend. The regulatory response is neither straightforward nor innocuous. While no or too-late regulatory intervention may leave the market foundations seriously touched and disequilibrate the whole sector, a too-early intervention may asphyxiate growth and stifle innovation. But not only timing is critical. It is also a matter of how and how much. Regulation may be insufficient or excessive, may allocate incentives wrongly, put too much pressure on incumbents, raise unintendedly barriers to entry for new entrants, or interfering in market competition or in product innovation. Therefore, demarcating the regulatory scope and, in the case of crypto markets, determining who to regulate are instrumental decisions in the policy making.

The European Union is deploying an extraordinary regulatory action programme in the building of a Digital Single Market with an ambitious and expansive agenda on the platform economy, the data economy, the use of artificial intelligence. The adoption of a number of very relevant pieces of legislation and promising proposals and initiatives is paving the path for a pioneered comprehensive legal framework for the expanding digital economy. A hoped-for transversal and cross-sectoral legal framework that has to be accompanied, elaborated on and specified by sector legislation and regulation. At this point, a strong case has to be

made for the need of ensuring consistency, coherence, and alignment of policy goals and solutions, filling gaps, avoiding overlaps, and refining deficiencies.

With all the particularities of the sector, the economic implications, and the policy considerations, the Digital Finance Strategy is and can be regarded as a piece of this macro-strategy for the digital future of the European Union. Under such a systemic approach, the digital finance market might benefit from positive spillovers of the intensive consumer protection and citizen/human-centric approach emanating from the Digital Single Market strategy.

2. Given the above, this paper intends to address two areas of regulatory deficiencies identified within the Digital Finance Package[73].

This research adopts a Law and Economics perspective and takes data provided by the Italian securities and markets authority (Consob) in the summer of 2022[74] as an analytical point of departure. We highlight the main challenges and concerns that Digital Finance appears to impose on the market structure and players, as well as on the prudential supervision mechanism. As we do not intend to offer a

[73] As a result of the Commission's Digital Finance Strategy, currently MiCAR and DORA are being discussed and negotiated between the Commission, the Parliament and the Council with the aim of reaching final agreements in late 2022 or early 2023, while the DLT Regulation has already been approved and has entered into force in late June 2022. These acts, referred to as the Digital Finance Package, are aimed at: (i) making Europe fit for the digital age and building a future-ready economy that works for the people; (ii) further enabling and supporting the potential of digital finance in terms of innovation and competition; (iii) mitigating the risks arising out of the digital transition of finance. On the Digital Finance Package see *inter alia* ANNUNZIATA, *La disciplina del mercato mobiliare*, Turin, 2021, p. 28-31; BUSCH, *The future of EU financial law*, EBI Working Paper No. 93/2021, p. 16 ff.; ID., *EU financial regulation in times of instability*, in *Financial stability amidst the pandemic crisis: on top of the wave*, edited by Gortsos and Ringe, EBI Book Series, 2021, p. 117 ff.; ZETZSCHE – ANNUNZIATA – ARNER – BUCKLEY, *The Markets in Crypto-Assets regulation (MiCA) and the EU digital finance strategy*, in *Capital Markets Law Journal*, 2021, p. 203-206; CIOCCA, *Pacchetto Finanza Digitale - Audizione della CONSOB presso la VI Commissione permanente (Finanze) della Camera dei Deputati*, 2021, available at *www.consob.it*.

[74] See, recently, *Comunicazione della Banca d'Italia in materia di tecnologie decentralizzate nella finanza e cripto-attività*, Rome, June 2022, available at *www.bancaditalia.it.* Also see C. BIANCOTTI, *What's next for crypto?*, in *Banca d'Italia, Questioni di Economia e Finanza (Occasional Papers)*, September 2022.

detailed dogmatic analysis of the legal state-of-play, our aim is to highlight and explore two issues which we identify as emerging regulatory flaws of the Digital Finance Strategy's implementation. On the one hand, (i) we explore highlight its deficiencies, gaps and disincentives that follow from the MiCAR regime and identify the risk of regulatory overkill in that respect. On the other hand, (ii) we explain an imminent regulatory gap regarding the protection of consumers that do not actively participate in the digital revolution in financial services provision.

3. As recently pointed out by Consob[75], data that refers to investment in crypto-assets is remarkable.

The Italian Authority shows that:

(i) since 2020, the number of crypto-currencies and other crypto-assets has been growing: over 10,300 as of April 2022 (from around 2,400 in 2020)[76];

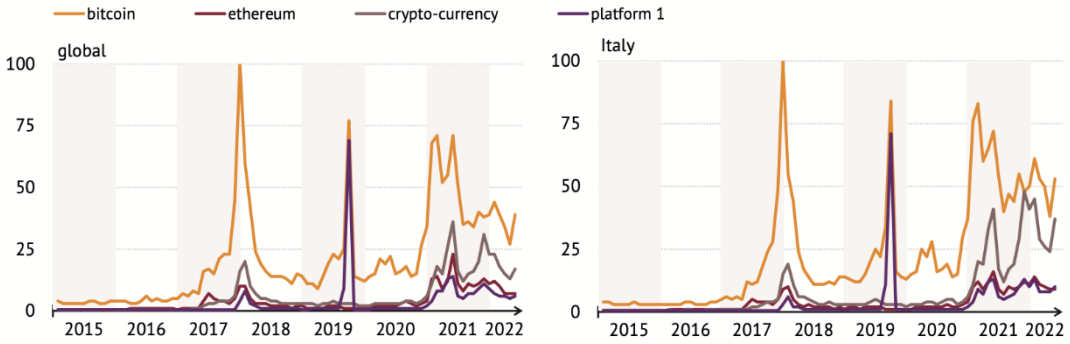
(ii) decentralised finance applications (Decentralised Finance or DeFi) have been growing as well: in fact, it must be underlined that «the value locked in DeFi applications (used as a size proxy) increased from 16.5 billion USD at the end of 2020 to about 56 billion USD in May 2022 (peaking at over 95 billion USD at the end of 2021)»[77];

(iii) since 2021, the number of crypto-asset owners has increased and, «among the major European economies, it ranges from 5% in the UK to 2% in Italy»[78].

The importance of such data is convincingly displayed in the following charts:

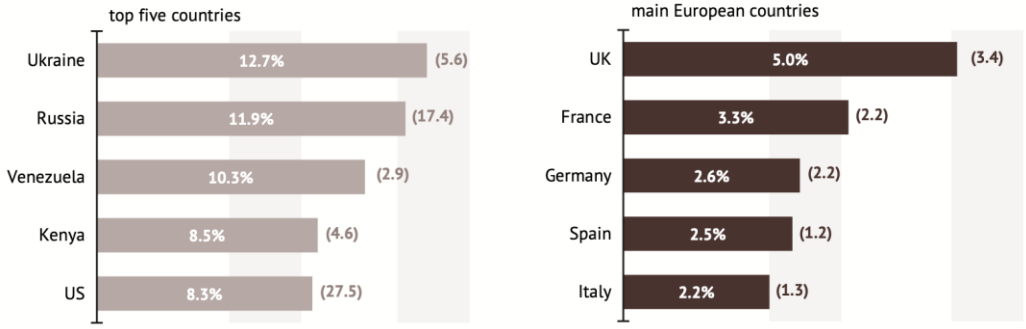
Chart 1: Interest in crypto-currencies over time based on web searches (monthly data up to May 2022)

[75] CONSOB, *Emerging trends in sustainable investing and cryptoasset markets*, Rome, June 2022, p. 7, available at *www.consob.it*, which is also the source of Charts 1, 2, 3, 4 and 6 below.
[76] CONSOB, op. cit., p. 6.
[77] CONSOB, op. cit., p. 7.
[78] CONSOB, op. cit., p. 7.



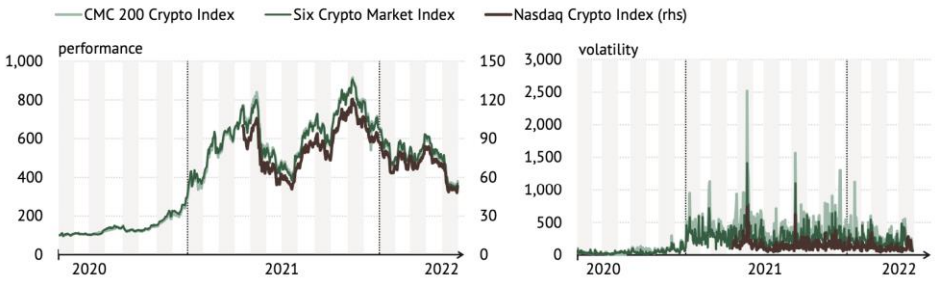
Source: Google Trends. Volume of searches made on Google of the words 'bitcoin', 'ethereum', 'cryptocurrency' and the name of the largest crypto exchange platform (platform 1 in the graphs). Indices are calculated as the ratio between the number of searches on a topic and the total number of searches made in each geographical area over the period considered. Indices range between 0 and 100, where 100 represents the highest frequency of searches detected.

Chart 2: Owners of crypto-assets by country (data as of 2021, share of country population in percentage; millions of owners in brackets)



Source: TripleA; https://triple-a.io/crypto-ownership/.

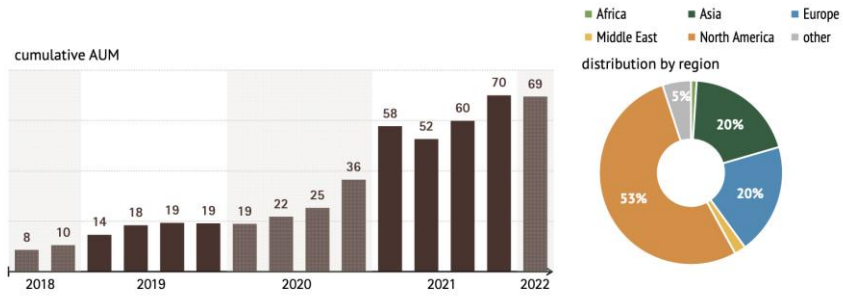
Chart 3: Trends in Cryptocurrency Markets (daily data up to 31 May 2022; 29 April 2020=100)



Source: calculations on Refinitiv data. Nasdaq crypto index tracks the performance of digital assets traded in US$; its current composition is: Bitcoin (weight equal to 67%), Ethereum (weight equal to 30%), Litecoin (weight equal to 0.75%), Chainlink (weight equal to 0.64%), Uniswap (weight equal to 0.35%), Bitcoin cash (equal to 0.44%), Stellar Lumens (weight equal to 0.32%), Filecoin (weight equal to 0.3%), Axie Infinity (weight equal to 0.36%), Sandbox (weight equal to 0.27%). CMC 200 Index includes first 200 cryptocurrencies by market capitalisation. Six Swiss 10 crypto index includes the first 10 cryptocurrencies by market capitalisation traded on Swiss Stock Exchange. Figure on the right reports volatility computed as the difference between the highest and the lowest price recorded during each day (range based indicator).

Turning to the mutual funds sector, the investments in products dedicated to crypto-assets have increased as follows:

Chart 4: Assets under management of funds investing in crypto-assets (amounts in billions of USD)



Source: Crypto Fund Research; https://cryptofundresearch.com/q1-2022-crypto-fund-report/. Figures refer to crypto hedge funds, venture funds, hybrid funds, private equity funds, fund of funds, and passive funds. Regional composition is based on the fund's primary office location.

Based on the above data, we can conclude that – even after the market turbulence surrounding crypto-assets in the past months – the dissemination of such assets is still very relevant, especially in certain countries and population segments. The regulators and supervisors cannot ignore this trend and are currently facing great challenges, in terms of determining both the scope of the upcoming regulatory framework and the instruments that should feature it. Finding an efficient point of equilibrium between market freedom and the protection of investors and consumers will not be an easy task. However, as explained below in greater detail, the EU lawmaker has already made comprehensive legislative proposals as regards the matters at hand. As currently «national frameworks governing crypto-assets diverge quite extensively»[79] the aim is to grant greater legislative consistency and harmonization.

4. As displayed by the above data and the current market trends, Digital

[79] EUROPEAN CENTRAL BANK (ECB), *Licensing of crypto-asset activities*, Supervision Newsletter, August 2022, available at *www.bankingsupervision.europa.eu*.

Finance gathers momentum in the technical, economic, and legal context. Such growth is bringing up pressing questions on the policy and regulatory engagement with the said phenomenon. Furthermore, the anticipation of future supervisory positions and approaches raises important issues. In particular, Decentralized Finance and crypto-assets have been identified *inter alia* as key elements to be addressed to evaluate the resilience and risk-tolerance of the markets and their players.

Consequently, lawmakers and authorities are progressively providing operators and practitioners with an increasingly massive number of provisions and official positions. The final goal is to make the system compliant with rules that intend to provide a detailed regulation of the subject matter and to enlighten the "dark side" of the above-mentioned assets. Efficiency goals coincide with social-policy-based safety concerns.

Among such provisions, specific attention must be paid to a recent turning point for the EU regulation on the subject matter: on June 30, 2022, the EU Council Presidency and the European Parliament negotiators finally reached a final political agreement on the regulatory framework to be applied to the crypto-asset markets, namely the already mentioned MiCAR. Through this new legal framework, the European Union intends to take the lead in the crypto-assets regulatory landscape and so to become the «Sheriff» of this new aspect of the Digital Finance revolution.

Reference made to this topic, it must be remembered that, as institutionally pointed out, Digital Finance has quite a broad horizon: Digital Finance «is the term used to describe the impact of new technologies on the financial services industry. It includes a variety of products, applications, processes, and business models that have transformed the traditional way of providing banking and financial services»[80]. Consequently, the identification of capacities to efficiently supervise such a nebulously defined market appears to be an enormous challenge.

[80] EUROPEAN COMMISSION, *Digital finance*, available at *https://finance.ec.europa.eu/digital-finance_en*.

In order to better understand the evolution of the topic, it is also crucial to pay attention to its background. Digital Finance has a brief but intense history. With the aim of modernizing the European economy and turning Europe into one of the global digital players, on September 24, 2020, the European Commission (EC) adopted the above-mentioned Digital Finance Package and issued its Digital Finance Strategy[81]. It was mainly intended to (i) address the problem of fragmentation in the Digital Single Market; (ii) ensure that the EU regulatory framework facilitates digital innovation in the interest of consumers and market efficiency; (iii) create a European financial data space to promote data-driven innovation, building on the European Data Strategy; and (iv) address challenges and risks associated with the digital transformation, in particular, to promote resilience, data protection and appropriate prudential supervision.

Importantly, for European lawmakers, Digital Finance is crucial for the general transition of the economic and financial system, even more after the crisis of recent years[82].

In fact, as pointed out by the Commission, «boosting digital finance would therefore support Europe's economic recovery strategy and the broader economic transformation», opening «new channels to mobilize funding in support of the Green Deal and the New Industrial Strategy for Europe»[83]. Moreover, it is being emphasized that Digital Finance «accelerates cross borders operations, it also has the potential to enhance financial market integration in the banking union and the capital markets union, and thereby to strengthen Europe's Economic and Monetary Union».

5. Following the above analysis of the main market data and the general

[81] EUROPEAN COMMISSION, *Questions and Answers: Digital Finance Strategy*, *legislative proposals on crypto-assets and digital operational resilience*, *Retail Payments Strategy*, 2020, available at *https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1685*.

[82] See, on this topic, CAPRIGLIONE, *The financial system towards a sustainable transition*, in this *Review*, 2021, p. 1 ff.

[83] EUROPEAN COMMISSION, *Digital finance package - Press release*, available at *https://ec.europa.eu/info/publications/200924-digital-finance-proposals_en* .

overview of the MiCAR framework – that as well-known intend to provide a brand-new uniform and Europe-based regulation for (not all the) cryptos – stemming out of the Digital Finance Package, it is crucial to focus on some pivotal aspects. More specifically, we intend to pay attention to the following main aspects: (i) problems related to regulatory intervention; (ii) critical analysis of the incentives and disincentives of the framework; (iii) AML profiles[84,85]; and (iv) link with the topic of non-financial sustainability.

As confirmed in the proposal, MiCAR has one key target: it intends to discipline crypto-assets falling outside existing EU financial services legislation (namely, that under the Markets in Financial Instruments Directive or MiFID), as well as e-money tokens. In light of the above, the proposal provides the operators with a definition of crypto-assets, that are «digital representation of value or rights which may be transferred and stored electronically, using distributed ledger technology or similar technology»[86]. In that regard, it must be underlined that «Crypto-assets can take on different forms and have various characteristics» and that, «a *summa divisio* can be made between cryptocurrencies on the one hand, and tokens on the other hand»[87].

[84] On this topic see MINTO, *Disciplina antiriciclaggio e obbligo di adeguata verifica della clientela: aspetti normativi e regolamentari legati all'outsourcing ad external service providers*, in Banca impresa soc., 2022, p. 295 ff.

[85] With reference to the AML profile, it is worth recalling the position of the Luxembourg CSSF, that on March 3, 2022, in the document *Faq Virtual Assets – Undertakings for Collective Investment*, to the question «*What is expected from Luxembourg Investment Fund Managers in terms of AML/CFT Due Diligence on Virtual Assets?*» answered that «Depending on the type of investment (direct or indirect), the type of virtual asset (for example cryptocurrency, utility token, etc...) and the way of acquisition (exchange platform, ITO, ICO, etc...), the level of ML/TF risk as well as the due diligence will vary», but «The key outcome of the due diligence on virtual assets is to understand where the virtual assets are coming from and/or where they are going to (buy/sell side) in order to mitigate the risk of the investment fund being abused by money launderers or terrorist financing».

[86] See the Proposal for a Regulation on Markets in Crypto-Assets (MiCAR). On MiCAR see ZETZSCHE - ANNUNZIATA – ARNER – BUCKLEY, op. cit., p. 203 ff.; TOMCZAK, *Crypto-assets and crypto-assets' subcategories under MiCA Regulation*, in *Capital Markets Law Journal*, 2022, p. 365 ff.

[87] See HOUBEN – SNYERS, *Crypto-assets. Key developments, regulatory concerns and responses*, Study for the Committee on Economic and Monetary Affairs, Policy Department for Economic,

More particularly, «Cryptocurrencies (or coins), such as Bitcoin and Litecoin, are those crypto-assets that are designed or intended to perform the roles of currency, i.e. to function as a general-purpose medium of exchange, a store of value and a unit of account.

They are intended to constitute a peer-to-peer alternative to government-issued legal tender», whereas «Tokens, on the other hand, are those crypto-assets that offer their holders certain economic and/or governance and/or utility/consumption rights»[88].

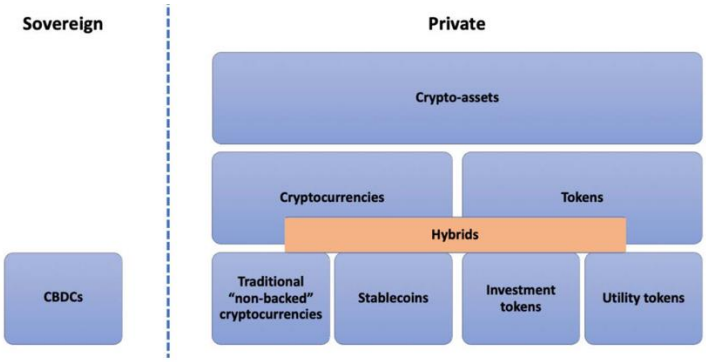


Chart 5: Taxonomy of crypto-assets[89]

Through MiCAR, EU lawmakers and authorities intend to score four somehow antithetical goals, and so to (i) provide citizens with a legal certainty on crypto markets; (ii) support the innovation of such assets, in a safe and regulated system; (iii) protect consumers and investors; and (iv) ensure financial stability. The «sum» of such goals would be, if realized, the creation of an efficient digital financial ecosystem that.

Scientific and Quality of Life Policies, European Parliament, 2020, available at *http://www.europarl.europa.eu/supporting-analyses*. On this topic see also SCIARRONE ALIBRANDI, *Il testo unico finanziario alla prova del fintech*, in *Il Testo Unico Finanziario*, directed by Cera and Presti, 2020, I, p. 29 ff.; PELLEGRINI, *Transparency and circulation of cryptocurrencies*, in *Open Review of Management, Banking and Finance*, 2021, p. 1 ff. For a general introduction see also MAUME – MAUTE – FROMBERGER, *The law of crypto assets. A handbook*, Munich, 2022.

[88] See HOUBEN – SNYERS, op. cit., p. 18.

[89] See HOUBEN – SNYERS, op. cit., p. 23.

In order to realize its targets, the proposal lays down uniform and quite heavy rules for (i) transparency and disclosure requirements for the issuance and admission to trading of crypto-assets; (ii) authorization and supervision of crypto-asset service providers and issuers of asset-referenced tokens and issuers of electronic money tokens; (iii) operation, organization and governance of issuers of asset-referenced tokens, issuers of electronic money tokens and crypto-asset service providers; (iv) consumer protection rules for the issuance, trading, exchange and custody of crypto-assets; and (v) measures to prevent market abuse to ensure the integrity of crypto-asset markets.

Concerning another aspect, it must be noted that supervisory activity according to MiCAR follows two paths. First, the new framework wishes to impose specific and heavy requirements on crypto-assets issuers (other than asset-referenced tokens or e-money tokens). Under Article 4 of MiCAR an issuer shall not offer such assets to the public in the Union, or seek an admission of such assets to trading on a trading platform for crypto-assets, unless (the relevant issuer) (i) is a legal entity, (ii) has drafted a crypto-asset white paper in accordance with Article 5[90], (iii) has notified such crypto-asset white paper in accordance with Article 7, and (iv) publishes the crypto-asset white paper in accordance with Article 8[91], (v) complies

[90] Stating *inter alia* that «The crypto-asset white paper referred to in Article 4(1), point (b), shall contain all the following information: (a) a detailed description of the issuer and a presentation of the main participants involved in the project's design and development; (b) a detailed description of the issuer's project, the type of crypto-asset that will be offered to the public or for which admission to trading is sought, the reasons why the crypto-assets will be offered to the public or why admission to trading is sought and the planned use of the fiat currency or other crypto-assets collected via the offer to the public; (c) a detailed description of the characteristics of the offer to the public, in particular the number of crypto-assets that will be issued or for which admission to trading is sought, the issue price of the crypto-assets and the subscription terms and conditions;(d) a detailed description of the rights and obligations attached to the crypto-assets and the procedures and conditions for exercising those rights; (e) information on the underlying technology and standards applied by the issuer of the crypto-assets allowing for the holding, storing and transfer of those crypto-assets; (f) a detailed description of the risks relating to the issuer of the crypto-assets, the crypto-assets, the offer to the public of the crypto-asset and the implementation of the project; (g) the disclosure items specified in Annex I».

[91] Stating that «1. Issuers of crypto-assets, other than asset-referenced tokens or e-money tokens, shall publish their crypto-asset white paper, and, where applicable, their marketing communications, on

with the requirements laid down in Article 13. Indeed, exclusions and limitations apply, whereby the above requirements do apply in relation to specific situations which justify a differentiated treatment, in accordance with Article 4, par. 2[92].

Second, specific attention must be paid to the arrangement of supervisory techniques that – for sure – will lead to a more complex and expensive (and therefore, probably economically inefficient) playing field. In that regard, it must be underlined that MiCAR offers a detailed regime on the powers of competent authorities and cooperation between competent authorities, the European Banking Authority (EBA) and ESMA (see art. 81 and following).

Within this framework, it is stated that NCAs shall have many supervisory and investigative powers, as those to collect (ask and obtain) information; to disclose, or to require a crypto-asset servicer provider to disclose all material information which may have an effect on the provision of the crypto-asset services in order to ensure consumer protection or the smooth operation of the market; and in urgent cases, to order the immediate cessation of the activity without prior warning or imposition of a deadline, where there is a reason to assume that a person is providing crypto-asset services without authorization. To reach such targets, it is also confirmed that competent authorities shall have specific supervisory and investigatory powers, likewise that one to request the freezing or sequestration of assets, or both and to

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their website, which shall be publicly accessible, by no later than the starting date of the offer to the public of those crypto-assets or the admission of those crypto-assets to trading on a trading platform for crypto-assets. The crypto-asset white paper, and, where applicable, the marketing communications, shall remain available on the issuer's website for as long as the crypto-assets are held by the public. 2.The published crypto-asset white paper, and, where applicable, the marketing communications, shall be identical to the version notified to the relevant competent authority in accordance with Article 7, or, where applicable, modified in accordance with Article 11».

[92] Affirming that the requirements under points (ii)-(v) above shall not apply where «(a) the crypto-assets are offered for free; (b) the crypto-assets are automatically created through mining as a reward for the maintenance of the DLT or the validation of transactions; (c) the crypto-assets are unique and not fungible with other crypto-assets; (d) the crypto-assets are offered to fewer than 150 natural or legal persons per Member State where such persons are acting on their own account; (e) over a period of 12 months, the total consideration of an offer to the public of crypto-assets in the Union does not exceed EUR 1 000 000, or the equivalent amount in another currency or in crypto-assets; (f) the offer to the public of the crypto-assets is solely addressed to qualified investors and the crypto-assets can only be held by such qualified investors».

impose a temporary prohibition on the exercise of professional activity.

The above framework, briefly summarized, clearly shows a «huge intervention» of the public authorities in the crypto market. It seems justified to assert that the regulatory intervention generates the risk of causing a deep distortion of the fundamental characteristics of the subject matter. As rightly noted in the literature, from a regulatory standpoint, «Based on the subjective qualities of the issuer itself (art. 4), on the presence of an informative white-paper (art. 5) and a minimum content for marketing communications (art. 6), the MiCAR is building the pillars for seeking to prevent the most common information asymmetries, as well as the provision of the right of withdrawal would protect consumers from their own irrational decisions (art. 12)»[93]. This expresses the principle of 'same activity, same risk, same rules and same supervision', which dictates «a clear commitment on policy makers to promote a regulation for a market that effectively supports negotiations based on high-tech mechanism, in order to ensure that such market will reach an equilibrium that complies with the levels of safety, stability, transparency and protection that qualifies the EU internal market»[94].

However, the huge powers conferred to the supervisory authorities paired with some disclosure mechanisms provided by the MiCAR framework, appear to violate the *raison d'être* of crypto-assets. While a safer system for investors is probably provided, the nature of the phenomenon that is being regulated seems at risk. It is worth underling that – at the present day – crypto-assets do already find their own "market rules", which evidently find their efficiency in those (assumed) critical elements (de-centralization) that the regulatory intervention would like to solve.

It follows that the excessive regulatory intervention in this regard could paradoxically and apodictically centralize a system whose decentralized defines its

[93] On this topic see LEMMA, *The public intervention on cryptocurrencies between innovation and regulation*, in *Open Review of Management, Banking and Finance*, 2022.
[94] On this topic see LEMMA, *The public intervention on cryptocurrencies between innovation and regulation*, in *Open Review of Management, Banking and Finance*, 2022.

nature. Further, it will probably lead to a shrinking of the market and its related growth prospects, given only by virtue of its "sheltering", the market could find the hoped-for development.

This topic is fundamental, as it underlines two pivotal topics of economic law: the (not so easy) relationship between economic (and technological) development and law, and the need to strike a balance between private autonomy and public regulation. Moreover, it shows the importance of clearly questioning the efficiency of a centralized system with respect to a decentralized one. It should also be noted that the strive for decentralization is not limited to DeFi, as it is a key social and political trend of the current years, strictly linked to a general feeling of mistrust in centrical schemes and organizations, which led to events of great magnitude, such as a period of deep Euro-skepticism which led *inter alia* to Brexit and widespread political turmoil across the EU.

In addition, the new regulatory framework on crypto-assets could negatively affect the European markets, which will be characterized by far more detailed and penetrating regulations than other markets. Against the backdrop that efficient models of supervisory cooperation with third countries are missing, a softer regulatory approach would certainly be more capable of attracting non-EU investments. Consequently, both (i) the EU innovative but hard approach to the subject matter and (ii) the envisaged presence, in crypto markets, of an EU «Sheriff» could lead to serious competitive disadvantages for the European economy.

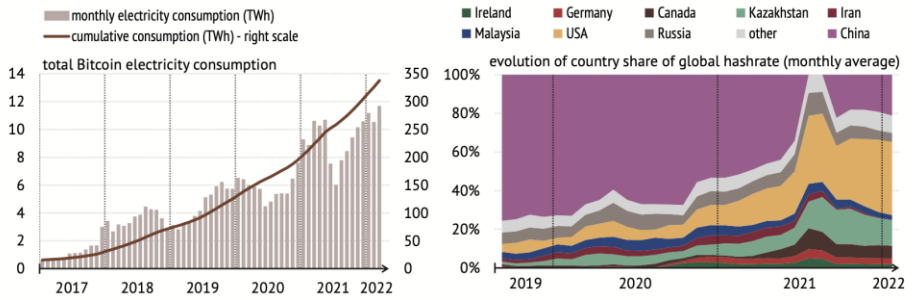
In terms of the supervisory effort that will encompass the MiCAR regime, it can be argued that the capacities of an EU «watchdog» would certainly be better allocated in different areas, for example, AML.

Reference made, in the end, to the link between crypto-assets and non-financial sustainability[95], the current provisions seem to forget – or at least not to pay

[95] On this topic see CAPRIGLIONE, *The financial system towards a sustainable transition*, cit., p. 1 ff. See also MACCHIAVELLO – SIRI, *Sustainable finance and fintech: Can technology contribute to achieving environmental goals? A preliminary assessment of 'Green FinTech'*, in EBI Working Paper

enough attention to – the strong impact of Digital Finance on the environment, not focusing nor formulating any clear and strong link between MiCAR and the EU legal framework for sustainable finance. It is worth recalling that despite well-known evidence concerning the energy consumption related to Digital Finance, the positive impact that the so-called Green Fintech could have on the sustainable transition is of high importance.

Moreover, it must be briefly noted that – forgetting for a while the environment aspect and especially thanks to the technological evolution – at least the "S" factor of the ESG seems to be at least reachable in a context in which the technological evolution itself seems to allow an easier access to finance by the EU citizens.



Source: Cambridge Energy Consumption Index. In the left graph, monthly electricity consumption figures are the sum of daily consumption figures calculated by assuming constant power usage over 24 hours at the daily best-guess estimate of Bitcoin's network power demand. The cumulative consumption is the sum of monthly totals. In the right graph, hashrate measures the total computing power in proof-of-work network like Bitcoin.

Chart 6: Total Bitcoin Energy Consumption and hash rate by country

6. In its Digital Finance Strategy, the Commission unequivocally asserts that the future of finance is digital [96]. This is being understood as a positive development not only for businesses but also for consumers. Interestingly, the Commission states that the people and businesses of Europe are ready for this revolution. This forward-

No. 71/2020; BODELLINI – SINGH, *Sustainability and finance: utopian oxymoron or achievable companionship?*, in this *Review*, 2021, p. 163 ff.

[96] EUROPEAN COMMISSION, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on a Digital Finance Strategy for the EU*, 24.9.2020, available at *https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0591*.

looking enthusiasm seems to provoke assumptions as regards consumers' adjustment abilities. The strong notion of consumers' alleged "readiness" to shift their financial matters to the digital space most probably lies at the core of the apparent regulatory gap the Digital Finance Package leaves unattended.

When examining the fourth priority of the Digital Finance Strategy it becomes evident that the notion of consumer protection within this document is narrow. It only covers the challenges and risks that arise for the *active* participants of Digital Finance. Consumers who are affected by the digital revolution but fail to become its active participants remain completely outside the scope of regulatory efforts. Consequently, the risks of digital exclusion in the area of financial services are neither addressed nor debated. This must seem quite surprising, as the problem of digital exclusion has long been identified both in academic and popular debate[97]. As a result, the Commission fails to engage with the fundamental topic of consumer heterogeneity[98].

A substantial feature of Digital Finance is the replacement of on-site financial services provision. The abandonment of the traditional means of rendering basic financial services is emblematically reflected in the empirical data on the steady decrease in the number of bank branches across Europe[99]. The switch from on-site to digital services certainly increases the overall accessibility of financial services for the average consumer. However, this narrative erodes when examining the access to financial services in reference to specific customer groups, which raises the alarm of potential discrimination. The use of online banking platforms requires basic proficiency in electronic devices and the nature of financial services. Market

[97] MCKILLOP – WILSON, *Financial exclusion*. Public Money and Management, Vol. 27, No. 1. 2007, p. 9; KOSSECKI – BORCUCH, *Digital, Social and Financial Exclusion Among Elderly People. Demographic Problems of Europe. Polish Example*, 17.08.2014), available at: https://ssrn.com/abstract=2482052 or http://dx.doi.org/10.2139/ssrn.2482052.

[98] MÖSLEIN, *Behavioural analysis and socio-legal research: is everything architecture?* In *Research Methods in Consumer Law - A Handbook*, directed by Micklitz, Sibony and Esposito, Edward Elgar, 2018, p. 446.

[99] BENNET, *Bank branches: why are they closing and what is the impact?,* 2019, available at: https://commonslibrary.parliament.uk/research-briefings/cbp-8740/

behavior, preferences, access to digital devices, and, most importantly, the cognitive abilities of consumers vary. Consequently, the digitalization of finance can actually limit access to financial services for certain consumer groups. In particular, this phenomenon is being detected amongst the elderly[100]. Due to their specific characteristics, the elderly value personal contact when taking care of their financial issues[101]. Existing research clearly shows that digital skills and financial literacy are lower amongst the elderly than in other age groups[102].

Financially excluded people are exposed to the loss of direct benefits associated with access to certain services and products, including essential services (e.g., cash withdrawal)[103]. Most importantly, financial exclusion may affect their quality of life and cause social marginalization. Further it can lower the individual's self-esteem due to the need for outside help in order to complete daily tasks[104]. In addition, financial exclusion of specific social groups affects the economy as a whole, including suboptimal market functioning, inadequate allocation of capital, increased burdens on the social welfare system, and slower economic growth[105]. Financial

[100] SANDERS - SCANLON *The Digital Divide Is a Human Rights Issue: Advancing Social Inclusion Through Social Work Advocacy,* (2021) J. Hum. Rights Soc. Work 6, p. 130–143; SVENSSON – BÄCKMAN – ODLÖW, *The Capabilities Approach and the Concepts of Self-Determination, Legal Competence and Human Dignity in Social Services for Older People*, in: *A Multidisciplinary Approach to Capability in Age and Ageing*, directed by Erhag, Lagerlöf., Rydberg Sterner, Skoog, Springer 2022, p. 176; CARTWRIGHT, *The Vulnerable Consumer of Financial Services: Law, Policy and Regulation,* (2015) 38 Journal of Consumer Policy (2015) 38, p. 119.

[101] KESBY, *Narratives of Aging and the Human Rights of Older Persons,* (2017) Human Rights Review, Vol. 18, p. 378.

[102] OEHLER – WENDT, *Good Consumer Information: the Information Paradigm at its (Dead) End?,* (2017) Journal of Consumer Policy Vol. 40. No. 2, p. 179-191l; FINKE – HOWE - HUSTON, *Old Age and the Decline in Financial Literacy*, (2017) Management Science, Vol. 63, p. 213–320

[103] MUBARAK - SUOMI, *Elderly forgotten? Digital Exclusion in the Information Age and the Rising Grey Digital Divide*, The Journal of Health Care Organization, Provision, and Financing, 26.04.2022, available at: https://journals.sagepub.com/doi/full/10.1177/00469580221096272; FRIEMEL, *The digital divide has grown old: Determinants of a digital divide among seniors*, (2016) New Media Soc. Vol. 18(2), p. 313-331.

[104] WALSH – SCHARF – KEATING, *Social exclusion of older persons: a scoping review and conceptual framework*, (2017) European Journal of Ageing, Vol. 14(1), p. 81–98.

[105] COOPER, *The Ageing Population and Financial Services,* available at: www.fca.org.uk/publication/research/future-horizons-ageing-population-financial-services.pdf; LUSARDI, *Financial Literacy and Financial Decision-Making in Older Adults*. Generations: Journal of the American Society on Aging, (2012) Vol. 36, no. 2, 2012, p. 25–32.

exclusion also affects key socio-economic factors, such as inflation, national income, unemployment, supply, demand, and components related to the quality of life[106].

The capacity to execute payments for goods and services is crucial in handling basic needs. Consequently, financial exclusion gravely affects all areas of consumers' societal involvement. While the digitalization in the area of distribution of goods and the rendering of other non-financial services still did not extinguish "traditional" on-site alternatives, Digital Finance incrementally discards these alternatives permanently and abruptly.

The discrimination in terms of access to financial products and services is currently governed mainly by the general prohibition of discrimination, particularly in the form of Art. 21 EChFR as interpreted by the ECJ. However, due to its vagueness, Art. 21 EChFR is an inefficient measure for protecting vulnerable consumers from the unwanted effects of the digital revolution. Specific needs of specific consumer groups were one of five priority areas distinguished by the Commission in the New Consumer Agenda 2020-2025: (1) ecological transformation, (2) digital transformation, (3) redressability and enforcement of consumer rights, (4) specific needs of specific consumer groups, (5) international cooperation.

As noted in the Agenda: "The elderly and people with disabilities have special consumption needs. It is important to ensure easy access to clear and consumer-friendly information both online and offline in accordance with EU requirements for accessibility of products and services. A fair and non-discriminatory approach to digital transformation should take into account the needs of older consumers, consumers with disabilities, and offline users in general, who may be less familiar with digital tools". Although clearly, the Commission has identified the need to protect seniors both through education and by providing specific mechanisms to counter exclusion due to the dynamic digitalization of commerce, no legislative initiatives have yet been taken in this regard.

[106] AYALON, *There is nothing new under the sun: ageism and intergenerational tension in the age of the COVID-19 outbreak,* (2020) International Psychogeriatrics, Vol. 32(10), p. 1–4.

The case for legislative intervention regarding the financial exclusion of consumers vulnerable to financial exclusion within the framework of the Digital Finance Package is supported by a growing tendency to view access to the financial market (the right to financial inclusion) as a human right[107]. Another important argument stems from the transforming societal expectations regarding the role of financial institutions in a new economic and social reality. The assumption that financial institutions carry a particular social responsibility is thus critical when considering the potential legal strategies the Commission could adopt[108] .

Consequently, seeking legal mechanisms to mitigate the risk of financial exclusion seems highly desirable. It is therefore surprising, that the allegedly complex assessment of the digital finance phenomenon by the Commission in its Digital Finance Strategy did not encompass a broader discussion of the interconnected "downsides" for non-digitalized consumers.

[107] KUMAR, *Access to Finance and Human Rights*, (2014) Munich Personal RePEc Archive Paper No. 80336, p. 13.
[108] MAYER, *Prosperity: Better Business Makes the Greater Good*, Oxford University Press 2018, p. 22; LENTER – SZEGEDI – TATAY, *Corporate Social Responsibility in the Banking Sector*, Public Finance Quarterly, (2015), Vol. 1, p. 95-103.

THE "SINGLE TAX PAYMENT" FOR CORPORATIONS AND SELF-EMPLOYED INDIVIDUALS IN RUSSIA

Ilya A. Goncharenko [*] - Olga V. Krivelskaya [**]

ABSTRACT: *This article provides an overview of a new digital method to pay taxes ('single tax payment') to be implemented in Russia. It includes an analysis of the background of the initiative, STP predecessor, current legal framework and criticisms to the legislation and its impact on the banking sector. The aim of the article is to examine current legal environment and possible further developments of the STP mechanism.*

1. In July 2022, Federal Tax Service of the Russian Federation launched a pilot project to introduce a so-called "single tax payment" (a new digital method to pay taxes) (further on referred to as STP) for the legal entities and self-employed individuals (referred to in Russian legislation as "individual businessmen"). The key advantage for the mentioned taxpayers would be a possibility to fulfil the obligation to pay taxes by one payment order without detailing the type of payment, its payment deadline or even a specific budget (federal, regional or local) it is due to be

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paid to.[1] At the same time the businessmen and companies would still have a possibility to pay taxes in accordance with the old scheme using the budgetary classification codes[2].

The initiative of tax authorities to introduce a single tax payment seems logical in the context of making digital relations with taxpayers, but its success will depend on its technical implementation. Federal Tax Service intended to create for the companies the same taxpayer's personal account as for the individuals, where it would be possible to track all the payments in real time[3]. Official site of the Federal Tax Service already serves as a digital platform for personal tax accounts of the individuals. Legal provisions that introduce STP are of temporary nature as basically this is an experiment. Within duration of the experiment to introduce an STP mechanism – between July 1 and December 31, 2022 – it would allow to credit, account for and distribute the taxes and duties paid as STP between budgets of all levels[4]. Such special payment procedure would benefit those taxpayers, who between April 1 and 30, 2022 (but not later, than one month after a joint reconciliation of calculations[5]) submitted a relevant application to use STP. The money paid as STP would be automatically accounted for and offset in accordance

[1] Official data from the official site of the Russian Ministry of Finance, https://minfin.gov.ru/ru/press-center/?id_4=37960-yedinyi_nalogovyi_platezh_budet_integrirovan_v_byudzhetnyi_protsess.

[2] Michael Kotlyar, "Ministry of Finance suggested to simplify taxation for legal entities and businessmen", 08.09.2020, RBC media site, https://www.rbc.ru/business/08/09/2020/5f5704909a7947a3bcbb5073?ysclid=l4ehmuto30519121872.

[3] Ruslan Zafesov, "One click: why FTS wants to introduce a single tax payment", 12.08.2021, Forbes site, https://www.forbes.ru/biznes/437185-odnim-klikom-pochemu-fns-hochet-vvesti-edinyy-nalogovyy-platezh?ysclid=l4snrpjkb281880004. Olga Ageeva, "Business would pay all taxes in a new way starting 2023", 30.12.2021, Vedomosti newspaper site, https://www.vedomosti.ru/economics/articles/2021/12/29/903311-biznes-platit?ysclid=l4rbqj3wkh987940810.

[4] Ibid.

[5] Act of a joint reconciliation of calculations on taxes, fees, penalties, and fines is a voluminous document that contains detailed information regarding taxes and fees. Such reconciliation allows a taxpayer to find out whether the necessary amounts of taxes and fees have been transferred to the budget system of the Russian Federation, whether a debt has been formed, whether fines and penalties for the taxes unpaid on time are accrued to the taxpayer. Definition taken from the official site of the Federal Tax Service of the Russian Federation, https://www.nalog.gov.ru/rn59/news/activities_fts/9072494/?.

with the following sequence in relation to tax liability[6]:

1. Tax arrears, starting their earliest day of discovery.
2. Taxes, advance tax payments, insurance contributions[7] starting the day they become due on the grounds of tax returns, calculations, notifications on the calculated amounts of tax or insurance contributions or advance tax payments.
3. Penalty.
4. Interest on the arrears.
5. Fines.

Companies and self-employed individuals using STP would have to submit a notification on the calculated amounts of taxes, advance tax payments and insurance contributions to the tax authorities by not later than 5 days prior to those become due. But business considers this to be in fact another form of tax reports[8]. It is interesting to note that STP may be made not only by a taxpayer himself but by a different person for the taxpayer's benefit. In this case, such a person would be deprived of a right to claim a return of the paid amount from the budgetary system of the Russian Federation in the future. It is originally planned that STP would create more comfortable environment to perform a liability to make mandatory payments, significantly decrease time to fill in all the payment orders and minimise taxpayer's technical mistakes when filling out the required paperwork.[9]

[6] Official data from the official site of the Federal Tax Service of the Russian Federation, https://www.nalog.gov.ru/rn77/news/activities_fts/12123939/.

[7] Insurance contributions are mandatory payments for mandatory pension insurance, mandatory social insurance in case of temporary disability and in connection with maternity, for mandatory medical insurance collected from organizations and individuals to financially ensure the realization of the insured persons' rights to receive insurance coverage for the corresponding type of mandatory social insurance. Definition from section 8(3) of the Tax Code of the Russian Federation, http://www.consultant.ru.

[8] Ageeva (n 3).

[9] Official data from the official site of the Federal Tax Service of the Russian Federation, https://www.nalog.gov.ru/rn77/news/activities_fts/12123939/.

2. The mentioned above STP experiment is a next step to another STP introduced in 2019 for the individuals only. The preceding STP seems an electronic purse, which any citizen may use voluntarily and in advance (before receiving a notification to pay taxes) to transfer money to in order to be used to pay taxes. It is a kind of "advance wallet" for a taxpayer, where he deposits money for a subsequent payment of taxes and arrears on them[10]. Originally, it was allowed to use such e-purse for individuals to pay property tax, land tax and transport tax.

In 2020 it became possible to make advance payment of income tax on individuals as well, if the latter was calculated, but not deducted by a tax agent. Any citizen may deposit any amount to such e-purse during a calendar year, thus not worrying for a timely payment of taxes in the future. This can be done in a taxpayer's personal account at Federal Tax Service site, which has the actual "wallet" button. STP mechanism for individuals allows to save up money in due course of a calendar year for the purposes of paying taxes. Besides, it eliminates a possibility of an error while paying taxes. The number of deposits to such e-purse, their amount or timing are not in any way limited.

Tax authorities offset the STP themselves, first of all directing the money to pay tax arrears, if any. The remaining amount of STP is left in the "advance wallet" until any taxes are due. Individual is notified about any transaction effected through the "advance wallet" and this information is also reflected in the individual's personal account with the Federal Tax Service site.

It is necessary to consider that if there are no tax arrears, then the STP for individuals would be offset against the future taxes within 10 calendar days since:

- The date a notification of tax payment is sent to a taxpayer, if the STP was paid earlier.
- The date an STP is received in the Russian Federation budget system, if the

[10] Official data from the official site of the Federal Tax Service of the Russian Federation, https:// www.nalog.gov.ru/rn50/ifns/imns_50_07/info/10022779/?.

STP had been paid after the notification of tax payment was sent[11].

It is worth mentioning that any individual may make advance tax payment using STP not only for himself, but also for the benefit of third parties.

3. The draft law extending STP mechanism to legal entities and self-employed individuals was originally developed by the Russian Ministry of Finance and Federal Tax Service of the Russian Federation. They wanted it to become effective since January 1, 2022[12]. The draft law was submitted to the State Duma[13] in April 2021. But it took almost a year for the draft to become a law[14], as Russian President signed it in November 2021 and the law was officially published in December 2021.

Explanatory Note to the mentioned above draft law[15] gives the following tasks and goals for this draft to achieve:

- To improve the order for the taxpayers (including those who pay duties and insurance contributions) to effect their liability to pay taxes, trade duty, duty for using the animal world objects and for using the objects of aquatic biological resources, insurance contributions (mandatory payments altogether).
- To improve the administration of taxes.

Thus, taxpayers are granted a single method to fulfil their duties to make mandatory payments by combining them on one platform, in one payment order without detailing a type of payment, term of its payment, attribution to a particular budget of the Russian Federation budget system[16]. It is presumed that STP

[11] Ibid.

[12] Michael Kotlyar, "Ministry of Finance suggested to simplify taxation for legal entities and businessmen", 08.09.2020, RBC media site, https://www.rbc.ru/business/08/09/2020/5f5704909a7947a3bcbb5073?ysclid=l4ehmuto30519121872>

[13] Lower chamber of the Russian Parliament.

[14] Federal Law N379-FZ dated 29.11.2021 "On amending part one of the Tax Code of the Russian Federation", http://www.consultant.ru.

[15] Explanatory Note to a draft Federal Law "On amending part one of the Tax Code of the Russian Federation in order to improve payment(transfer) of taxes, duties, insurance contributions", https://sozd.duma.gov.ru/bill/1141868-7#bh_histras.

[16] Ibid.

mechanism may accumulate the amounts of excessively paid or excessively collected taxes as well. And the tax authority would be responsible for taking account of all the money transferred to the Russian Federation's budget system via STP on a basis of documents it possesses to cover the taxpayer's liability to make mandatory payments. The proposed regulation for the companies and self-employed would contribute to the formation of a single balance of the taxpayer's settlements with the budget (a single tax account) and would allow to avoid excessive accrual of penalties and excessive collection procedures, in fact making these procedures use a single amount reflecting the result of settlements between all budgets of the Russian Federation's budgetary system and a taxpayer.

Explanatory Note suggested that implementation of the draft law would create more comfortable conditions for the taxpayers to meet their liabilities to make mandatory payments, reduce the costs for the entities involved in cash settlement transactions, and the time of processing the settlement papers, and would also ensure a clear and simple state of the taxpayer's settlements with any budget[17]. Those comfortable conditions include[18]:

- payment by only 2 details (individual taxpayer's number and the actual payment amount);
- single payment term per month;
- single balance of settlements with the budget;
- deadline to refund an overpayment reduced to 1 day.

To study the demand for the projected STP regime and its individual parameters for potential users, the Federal Tax Service of Russia conducted multiple relevant surveys, including those performed jointly with credit institutions among

[17] Ibid.

[18] "Single tax account is a healthy tax settlement", 12.05.2022, Kommersant media site, https://www.kommersant.ru/doc/5348430.

their clients. Such surveys were conducted anonymously for taxpayers[19]. Prior to this draft law there emerged a situation with some 900 trillion variations for the taxpayers in filling out tax payment orders. This implies about 30 million technical errors per year, which lead to reconciliations, offsets, search for payments, penalties, which means additional work, nerves, costs.[20] With the introduction of STP for the companies and self-employed possibilities to make such technical payment errors would be minimized. One of the major problems is that more than 15% of tax payments "hang up" due to technical errors in the details. Such technical errors cause "technical" tax debts, which may lead to the tax authorities blocking taxpayer's bank accounts[21]. Switching to STP will save time and reduce the administrative burden on business.

The mentioned above surveys of the Federal Tax Service of the Russian Federation contained the following original conditions, regarding which tax authorities wanted to receive feedback from the taxpayers (first of all small businesses)[22]:

- Small businesses may be exempted from paying insurance contributions for themselves (for individual businessmen) and their employees (for companies) but a tax rate on doing business would be increased. Relatively in one of the survey sections, the Federal Tax Service asked businessmen whether they would accept an increase in the tax rate by 4 p.p. in case the insurance contributions are canceled.
- The Federal Tax Service will be able to receive information about transactions on the taxpayer's current accounts directly from his/her bank. And the tax authorities, based on the data provided by the banks and cash registers (KKT), will

[19] Anna Balashova, Ivan Tkachev, "FTS has started developing new tax regime for small business", 30.06.2021, RBC media site, https://www.rbc.ru/economics/30/06/2021/60dc59b89a7947e63c847f57?ysclid=l4sa01y5x0563467523.

[20] Dmitri Grinkevich, Olga Ageeva, "Federal Tax Service has named key projects to legalize the economy", 10.09.2021, Vedomosti newspaper site, https://www.vedomosti.ru/economics/articles/2021/09/09/886037-fns-obeleniyu-ekonomiki?

[21] Ageeva (n 3).

[22] Balashova and Tkachev (n 19).

independently calculate tax liabilities and provide them to taxpayers.

- The tax period will be one month.
- Approved deductible expenses will only be the transactions made using non-cash payments and carried out through settlement accounts or recorded by the KKT.
- Business should pay wages only through banks. At the same time, the bank will act as a tax agent for calculating and paying income tax on individuals based on salary registers.
- Business is exempt from accounting and tax accounting, filing reports under a simplified system of taxation (USN), income tax on individuals and insurance contributions, will not have to submit reports to social funds and Rosstat.[23]

But obviously on the grounds of feedback received from business, the STP system was modified in the draft law leaving many originally considered aspects aside with a possibility for further implementation in the future.

4. Business generally perceives the idea positively. Several companies, especially large ones, at an early stage already expressed a desire to participate in the experiment to tune all processes and set up accounting systems. One of the STP advantages is that there is no need to disclose additional information or accounting databases[24].

Introduction of STP would allow any taxpayer to understand his balance of payments with the state, it would be as simple as either you have an overpayment, or you owe something. If necessary, any taxpayer would be able get details on how the balance was formed, how the payments were spread. In due course of one month all the due dates of the mandatory payments may be brought down to one date, then there would be only 4 tax payment orders per annum for 90% of businesses. Or it would be possible even to deposit the whole STP sum once. At

[23] Russian Federal Service of State Statistics, https://rosstat.gov.ru/?%2F.

[24] Olga Ageeva, "Business would pay all taxes in a new way starting 2023", 30.12.2021, Vedomosti newspaper site, https://www.vedomosti.ru/economics/articles/2021/12/29/903311-biznes-platit?ysclid=l4rbqj3wkh987940810>

average for a large business there are currently around 100 due dates for the mandatory payments per annum and introduction of STP would allow to cut this figure down by at least 7 times[25].

STP would largely allow to avoid technical errors at paying taxes, i.e., to reduce a risk of unintentional violations of tax laws. And in the future a single balance of settlements between the state and a taxpayer would give the latter an opportunity to forget about offsets and clarifications, penalties and fines as all the taxes would be paid. Such an innovation would allow to dramatically simplify payment services: making payments using individual taxpayer's number would be as easy as paying by phone, even enabling autopayments.[26]

But on the other hand, business is afraid that tax authorities would not always distribute payments in an optimum way for the taxpayers from the point of view of cost efficiency. For example, STP might be fully used to pay off the arrears and penalties for one tax, but another tax would be unpaid, leading to other arrears and fines.[27] Besides, business expects the STP method to simplify tax administration first of all for the tax authorities.[28]

There is also a point of view that large businesses would have to advance budgets by substantial amounts.[29] A company with multibillion-dollar monthly payments, when replenishing the tax account, immediately diverts huge amounts from its turnover. For instance, what happens if you deposit 500 million rubles for STP one week before the deadline to pay taxes, would there still be a possibility to take those back during this period, as such a need may arise urgently, in the event, for example, of an accident at work.

Although the STP mechanism allows to pay taxes in advance, business is

[25] Dmitri Grinkevich, Olga Ageeva, "Federal Tax Service has named key projects to legalize the economy", 10.09.2021, Vedomosti newspaper site, https://www.vedomosti.ru/economics/articles/2021/09/09/886037-fns-obeleniyu-ekonomiki?.
[26] Ibid.
[27] Ibid.
[28] Ageeva (n 24).
[29] Ibid.

unlikely to keep money on such interest-free tax accounts, except for using it as a specific risk minimization tool. It is a common practice in Russia that business specifically overpays certain taxes if it feels that additional charges are possible as a result of an audit. Then such an overpayment may be offset against the payment of arrears, thus there might be no penalties accrued.[30] Experts suggest that introduction of STP would be mostly significant for the SME, those, who so-to-say have one accountant, working on a part-time basis. Even though legislators refer to a successful experience of introducing STP for citizens. But the taxes on individuals cannot be compared with business taxes in terms of the complexity of administration.[31]

5. Many Russian commercial banks play an active role in making STP popular. They place its description, explanation of major concerns, advantages and disadvantage on their sites thus educating their clients regarding the new digital method of paying taxes.[32] Obviously, commercial banks plan to save on their operational expenses, as STP would allow to cut the number of separate tax payment transactions dramatically, because those would be done by the Federal Tax Service on its digital internet platform. Relatively STP would ease the load on the banks payment systems, decreasing general processing time. But banks being large taxpayers themselves also share concerns of the major Russian businesses regarding the STP. First major issue that Russian commercial banks face regarding STP is the withdrawal of corporate software manufacturers (such as SAP) from the Russian market, which significantly complicates the implementation of STP system. Relatively, banks would have to make additional manual configuration of the existing

[30] Ibid.

[31] Information from the official site of the Russian Chamber of Commerce and Industry, https://news.tpprf.ru/ru/media/2929656/.

[32] For instance, see: the official site of Sovcombank, https://sovcombank.ru/blog/glossarii/chto-takoe-edinii-nalogovii-schet-i-edinii-nalogovii-platezh.one of the official sites of Sberbank, https://sberbusiness.live/publications/elektronnaia-podpis-i-edinyi-nalogovyi-platiozh-chto-izmenitsia-dlia-biznesa-v-2022-godu.

debugged systems. And in a situation where banks are under restrictions/limitations of SAP, any additional adjustments would now require at least twice as much time[33]. Current tax calculation is based on three systems — Oracle, SAP and Teradata, all of which have left Russia. And the main task for the next six months would be to replace these tools, attempt to switch to others. By itself, revision of the system for the transition to STP would not be so frightening if it were not for the current crisis and a number of other problems that IT services are now rapidly solving due to the software manufacturers leaving Russia.[34]

German manufacturer of SAP software has announced its intention to abandon the support and maintenance of local products in Russia. The organization has stopped working with Russian companies under sanctions. In Russia, SAP used to sell enterprise resource management (ERP), customer relationship management (CRM), supply chain management (SCM), production management (ERP Production Planning, MES, EAM, CAD) systems. Among its clients were Sberbank and a great number of other Russian commercial banks. Oracle also suspended its operations in Russia and Microsoft stopped servicing customers under sanctions.[35]

The second major issue for the banks is that transition to an STP might not in fact reduce the administrative burden. The new legal provisions do reduce the number of payment orders, but at the same time introduce an obligation to fill in notifications (on the calculated amounts of tax required by the tax service for the distribution of STP between specific types of taxes and duties), in which all the same details and budget classification codes stay. Banks assume that one document is just being replaced by another, and moreover, to fill out such notifications would require existing business processes to be rebuilt, which may hardly be considered a one—

[33] Katherine Vinogradova, "Large business declared difficulties in switching to single tax account. New system would increase administrative burden on companies in times of crisis", 26.04.2022, RBC media site, <https://www.rbc.ru/economics/26/04/2022/62668be59a7947869f737b65>
[34] Ibid.
[35] Ibid.

hundred-percent simplification.[36]

The third major concern for the banks is a decrease in the efficiency of working capital management. Current legislation makes it possible to replenish a tax account with one payment (STP) and then only manage the distribution of funds. But this is especially sensitive for the banks, as it becomes an inefficient treasury. Any large business, and banks are not an exception, make its money work all the time, i.e., available money is on “overnights” (one-day deposits) or somewhere else, constantly generating income. A one-time transfer of a large amount of taxes means a loss of efficiency in the free balance of funds. So, it is highly likely that in practice banks would make STP at the last moment, just before the taxes are due so as not to lose this efficiency. And the majority of Russian large businesses, being banks’ clients, would most certainly do the same by keeping their funds at bank deposits for as long as possible. Any earlier STP would mean that banks and any other business would credit the state with their money.

It is also necessary to point out that banks play one of the major roles in recognizing that a taxpayer’s liability to pay mandatory payments has been met by way of STP. Namely a taxpayer’s liability would be considered fulfilled through STP the date a payment order is submitted to a bank for the latter to transfer money from the taxpayer’s account (from another person’s account if he pays for the benefit of the taxpayer) to the budget system of the Russian Federation (to a Federal Treasury account) as STP if there is sufficient cash balance. But in any case, the date of the taxpayer meeting his/her liability may not be earlier then the relevant tax becomes due.[37]

Banks bear responsibility for violating a deadline to execute a taxpayer’s payment order regarding STP in exactly the same way as regarding any other mandatory payment. In case of such a violation any bank would have to pay a fine at

[36] Ibid.

[37] Section 45(8), Tax Code of the Russian Federation (part one), dated 31.07.1998 N146-FZ (as amended on 28.05.2022), http://www.consultant.ru.

the amount of 1/150 of the Russian Central Bank's refinancing rate[3839], but not more than 0.2 percent per each calendar day of delay[40]. Generally, extending the STP experiment to companies and self-employed would demonstrate how the system manages such a workload. It is very important that there are no failures and trust in the state represented by the Federal Tax Service is not undermined. It is proposed to make a new STP method mandatory immediately after the trial period, although it might be worthwhile taking a pause to stop and evaluate the results to recognise the experiment as successful or not.

In this case it is not so much an "experiment" as a "trial operation" to identify and work out "shoals" before a full-scale launch.[41] To support the view of a "trial operation" it is necessary to mention a draft law[42] (further on referred to as Draft Law), which the State Duma has already approved and recommended for submission to the upper Chamber of the Russian Parliament. This Draft Law provides for the STP to become mandatory for the companies and self-employed individuals in 2023. It is planned to introduce the following order: instead of different payments of individual taxes, it would be necessary to transfer STP to a single tax account with the Federal Treasury.[43] At the same time, as a rule, to do so a taxpayer would need to specify

[38] The rate used by the Russian Central Bank to credit commercial banks.

[39] Current refinancing rate is 9.5% per annum, see the official Russian Central Bank site, https://cbr.ru/hd_base/KeyRate/.

[40] Section 133, Tax Code of the Russian Federation (part one), dated 31.07.1998 N146-FZ (as amended on 28.05.2022), http://www.consultant.ru.

[41] Olga Ageeva, "Business would pay all taxes in a new way starting 2023", 30.12.2021, Vedomosti newspaper site, https://www.vedomosti.ru/economics/articles/2021/12/29/903311-biznes-platit?ysclid=l4rbqj3wkh987940810.

[42] Draft Law N 46702-8 "On amending parts one and two of the Russian Federation Tax Code (in terms of improving the procedure for paying taxes)", https://sozd.duma.gov.ru/bill/46702-8#bh_note.

[43] One of the Federal Services coordinated by the Ministry of Finance of the Russian Federation, which is responsible for inter alia execution of the federal budget, cashflow services for the execution of budgets of the Russian Federation budgetary system etc. Data from the official Treasury site, https://roskazna.gov.ru/o-kaznachejstve/.

only the individual taxpayer's number.[44] Then the STP amount would be distributed by the tax authorities. The specified account with the Treasury would be maintained for each company, self-employed or individual.[45]

The Draft Law contains an interesting mechanism regarding tax arrears. Any tax debt appears as a negative balance of the taxpayer's account with Treasury. When tax authorities discover the debt, they would issue a demand to pay up the arrears[46]. If a company or self-employed does not fulfill the requirement voluntarily, the tax authorities would have to place their decision in a special register to recover such tax debt.[47] An order for the bank to make a money transfer to pay the debt would be placed there as well and once placed such an order would be considered sent to the bank. The mentioned register would also include resolutions on debt collection at the expense of property and information on bank account blocking.[48] Once bank accounts are blocked under the tax authorities' order, banks will be able to open new accounts for such taxpayer, but it will not be possible to carry out any expenditure operations through them.[49]

The Draft Law also has transitional provisions that tax authorities would make each taxpayer a balance for his/her tax account as of January 1, 2023[50]. After that date every tax debt collection mechanism would go through the tax account only, i.e., tax authorities would not consider paper applications to refund tax overpayments, its offset or tax deferral (payment by installments), if the relevant documents had been submitted earlier, but tax authorities did not make a decision until December 31.

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[44] Section 1(9) of the Draft Law N 46702-8 "On amending parts one and two of the Russian Federation Tax Code (in terms of improving the procedure for paying taxes)", https://sozd.duma.gov.ru/bill/46702-8#bh_note.
[45] Ibid, Section 1(2).
[46] Ibid, Section 1(26).
[47] Ibid, Section 1(11).
[48] Ibid, Section 1(33) (12 and "b").
[49] Ibid, Section 1(33)(p).
[50] Ibid, Section 4.

6. In conclusion, it is necessary to say that currently there is a gradual ongoing digital transformation of the tax sphere taking place in Russia. STP was started back in 2019 only for the individuals and now there is an STP experiment going on for the companies and self-employed with a very strong chance of STP becoming mandatory for every taxpayer in Russia some time in 2023. On one hand, STP is aimed at simplifying the procedure to pay taxes, so that the Federal Tax Service would manage all the technical aspects of distributing the received STP amounts between different budgets of the Russian budgetary system. Once there is sufficient balance on your tax account you do not have to worry about paying taxes. On the other hand, companies and self-employed would still have to submit tax returns and reports to tax authorities. Besides, the mentioned taxpayers would have to advance the state with the money to pay taxes before the latter are actually due. This deprives taxpayers of an opportunity to gain income from placing the currently available amounts on short-term bank deposits. It is very likely that taxpayers would transfer money to their tax accounts to be used as STP shortly before the taxes are due, like only a day or even several hours in advance. This is especially relevant for the large taxpayers with millions of rubles in tax payments. Commercial banks are generally positive about the STP initiative. They even advertise it on their Internet sites, especially for the individuals. But it is evident that banks would have to adjust their software to make and account for the STP, which might not be easy due to the world major software manufacturers having left Russian market. Banks would not advance the state with early money transfers to their tax accounts, as they would rather keep those on overnight deposits generating income. We shall see what the implementation of STP would bring in practice. A lot would depend on how smooth everything goes, first, on the side of Federal Tax Service. But only time will tell.

CRYPTO ASSETS, DECENTRALIZED AUTONOMOUS ORGANIZATIONS AND UNCERTAINTIES OF DISTRIBUTED LEDGER TECHNOLOGIES

Ireneusz Żuchowski* - Francesco Capriglione** - Nunzio Casalino***- Igor Skrodzki****

ABSTRACT: *The properties of the blockchain allow the creation of new organizational forms which, as we will see, mark the passage from goals centralized and top-down logic to so-called distributed networks, in which the participants (defined nodes) are in an equal relationship. To better understand the changes in the organizational design and in decision-making, which are close to the introduction of the blockchain, the article proposes to carry out an examination of the more complex and specific elements of organizational design in financial organizations, thanks to which we will be able to quickly understand the evolution of the different organization design approaches. The national and EU sector authorities are showing great interest in the phenomenon of crypto assets, making a significant contribution to the analysis that international institutions and scholars in the field have been undertaking for some time now to prevent dystonic forms of their use. Significant, in this regard, is the*

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affirmation of a guideline that proposes its collocation among the modes of use of information technology in the banking and financial intermediation sectors: from credit to payment services, to advisory services. Cryptocurrencies - based, as mentioned above, on the decentralised validation of transactions (Blockchain or Distributed Ledger Technology) - are part of this regulating and operational context, which is why some judges have included them in the category of financial instruments, as their essence, according to administrative jurisprudence, can be traced back to «means of exchange for the purchase of goods and services or for investment purposes». The authors in the article also describe the role of organizational design and the importance of the Decentralized Autonomous Organization, considering advantages, disadvantages, and the effective impact for human resource management practices. After that also several aspects of the Blockchain, crypto assets and strategic choices in financial organizations, by a detailed analysis of the role of the national sector authorities and of the Distributed Ledger Technologies in the field of financial services. The article at the end tries to make the point on new challenges and opportunities for the business contexts.

1. Over the past two centuries, companies have experienced a huge change, either technological or social. We are currently going through the strengthening of what in the economic and organizational literature is called the fourth industrial revolution - also defined as the era of Industry 4.0 - characterized by changes made possible thanks to the use of the Internet, big data, dynamic and adaptive algorithms,

machine learning and nano technologies.

All these developments require deep changes for organizations competitive dynamics, in strategic choices, managerial and organizational systems. In essence, companies rely on continuous innovation trying to remain efficient, improve the organization and quality of work and to reduce production costs. To date, change has become imperative. Change is seen as an essential element in the development processes - strategic and organizational - of companies and as a process aimed at increasing the competitive potential of companies.

The frequency with which changes occur is much greater than in the past because companies base their "raison d'être" in the ability to continuously adapt to the external environment to follow or anticipate society and the market.

It becomes essential to define the concept of "organizational change" and some peculiarities of this phenomenon will be understood. Subsequently, the attention will focus on the blockchain phenomenon; therefore, on its introduction in companies and the consequent change.

Changes are implemented by organizations to gain advantage strategically, for this purpose four different types can be identified: technological, product/service, strategy, and structure and cultural.

Let's start with the technological changes, which concern the changes that have taken place in the production process of a company[51]. These are changes that arise the goal of achieving greater efficiency[52], thanks to the innovations of machinery used and work processes, the response capacity of the company itself and overcoming any constraints and resistances that may arise "in itinere".

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[51] R. BASKERVILLE, F. CAPRIGLIONE, N. CASALINO, Impacts, challenges and trends of digital transformation in the banking sector, in Law and Economics Yearly Review Journal - LEYR, Queen Mary University, London, UK, vol. 9, part 2, pp. 341-362, 2020.

[52] J. PFEFFER, Seven practices of successful organizations, California Management, 1998.

strategic decisions, and also structural and cultural impacts[53].

Let's start with the technological changes, which concern the changes that have taken place in the production process of a company. These are changes that arise the goal of achieving greater efficiency, thanks to the innovations of machinery used and work processes.

Then there are the product and/or service changes, through which the company develops new products and/or services or improves those already present in the operational range. The reason for making such a change lies in the possibility to grow in terms of market share and to be able to reach new ones markets and new customers.

Much more complex changes are those of strategy and structure, which they concern: the corporate strategy, the organizational structure and the related coordination and control mechanisms. Generally, they are top-down changes, that is, proposed and imposed by top management downwards.

Among the reasons that lead us to take an interest in the blockchain is the need to know the repercussions that this paradigm can have on an organizational level.

As known, the blockchain was born as a tool to optimize economic transactions in cryptocurrencies. Very often, in fact, this technology is still associated with bitcoins today, but with a fundamental difference: while virtual currency only appeals to some - while others do not perceive its usefulness - almost everyone agrees in affirming the importance of the chain in blocks.

This has the essential task of facilitating access to certified and guaranteed information, making it shared, immediate, and completely transparent through an immutable register that collects all the transactions that are part of a business network. In general, ranging from the food supply chain to art, from the

[53] F. MILANI, L. GARCIA-BANUELOS, M. DUMAS, Blockchain and business process improvement, BP Trends, 2016.

management of real estate properties to purely digital assets[54]. In addition to the fact that only authorized users can access the network, this digitized system is able to generate greater confidence in the security of information, including the accuracy with which it is collected. And all through a significant cost reduction and in general also to the digital transformation adoption.

The properties of the blockchain allow the creation of new organizational forms which, as we will see, mark the passage from goals of centralized and top-down logic to so-called distributed networks, in which the participants (defined nodes) are in an equal relationship.

To better understand the changes in the organizational design and process decision-making, which are close to the introduction of the blockchain, the article is proposes to carry out an examination of the more complex and specific elements of organizational design in financial organizations, thanks to which we will be able to quickly understand the evolution of the different organization design approaches.

2. The national sector authorities are showing great interest in the phenomenon of crypto assets, making a significant contribution to the analysis that international institutions and scholars in the field have been undertaking for some time now to prevent dystonic forms of their use.

Significant, in this regard, is a recent document by the Bank of Italy in which it points out that «a rapid and wide dissemination of these instruments could "jeopardise" the stability of the financial system due to the interdependence of the players involved, both regulated and unregulated, as well as the lack of controls ... that can limit the effects of unfavourable events»[55]. There is a clear fear that crypto

[54] M. PELLEGRINI, A. DAVOLA, N. CASALINO, P. BEDNAR, Striking a balance between profit, people welfare, and ecosystem health in the transition towards a sustainable financial system, Law and Economics Yearly Review Journal - LEYR, Queen Mary University, London, UK, vol. 10, part 2, pp. 295-324, 2021.

[55] See *Bank of Italy Communication on decentralised technologies in finance and crypto assets*, Rome, June 2022.

assets, being able to generate risks of various kinds, if they have “a rapid and widespread diffusion”, may adversely affect the stability of the financial system, given the lack of a ‘centralised manager’ and being in the presence of an activity that takes place in a deregulated sector.

Add to this the careful reflection on ‘crypto assets’ represented by the Bank of Italy in its *Final considerations* of May 2022, when it highlighted the need for an in-depth thematic study of *subiecta materia,* to be considered as unavoidable in view of a regulatory intervention[56]. In particular, it emphasised the growing diffusion of such instruments which, due to the way in which they are issued and the way in which the relevant exchanges are carried out, make use of technologies characterised by an intrinsic riskiness; an orientation in confirmation of which the authority emphasised the ‘recourse to automated mechanisms’ accepted by users without having obtained adequate prior information regarding the dangers underlying this form of operation.

Certainly, the Supervisory Authority, in providing said information to the financial system, is moved by the awareness that, on the subject, there are still no classificatory analysis capable of allowing an adequate collocation of crypto-assets within the framework of ‘financial instruments’, which - as is well known - have been fully recognised by our legislature. In this premise, the authority wishes to emphasise their exclusion from the perimeter of operational forms that can be brought within the scope of the supervisory interventions within its competence, hence the obvious exposure to risk of those who use them for investment or other market interventions.

In the same logical order is a significant part of the report given in 2021 by the chairman of Consob at the *annual meeting with the financial market*. On that occasion, in fact, he emphasised the «change ... (of) ... market functioning» due to the growing use of «virtual instruments», hence the *input* to the «emergence of “technological platforms” that enable faster and less costly ways of accessing

[56] See *Final Considerations*, p. 19.

payment and securities trading services than those offered by banks and other intermediaries»[57]. This marked the *incipit* of a necessary regulatory programme aimed at an orderly development of the phenomenon in question; it would later be given particular attention by Consob's top management, representing that a disciplinary hypothesis cannot disregard the definition of operating standards with which all the parties involved in the same must comply[58].

On closer inspection, it appears that the appointed authorities have full awareness of the peculiarity of this phenomenon, which is configured as the expression of an *anti-system* logic or, more precisely, antagonistic to the configuration of a market regulated according to criteria of orderly and prudent management[59]. In fact, the risks that crypto activities can cause to the stability of the financial and monetary sector are taken into account, overturning the cornerstones of the current disciplinary construction based on the strict observance of the regulatory precepts placed to safeguard the operational security deriving from the transparency of the act and adequate control mechanisms. In other words, the identification of suitable interventionist tools to counter the affirmation of an alternative system to the ordinary one, but lacking the latter's guarantees, is perceived by the authorities as a dutiful aspect of their institutional function; hence the need expressed, on several occasions, by the latter to extend their duties also to the supervision of the negotiation cases that give content to the phenomenon under consideration.

The scenario that has long been the focus of attention of jurists interested in analysing the impact of cybernetics and digital technology on the development of negotiation relations, the horizon of which opens up to the use of innovative models

[57] Cf. Speech of President Prof. Paolo Savona, Rome, delivered on 14 June 2021, p. 10 ff.
[58] See Cycle of Meetings "*Fintech InnovAction - Virtual Workshops on Cryptocurrencies*", organised by Dentons Law Firm and the Guido Carli Association, 2021 - 2022.
[59] Cf. V. LEMMA, *The public intervention on cryptocurrencies between innovation and regulation*, in *Open Review of Management, Banking and Finance*, 2022, para. 2, where the Author describes on the tendency of certain operators towards a flight from sovereignty and, in particular, on the finding of movements proposing to introduce non-legal tender currencies into the financial markets.

of knowledge[60], is presented in new terms. Consequently, the investigation will be able to make use of the studies carried out in the past, when the intrinsic capacity of technology to interact on the government of factual reality was emphasised; hence its impact on the legal order of the market through the modification of the structure of the latter's normal *modus procedendi*, implemented in reference to the specificity of the virtual world[61].

On a general level, it is evident how the public authority is called upon to assess varied issues attributable to the fact that we are in the presence of a form of operation that has hitherto been exempt from the obligation of a specific licence and, therefore, carried out outside the ordinary channels of controlled competition. The need to arrive, in the short term, at effective regulatory solutions confers peculiar vectors to the action to be taken; the latter - moving from the ascertainment of the technical forms used in the performance of the activity linked to the issuance and circulation of cryptocurrencies - must take into account the economic function of the instruments in question, assessing specifically whether the prerequisites for any disturbances to the market order exist.

Significant, in this context, is also the verification of the impact of technological devices on the decision-making processes underlying the negotiations in question; such verification helps, in fact, to shed light on the possible legal framework of the relationship established between the user and the automated mechanism that enables the formation and use of crypto activities. Hence the possibility of configuring classificatory hypotheses that refer to the codified indications relating to certain specific types of contracts.

It goes without saying that the aforementioned national control institutions

[60] Cf. G. ALPA, *Fintech: un laboratorio per i giuristi*, Preface to AA.VV., *Fintech: diritti concorrenza, regole*, Bologna, 2019, p. XIII ff., who points out how, following the digital revolution, «law has had to chase scientific discoveries... in order to make the most appropriate choices».

[61] On this subject, see, among others, the well-known work of FROSSINI, *Cibernetica: diritto e società*, Roma- Ivrea, 1968, a study in which he addresses the problem concerning the possibility of applying cybernetic procedures to law; and RODOTÀ, *Elaboratori elettronici e controllo sociale*, Bologna, 1973.

will have to monitor market trends also with reference to the non-EU development of the phenomenon, for this purpose liaising with the realities of other States; this will proceed, if necessary, to the definition of territorial areas within which to contain the size of the phenomenon. Indeed, it does not escape the observer's notice that a growth in cryptocurrencies that expands worldwide entails further problems, *in primis* linked to the increase in international arbitrage; hence the opportunity to come up with an operational line that allows for its increase on the basis of agreements between the countries interested in the implementation of effective interventions.

3. In light of this consideration, it is understandable why in both of the aforementioned interventions of the sector authorities' reference is made to heterogeneous instruments, which in the literature are distinguished according to whether their issuance takes place against real and/or financial assets (fully backed stable coins) or in modalities that do not make reference to such support. In particular, it should be noted that these services are linked to stabilisation mechanisms based on algorithmic automatisms, thus creating a highly volatile business that exposes crypto asset holders to great risks, with the consequence that these instruments end up being used mainly for speculative purposes.

This peculiarity of the operational forms under consideration is confirmed by the related exchange modalities, which are carried out without the intervention of service providers and through computer programmes (smart contracts*),* made available by subjects not subject to control. Hence the reference to the typical modular framework that connotes the application ecosystem of decentralised finance, which if, on the one hand, entails a significant ease of access and a reduction in the costs associated with the use of the product, on the other hand is marked by the risks found in the activity (carried out on platforms in digital assets*)* realised in terms lacking the guarantees that come from the concrete traceability to an authorised intermediary.

The presence of «stabilisation mechanisms based on automatic rules that adapt supply to variations in demand (algorithmic stable coins)» - referred to by the Bank of Italy[62] - while improving the efficiency of the manner in which the services in question are offered, thanks to «distributed ledger technologies (DLT)», do not relieve users of the risk to which their involvement in such an operational context exposes them. Indeed, the lack of transparency and reduced reliability of an activity carried out outside the perimeter of regulation can easily lead to situations of insolvency, destined to spread to the entire sector if forms of contagion are not prevented. Hence the need, represented in various fora, to prepare in-depth studies aimed at highlighting the danger underlying the use of crypto-assets and, therefore, at reducing the risks for investors who frequently, due to a limited knowledge of such financial instruments, become victims of the insane greed by which they are moved[63].

Economic doctrine in recent times - thanks also to the *input* to the analysis given by Paolo Savona[64] - has subjected the issue in question to close scrutiny. A significant contribution has been made to the clarification of the problems posed by an operational specificity that is characterised by being closely connected to Innovation Technology and, therefore, by the relevance ascribable to the «calculation of probabilities» and the use of «algorithms» in the identification of its characterising data; however, without achieving satisfactory results in the search for adequate solutions.

In particular, we note the indications found in the studies that represent the

[62] Cf. *Final considerations*, loc. cit.

[63] See, among others, the work entitled *Blockchain: the road to the next web revolution*, published in January 2022 by the *Blockchain & Distributed Ledger Observatory* of the Milan Polytechnic, where - in the Introduction by Perego and Sciuto - it is emphasised that participation in the application revolution of the new «financing, ownership and business models.....requires developers, companies and users to understand the technological mechanisms and their prospects and capacity to adapt and innovate within a rapidly evolving framework».

[64] See speech in the Seminar "*Cryptocurrencies*: *from the Instrument to the Technique*", held at the Fondazione De Gasperi, 24 May 2022, at the end of the cycle of meetings "Virtual Workshops on Cryptocurrencies" organised by the Dentons Law Firm and the Guido Carli Association.

conceivable criticalities arising from the «use of decentralised technologies (Distributed Ledger Technologies or DLT) in the field of financial services» connected, *inter alia*, to blockchain technology, which is known to lack a centralised database and an administrator[65]. Hence, the factors characterising decentralised finance are highlighted and, in particular, the management (carried out by platforms) of economic transactions that are structured in interconnected 'blocks' (blockchain); an automated mechanism that is articulated in specific processes, the function of which is considered, in concrete terms, to replace that of credit intermediaries (verification of the regularity of online transactions)[66].

This analysis takes into consideration the technicalities used for the activation of cryptocurrencies, the circulation of which makes use of networks headed by users (located all over the planet), who benefit from programmes that allow them to operate without control by central authorities[67]. We are in the presence, in fact, of peer-to-peer movements implemented in a collective form that give rise to an enormous amount of data, which grows daily; hence the need to manage it by resorting to complex technical elaborations, typically typical of algorithmic calculation[68]. This makes it possible to make use of computer codes that allow an appropriate evaluation of the applicable management methods, which obviously involve all those who access the programme.

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[65] See on this topic MASERA, *New Risks and Regulation of Cryptocurrencies*, in *Bancaria*, 2022, No. 3, p. 5 ff.

[66] F. PASTUCCI, *La natura giuridica dei bitcoin*, in *Rivista della Corte dei Conti*, 2018, p. 357 ff.

[67] See MINENNA, *Criptovalute: perché il 2022 sarà l'anno dei regulators*, in *IlSole24Ore* of 11 October 2021, where the global take-off of digital currencies is emphasised, hence the launch of a massive market regulation campaign.

[68] In this regard, it has been emphasised in the literature that the architectural model of the computer network consists of 'nodes' organised in an 'equal' form, whereby they can act as both client and server to other nodes in the network, enabling transactions to be initiated and completed.
Significant on this point is the clarification formulated by CONSOB: «Cryptocurrency, where there is consensus between the participants in the relevant transaction, can be exchanged in peer-to-peer mode (i.e. between two devices directly, without the need for intermediaries) to purchase goods and services (as if it were legal tender to all intents and purposes)»; see *Cryptocurrencies*, available at *https://www.consob.it/web/investor-education/criptovalute*.

This systemic system conforms to the definition of 'technologies based on distributed registers', given by Article 8, paragraph 1, so-called simplifications decree (Law Decree 14 December 2018, no. 135, converted into Law 11 February 2019, no. 12); in this, in fact, one has regard to «computer protocols that use a shared, distributed, replicable, simultaneously accessible, architecturally decentralised register on cryptographic bases, such as to allow the recording, validation, updating and storage of data».

More specifically, as the authorities have pointed out, the reference to a distributed digital database - in which the transactions that take place on the network are recorded in a secure manner - is technically expressed, as mentioned above, in a chain of blocks (made up of the so-called 'nodes' that identify the devices connected to it) that is characterised by being chronologically ordered, as well as by the fact that it can only be updated with the consent of the participants in the system. Therefore, operating methods are identified that should prevent the manipulation of data which, once entered, are recorded and are validated by the devices connected to the network.

The positive profiles of such an ecosystem of open-source financial applications are evident, which, thanks to the operation of the underlying network, allow users to retain control of their assets, despite the creation in the *continuum* of a potentially new market. In addition to this, such applications, as mentioned above, do not require an intermediary, hence the obvious reduction (for users) of the costs associated with the use of products, which facilitates access to them even by low-income individuals, who can thus benefit from a wide range of services. Finally, it should be noted that a decentralised system may be better able to withstand cyber-attacks or operational incidents than a centralised system; this is because its particular articulation makes it possible to maintain operations even when part of it

ceases to function[69].

However, in spite of the aforementioned advantages, an intrinsic opacity characterises this modality of financial activity, whereby the degree of trust that is ordinarily required to access market operations is reduced to a minimum; thus, the favour for such phenomenal instrumentation, in some respects, can be understood with regard to the 'high costs' and the 'inefficiencies of the current payments system'. On closer consideration, certain characteristics of access to crypto assets - such as the instantaneous settlement of the transaction, the possibility of collateralising digital assets, the absence of any form of credit control, and the consequent referability to cryptographic verification methods - although they make recourse to such forms of decentralised finance potentially convenient, aggravate the climate of uncertainty that characterises this operative mechanism, inducing the search for technical/legal modalities suitable for containing the relative risks.

Add to this the complexity of the virtual world, whose horizon, open to the use of innovative models of knowledge, ends up by referring to a generalised use of the myriad of information and data of an immaterial nature available on the market; hence a scenario in which crypto assets are proposed in a functional context that is, in some way, alternative to that of the authorised intermediaries. This fully delineates the negative consequences - or, more precisely, the dangers - connected to an offer of services that, in concrete terms, overlaps with that of the authorised subjects in a substantially competitive logic, even though - as mentioned above and further on – their circulation does not benefit from the protection mechanisms that assist traditional financial instruments.

Hence the belief that risks of a new kind arise from the cybernetic approach

[69] See, among others, DAVOLA, *Bias cognitivi e contrattazione standardizzata: quali tutele per i consumatori?* In *Contratto e impresa*, 2017, no. 2, p. 637 ff; AVGOULEAS and KIAYIAS, "*The Promise of Blockchain Technology for Global Securities and Derivatives Markets: The New Financial Ecosystem and the 'Holy Grail' of Systemic Risk Containment*", in *Edinburgh School of Law Research Paper No. 2018/43;* PELLEGRINI, *Transparency and Circulation of Cryptocurrencies*, in *Open review of management, banking and finance*, 2021.

that, with increasing frequency since the beginning of this millennium, has been practiced in the financial sphere[70]. It also highlights the danger of fraud and cyber-attacks that undermine the efficiency and ability of operators to compete, which is why the spread of new technologies is associated with the possibility of seeing the stability of the financial system compromised; this is irrespective of the fear that an excessive spread of virtual money could undermine the balance of legal money, posing problems for the sector's top authorities that are difficult to resolve in terms of containing the automatisms underlying the creation of crypto assets. This hypothesis is confirmed by the ups and downs of the values attributable to the latter; something that, as is pointed out in the technical section, is also found in the market for stable coins, which "issue currency on blockchains against a reserve of dollars of equal value"[71], a market that, due to its structure, should offer sufficient guarantees of reliability.

In this context, economic and legal doctrine has not neglected to observe that the revolution induced by digitalisation is radically altering our society and economy, creating new forms of socio-political involvement and commercial exchange[72]; these forms of operation, departing from those traditionally practised, introduce types of negotiation that are difficult to qualify and obviously require appropriate intervention by the regulator.

Significant, in this regard, is the issuance of Directive No. 2016/1148 on

[70] Significant, in this regard, is the study, among the first on the subject, by ALPA, *Cyber law. Problemi giuridici connessi allo sviluppo di internet*, in *Nuova giurisprudenza civile commentata*, 1998, II, p. 385 ff.

[71] See MINENNA, *Valute digitali, regole e nuovi equilibri*, in *IlSole24Ore* of July 10 2022.

[72] Cf. P H. ROSA, *Social acceleration: ethical and political consequences of a desynchronized highspeed society*, in *Constellations*, 1, 2003; CASCINELLI, BERNASCONI, MONACO, *Distributed Ledger Technology e Smart Contract: finalmente è Legge. Prime riflessioni su una rivoluzione tecnologico-giuridica*, in *DirittoBancario.it*, insights, March 2019.

With particular reference to banking and financial matters, see PANETTA, *L'innovazione digitale nell'industria finanziaria italiana*, speech at the inauguration of the FinTech District, Municipality of Milan - Ministry of Economy and Finance, Milan, 26 September 2017; PELLEGRINI, *Il diritto cybernetico nei riflessi sulla materia bancaria e finanziaria*, in AA.VV., *Liber amicorum Guido Alpa*, edited by Capriglione, Milan, 2019, p. 351 ff.

Network and Information Security (NIS), which introduced harmonised rules and security measures for the cyber security of vital sectors of the economy and society, being aimed at fostering cooperation between national authorities to deal with possible cyber-attacks[73]. It is evident that there is a growing need to identify the remedies that can be proposed in an increasingly connected financial and economic context in order to ensure the conditions necessary to prevent the occurrence of unfair business practices.

4. In another respect, the different orientation that has developed in the courts, where crypto activities have been framed in ways that could be described as contradictory, is relevant.

Significant, in this regard, is the affirmation of a guideline that proposes its collocation among the modes of use of information technology in the banking and financial intermediation sectors: from credit (crowdfunding and peer-to-peer lending) to payment services (instant payment), to advisory services (robo-advisor)[74]. Cryptocurrencies - based, as mentioned above, on the decentralised validation of transactions (Blockchain or DLT - Distributed Ledger Technology) - are part of this operational context, which is why some judges have included them in the category of financial instruments[75], as their essence, according to administrative jurisprudence, can be traced back to «means of exchange for the purchase of goods and services or for investment purposes»[76]. In contrast to this approach, there is another that configures crypto assets as "intangible assets" (by nature devoid of any support, as well as having the character of fungibility and potentially intended to be the subject

[73] See on this topic *ex multis* LEMMA, *FinTech Regulation. Exploring New Challenges of the Capital Markets Union*, Cham (SW), 2020; CANALINI, *Il Fintech e le nuove frontiere dell'innovazione finanziaria*, in AA.VV, *Manuale di diritto bancario e finanziario*, Milan, 2019, p. 299 ff; BARBAGALLO, Speech at the Conference Winter 2019, "*FinTech: Ruolo dell'Autorità di Vigilanza in un mercato che cambia*", Naples, 8 February 2019.

[74] In this regard, see CONSOB, *The digitalisation of financial investment advice*, January 2019.

[75] Cf. *ex multis* Court of Verona, Civil Section II, 26 January 2017, No. 195

[76] Thus, Regional Administrative Court LAZIO, Section. III, 28 January 2020, No. 1077.

of rights[77]).

There is, therefore, a gap of solutions that, inevitably, affect the possibility of ensuring effective protection for the consumer who, in the absence of an adequate disciplinary regime, ends up being exposed to the bad weather of a reality characterised by the 'uncertainty' of a law conditioned by the changing course of jurisprudential interpretations.

It goes without saying that in a 'spatial' dimension of the market (to use an expression of Allegra Canepa), a correct investigation on the legal qualification of virtual currencies cannot disregard the examination of the characteristics that characterise digital platforms, from which follows the specification of the modalities of their use in the financial field[78]. Indeed, their ability to process significant amounts of data through the application of algorithms allows for appropriate forms of interconnection that, through the activation of links between different platforms, gives rise to the 'operativity between computer architectures' necessary for the realisation and transfer of the instruments that concern us here.

Certainly, platforms lend particular flexibility to the encounter between users of financial services, fulfilling an indispensable function for this form of business to be viable. As will be made clear later on, however significant this role may appear, it must be said that it is limited to a sphere that does not go beyond the operational technicality that characterises the actions of such mechanistic instruments. It follows that, on a conceptual level, it is difficult to agree with the hypothesis according to which platforms concretise a sort of «fragmentation of the enterprise understood as a subject that unites in itself the various phases from production to distribution»[79], almost as if to recognise in them an intermediary subjectivity that goes beyond the traits of a technological application consistent with their essence.

[77] See Court of Firenze, Bankruptcy Section, Judgment no. 18 of 21 January 2019.

[78] Cf. AMMANNATI - CANEPA, *Presentation to* AA.VV., *Tech Law Il diritto di fronte alla nuove tecnologie*, Naples, 2021, where the «pervasive growth of digital platforms and their power» is emphasized.

[79] Thus CANEPA, *I mercanti dell'era digitale*, Turin 2020, p. 24.

From a general point of view, then, the problem of the compatibility with the operational cases under observation of the regulation of States other than the national one comes into consideration, a factual hypothesis easily found in practice (especially in the activation of platforms); this, with the obvious consequence of rendering further uncertain and risky the position of those who remain caught in the meshes of the dangerous network of relationships established by the automated mechanisms that allow the transmissibility of crypto assets. To this must be added the need to clarify the issue concerning the possibility of bringing the present matter within the scope of applicability of the special banking/financial regulation, having regard, in particular, to the provisions of the Consolidated Banking Law concerning the matter of the 'abusive collection of savings', as well as those of the Consolidated Law on Finance concerning the solicitation of 'public savings'.

This gives rise to a particularly complex investigation perspective, to which the recent innovations introduced by the subsequent agreement on the 'proposal for the regulation of crypto assets markets' (so-called MICAR) are of no particular benefit; in fact, these are insufficient to standardise the issuance of the instruments in question, as they must take into account problematic profiles of an administrative nature (e.g. security systems, adequate information systems, etc.), which have not been subjected to adequate in-depth examination at present. A similar consideration should be made with reference to the Digital Resilience Operational Act regulation (so-called DROA), which is designed to ascertain the full operational capacity of networks that provide services relating to correct information and communication to companies and third parties. We are in the presence of desirable initiatives on whose realisation depends the possibility for the European Union to continue to be one of the most advanced financial centres on the planet.

Undoubtedly, technological innovation increasingly pushes us towards a virtual dimension - known as the «metaverse» - that overlaps and coexists with the real one. Hence, the search is on to identify the ways in which this transposition can take place, destined to affect the explanatory forms of public intervention and, more

generally, the socio-political aspects of EU countries. In this context, it may be helpful to revisit past legal experiences from which to draw appropriate suggestions in order to remove the causes that hinder overcoming the difficulties of a path that proposes the political and cultural construction of an "advanced system", capable of integrating highly technical rules in a reality oriented to make use of them as meta-economic determinants capable of achieving the targeted goals.

5. It becomes essential to be able to think about the organizational design choices that seem most appropriate for companies that want to adopt blockchain technology and the implications that these intentions[80] have on the organizational structure.

This must certainly be analysed taking into account the quality of the technological infrastructure that can positively support the organization for business processes and project management.

In the last year also, in the academic contexts, researchers and experts[81] are monitoring the evolution of DAOs - Decentralized Autonomous Organization. In reality, this new company philosophy has been talked about for a long time before the health emergency, and is applied, with effects that are often not entirely certain. Already in April 2016 "The DAO" was launched, a direct investment project open to venture capitalists based, precisely, on the concept of Decentralized Autonomous Organization. The linked crowdfunding campaign will be remembered for being one of those that raised the most money, while "The DAO", based on blockchain and complete with cryptocurrency, will remember for being hacked a few months later and for 50 million of $ evaporated in minutes. However, the DAO experiment remains a new approach to corporate business management on which the

[80] V. WEERAKKODY, M. JANSSEN, Y.K. DWIVEDI, Transformational change and business process reengineering (BPR), Lessons from the British and Dutch public sectors in Government Information Quarterly, 28(3), pp. 320-328, 2011.

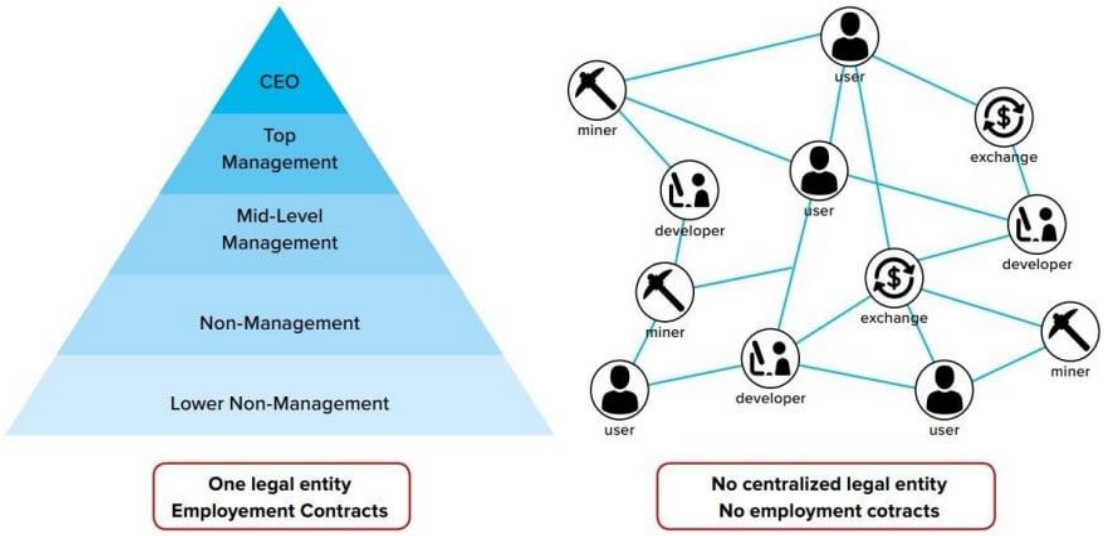
[81] I. ŻUCHOWSKI, N. CASALINO, B. MURAT, Experience of academic staff in mentoring programs, International Journal of Management and Economics, vol.58, no.2, 2022, pp. 23-41, 2022.

organization experts continue to push, certain that this is the right - and perhaps necessary - path for the companies in the future years.

At present, there is no regulation of this model nor, even less, can a single definition be given; analysing the previous experiences and projects (actually not many), the DAO should represent an organization designed to be entirely (or almost) automated and decentralized[82], without any management structure or board of directors, committing funds for a specific purpose. In this context, the issue of tokens, upon payment in cryptocurrency or through "proof of work" (the consent algorithm for validating transactions on the Blockchain), would guarantee its owner a right to vote in the management of the Organization or further rights.

An assist to the DAO was certainly provided by the pandemic and everything that has been questioned in terms of the centrality of the workplace and, consequently, of the entire company organization. It is a short step from platforms to DAO. It should be clarified immediately that Decentralized Autonomous Organization does not just mean smart working, distributed IT architectures or collaborative processes as the name might suggest. Quite simply, these phenomena fit perfectly within the DAO paradigm, which is something more. Those who propose DAO criticize the traditional business organization: centralized and hierarchical with systems and processes imposed from above. A structure that proves to be slow, cumbersome, complex and that holds back creativity and innovation. Furthermore, if we embrace the vision that every modern company is a technology company, or even comparable to an engineered and fully computerized company, the transition to a Decentralized Autonomous Organization would be clear, thanks to technology.

[82] A. D'ATRI, M. DE MARCO, N. CASALINO, Interdisciplinary Aspects of Information Systems Studies. pp. 1-416, Physica-Verlag, Springer, Germany, 2008.



What is a Decentralized Autonomous Organization (DAO), Tripathi H., 2020

Today we have low-cost hardware available, which also thanks to cloud technologies has become increasingly accessible even to small and medium-sized enterprises, global networks, huge amounts of data generated and integrated with each other, automation algorithms and machine learning (Artificial Intelligence), and technologies for a deeper human-machine interaction or for the creation of "hybrid" environments in which the virtual simulates and interacts with the real (see for example also the Metaverse).

And then, we have the platforms, and we have the blockchain and the smart contracts. The platforms (Facebook, Netflix, Amazon, Uber, etc.) take full advantage of the new technologies available and have the first two letters of DAO as distinctive features: decentralization and autonomy. Decentralization means eliminating centralization: business decisions, the introduction of new services and their customization do not depend on superior choices and, often, far from reality, but are based on the use of the platform by users. Thanks to technology, software, machine learning algorithms, the platform evolves autonomously, without decision-making

intermediaries that can only slow it down[83].

The company organization, always understood as a set of social entities composed primarily of people (bosses, managers, employees, customers, etc.), listens to users thanks to the inputs that come, basically, from a code or an algorithm that can really make a difference.

It is the software that provides processed data and information, while the role of the operators who supervise and validate the changes to the service, perhaps proposed directly by the algorithm, remains fundamental, and finally, it is the man who develops and releases the new versions of an application or service. An evolved human-machine interaction in which humans' control, manage and ultimately make decisions. The whole organization is practically under constant observation, again thanks to powerful algorithms and not only on internal business processes.

Some of the companies that are leaders in the use of distributed ledger technology and that make massive use of these technologies include those companies[84] that provide services such as:

- Credit Suisse
- HSBC
- Equinor
- Digital Currency Group
- Fidelity
- JPMorgan Chase
- PayPal
- Visa

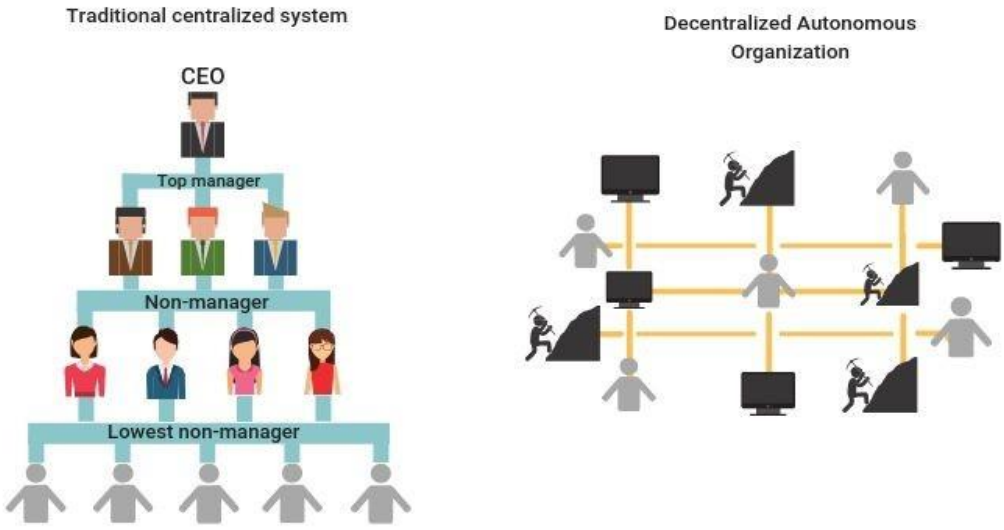
[83] B. BORIN, M. CAROLI, N. CASALINO, M. CAVALLARI, N. DI CARLUCCIO, P. DI NAUTA, G. PIZZOLO, A New Approach to Enhance the Strategic Impact of Digital Education in Universities and to Foster the Development of a High Performing Common EU Smart Education Ecosystem, in volume Smart Education and e-Learning - Smart Pedagogy edited by Uskov, Vladimir L., Howlett, Robert J., Jain, Lakhmi C., pp. 211-229, Springer Nature, Singapore, 2022.

[84] DEL CASTILLO M., What are the 50 companies driving the blockchain revolution, Forbes, 2021.

or products such as:

- Stone Ridge
- Amazon
- Samsung Group
- Novartis
- Northern Trust
- Walmart
- Oracle
- LVMH.

Ultimately, the concept of platform simplifies, speeds up and makes the relationship between producer, supplier and customer linear and direct. With the use of a platform, a horizontal ecosystem is created that generates innovation, and turnover for those in control. From here it is easy to understand that another distinctive element of a platform is collaboration. Element suddenly returned to a strong trend following the health emergency. Great dusting off for remote collaboration between employees, thanks to application services that are designed to favour peer-to-peer interaction without hierarchies and centrality, and that make extensive use of new technologies. In particular, network technologies, protection technologies and machine learning algorithms and for the autonomous management of application platforms.



Traditional centralized system and DAO Decentralized Autonomous Organization, Punzano G. 2021

The term Distributed Ledger Technologies (DLT) refers to electronic "ledgers" (or registers), geographically distributed over a large network of nodes, whose data is protected from potential cyber-attacks thanks to the fact that the same information is redundant, verified and validated through the adoption of different protocols (or rules) commonly accepted by each participant[85].

The management of these registers is de facto decentralized, as the secure storage of encrypted information is based on consensus algorithms that involve all or part of the participants, or on mechanisms that are useful to ensure that all the nodes of the network agree on the set of valid transactions.

The use of such technologies can be advantageous above all for tracking applications: every time a product transits into a new state, the transaction can be documented and recorded in a distributed ledger, thus creating a permanent and unalterable history of the product, from production to the sale. The inclusion in the register of information concerning each step of the supply chain takes place only after certain recognition of the user who enters it, through digital signature techniques and after obtaining the consent according to the established rule. The

[85]See Distributed Ledger Technologies, Ministry of Economic Development, Italy, 2021.

information thus entered becomes unchangeable, preventing any subsequent malicious alteration.

Different types of information can be entered within a distributed register, although with limitations in terms of size. A company has the possibility to make this information public, to make it private, in whole or in part, or to share it only with specific players in the supply chain. The final consumer can consult all the public data contained in the register by scanning an intelligent label associated with the product through an appropriate device, typically a smartphone.

The application of Distributed Ledger technologies in anti-counterfeiting methods increases the reliability of the information that can be associated with the product along the production and distribution chains. A topic still to be explored concerns the safety characteristics of the label containing the unique identifier of the product (indissolubility of the association between the label and the product itself, impossibility of cloning, authorization to read the identifier, etc.), from which it is possible to trace the information stored in any distributed register.

6. Organizational models have certain characteristics that make them more or less suitable for certain situations. Compared to a traditional company, a Decentralized Autonomous Organization has a series of objective advantages, in the face of some obvious weaknesses. These elements constitute the basis through which to evaluate which is the most suitable model to follow when you intend to activate a business.

The DAO, Decentralized Autonomous Organization, is a paradigm that draws heavily from the spread of principles of equality in the horizontal supplier-company-customer interaction, eliminating all possible intermediaries. In the near future, if a company, in any field, realizes that inside it produces technology, develops code, perhaps without knowing it, then it could be ready for the DAO. In simple terms, it is

a question of having all the organizational activities[86] of a company managed by an application platform based on blockchain. The blockchain, secure by design, is the perfect model to manage transitions, commercial but not limited to, protected, certified, transparent and not subject to hierarchical criteria. It is quite clear to understand how a blockchain platform can guarantee safe, fast, direct, validated, and transparent commercial transactions. The advantage of using the blockchain in a commercial transaction is also to allow you to add value to the transaction itself. The trade agreement is managed through a smart contract, and its life cycle could be associated with an economic quote, a token, whose value varies over time. In a sense, forgive us for simplifications, the evolution of the project could be "put up for sale" and those who trust the company and the project, investing in cryptocurrencies, could earn. Just like crowdfunding. It is less clear to understand what the blockchain has to do with the organization of the corporate workflow. Is it possible to assign an economic value, also considering the sustainability aspects, to an internally developed project, managed entirely within a ledger? And, according to this vision, the concept of productivity takes shape more concretely. Ultimately, DAO forgets the centralization of decisions, hierarchies and geolocation and promotes the horizontal sharing of projects, activities and contents, within a platform, built with application code, secure and structured. The biggest critical issue, in addition to the grievances of managers who would feel power and control evaporate? hierarchies and geolocation and promotes the horizontal sharing of projects, activities and contents, within a platform, built with application code, secure and structured. The biggest critical issue, in addition to the grievances of managers who would feel power and control evaporate? hierarchies and geolocation and promotes the horizontal sharing of projects, activities and contents, within a platform, built with application code, secure and structured. The biggest critical issue, in addition to the grievances

[86] N. CASALINO, M. CAVALLARI, M. DE MARCO, M. FERRARA, M. GATTI, C. ROSSIGNOLI, Performance Management and Innovative Human Resource Training through Flexible Production Systems aimed at Enhancing the Competitiveness of SMEs, IJKM, Iup Journal of Knowledge Management, vol. XIII, No. 4, October, pp. 29-42, 2015.

of managers who would feel power and control evaporate?

With regard to DAOs, the main strengths can be traced back to the following aspects[87]:

- activation speed: zero bureaucracy, a simple software makes it immediately operational;
- transparency[88]: the contents of a DAO are registered in a smart contract on a blockchain and freely accessible by anyone;
- trust: the terms of the agreement cannot be changed, under penalty of cancellation of the same, according to the fundamental rules of the blockchain;
- automation: the smart contract is able to automatically perform the required operations, without the need for lengthy organizational procedures;
- reward: tokenization makes it possible to fairly reciprocate the commitment that the various stakeholders make to ensure the functioning of a DAO;
- innovation: the absence of constraints linked to centralization makes it possible to experiment with completely new forms of governance, to give rise to unconventional organizations.

Conversely, a Decentralized Autonomous Organization is vitiated by some weaknesses, largely deriving from its technological youth, but above all from its disruptive reach in the context of traditional organizations:

- Legal uncertainties: a company defined by an electronic contract, not subject to any form of control by a non-partisan body, is difficult to frame in the traditional legislative context, starting with jurisdiction;
- Clarity: the certainty of the rules does not necessarily equal their clarity. Translating the terms of an agreement from an IT point of view is in some cases extremely complex, not because of their complexity at the programming level of the code, but from the point of view of interpretation at the regulatory level;

[87] F. LA TROFA, Decentralized Autonomous Organization (DAO): the governance of the metaverse, Tech4Future, 2022.

[88] M. CAROLI, La politica anticorruzione nei gruppi internazionali, Luiss University Press, 2019.

- Security: if the blockchain is secure in terms of design, the vulnerabilities of a specific application are easily exploited by the bad guys, due to the absence of a supervisory body called to confirm the validity of a transaction;
- Technological immaturity: blockchain-based development does not yet enjoy the background of other fields, both in terms of tools and expert programmers in this discipline. This is a skill gap that will take some time to compensate for on a large scale, especially in anticipation of a drastic increase in entered "smart contracts";
- Difficulty of coordination: the zero-trust logic of the DAOs makes it rather complex to coordinate the parties involved, especially if there is an objective need to vary the terms of an agreement.

7. Among the significant advantages that it will bring in various sectors and contexts there is certainly the verification of data, starting from the control of identities and the management of information on workers and candidates. In the field of human resources and personnel management[89] it is preferable that there is a simplification of activities thanks to the blockchain, with the possibility of quickly and automatically storing all the most significant information, so as to have a broad vision of the entire professional path of the collaborator or potential future worker. All this takes place with the use of an electronic file (in some ways similar to the health one) in which to bring together the educational qualifications, work experience and qualifications, generating a complete and detailed profile in full compliance with the European regulation GDPR.

Furthermore, through the use of the blockchain, it is already possible to monitor and analyse all corporate work processes in a shared manner: the progress of projects, the division of tasks and responsibilities, the achievement of objectives and the implementation of systems. of analysis. Of all the benefits, the most intuitive

[89] S. AHMAND, R.G. SCHROEDER, The impact of human resource management practices on operational performance: recognizing country and industry differences, Published by Elsevier Ltd, 2013.

is still the management of payment automation systems, made simpler and more efficient. Finally, blockchain technology guarantees a level of IT security superior to all the means previously in use, precisely by virtue of the use of a decentralized encryption system and therefore more difficult to attack.

The use of a shared and immutable data structure can make the work ecosystem more efficient and functional, but at the same time it determines a series of effects on the role of the worker: the greater automation decreases the frequency of interventions and manual controls, therefore makes it essential to retrain the professional staff, to move the human component from repetitive tasks (increasingly entrusted to machines) towards higher qualification activities. In summary, as is true for most of the new technologies, the reduction of some professional figures[90] will be offset by new opportunities, and therefore new jobs.

The adoption of blockchain technology is proving to be decisive for human resources. Verify and certify skills and qualifications of candidates, identify the best profiles, manage contracts programmatically in order to "retention" the best candidates through an incentive plan in Token, Token options, vouchers or NFTs, are becoming the main areas in which the use of the blockchain can really innovate and facilitate the work of human resources management.

The blockchain, together with an integrated identification system, can be used to verify and certify the identity, qualifications, credentials and experiences of potential candidates during the selection process, but also to certify progress, promotions. and the certifications acquired during the career path. Below is a list of the different benefits for human resources offices:

- Greater transparency in the management and keeping of employee data;
- Control of employee work detailed history;
- Identification according to law;

[90] F. CAPRIGLIONE & N. CASALINO, Improving Corporate Governance and Managerial Skills in Banking Organizations, International Journal of Advanced Corporate Learning (iJAC), Austria, vol. 7, issue 4, pp. 17-27, 2014.

- Contract certification;
- Attendance and register management;
- Performance monitoring;
- Payments and benefits/incentives management;
- Training certification and updating.

Companies can perform more agile auditing[91] and compliance reports by constantly monitoring the goals and performance[92] of new hires, keeping them effectively updated and recognizing benefits and rewards promptly to their employees. The tokenization of rewards through smart contracts can really have a positive and significant impact, as it favours the involvement of the worker in the definition of the plans and the method, automates the calculations applied in a neutral way for the parties and according to an objective approach and increases trust, levels of productivity and collaboration between the parties.

The new organizations that are being established on Blockchain platforms are an innovative phenomenon from the point of view of organizational and business models[93] and deserve careful observation and analysis. It is still a phase of initial technological discovery - in which many players will be doomed to fail and others to evolve - but we have now learned how transformations can become real avalanche effects.

The new companies that are emerging have the ability to establish themselves on the basis of smart contracts. Each is made on contracts, with employees, with lenders, with suppliers and customers. In the initial stages of its life cycle, the

[91] M. PELLEGRINI, V. USKOV, N. CASALINO, Reimagining and re-designing the post-Covid-19 higher education organizations to address new challenges and responses for safe and effective teaching activities, Law and Economics Yearly Review Journal - LEYR, Queen Mary University, London, UK, vol. 9, part 1, pp. 219-248, 2020.

[92] M. CAROLI, Economia e Gestione Sostenibile delle Imprese, 1/Ed, Mc Graw Hill, 2021.

[93] N. CASALINO, M. DE MARCO, C. ROSSIGNOLI, *Extensiveness of Manufacturing and Organizational Processes: an Empirical Study on Workers Employed in the European SMEs*, in *Smart Digital Futures 2015*, Neves-Silva R., Tsihrintzis G.A., Uskov V. (Eds.), Smart Education and E-Learning 2015, Uskov V., Howlett R.J. and Jain L.C. (Eds.), IOS Press, KES Smart Innovation Systems and Technologies series (TBC), Springer, 2015.

company can define relations with its lenders in this way: this allows the use of forms of work based on more widely distributed models, also from a geographical point of view, of the “freelance” type. The tracing of the curricula, the confirmation of the identity and the “reputation” of the workers can take place on the Blockchain allowing an enlarged market in which it is easier for organizations to find the necessary skills.

Teams aggregate on projects and the resulting organizational structure looks much more like a community than a traditional hierarchy. A ‘core team’ working full time on the project is often flanked by extensive teams of developers, promoters, testers. In general, I believe that the ‘core team’ of the company - even the traditional ones - is destined to contract, also thanks to the new trends in artificial intelligence and automation, while the enlarged communities are destined to expand and will be based on a greater aggregation voluntarily. The remuneration mechanisms of the extended communities - in addition to those for the ‘core team’ - become an aspect of primary importance in the management of the teams involved.

8. While blockchain allows businesses to benefit from numerous benefits, it still remains an emerging and disruptive innovation, so it is normal for this change to be accompanied by some obstacles and scepticisms.

Generally speaking, the challenges surrounding the implementation of the blockchain can be divided into two categories: those related to “policy making” and then a whole series of technical obstacles caused by the current state of blockchain technology, which has yet to be perfected.

One of the biggest complications to deal with concerns the problems of regulation, which fall into the first category mentioned above, that is the challenges related to policy making. A complete one is still missing regulation of these projects and this is a major limitation to be addressed. Need keep in mind that we are talking about a technological innovation, which allows you to connect people in different nations and countries; therefore, having no regulatory code is a real problem to deal with. For example, in the absence of a complete

regulation, in the event that an error should occur, it is not certain of what the consequences, responsibilities and "victims" of this error may be.

The most relevant concerns are related to legal matters, data privacy and intellectual property. Precisely with regard to privacy, the blockchain, if properly implemented, shares the same objectives with the GDPR (General Data Protection Regulation), the regulation 679/2016 on data protection. However, it was proved by Meiklejohn et al. that this technology it does not always manage to guarantee the privacy of transactions[94], thus contradicting the above stated.

Only a few governments have introduced regulation for the blockchain. For example Singapore, China, Japan and South Korea have regulated cryptocurrency markets.

To what has just been said, there are also technical criticalities, which, although on the one hand they are seen as challenges, also represent opportunities to be able to improve the technological apparatus of the blockchain more and more. One of the most important technical issues has to do with scalability of the blockchain. The term "scalability" refers to the ability of a technology to manage an increasing number of transactions.

When the frequency of transactions increases, the blockchain must be able to validate these transactions sent in a very short time, with the minimum of latency and then to archive them. The Bitcoin Blockchain was able to process around seven transactions per second. However, in the case of the blockchain applied to the most disparate sectors, we are not talking about just seven transactions per second, but much more.

We are talking about millions of transactions, which obviously would not be able to be archived and processed according to these parameters.

[94] S. MEIKLEJOHN, M. POMAROLE, G. JORDAN, K. LEVCHENKO, D. MCCOY, G.M. VOELKER, S. SAVAGE, A fistful of bitcoins: characterizing payments among men with no names, Internet Measurement Conference, New York, 2013, by ZHENG Z., XIE S., DAI H., CHEN X., WANG H., Blockchain challenges and opportunities: a survey, International Journal of Web and Grid Services, vol. 14, no. 4, 2018, pp. 352-375.

This inability of the blockchain hinders its adoption on a global scale, there is a need to seek and design more effective solutions. Another critical issue is that concerning interoperability, understood as capacity to connect and communicate not only different blockchain platforms, but also the blockchain with other systems. It is a focal point, since first and foremost, if the blockchain is not cleverly connected to existing business systems then it turns out to be of little use to the organization. In addition, if the blockchain fails to communicate with other different platforms, as they are incompatible, then the possibility of exchanging information and carrying out transactions is lost. A successful example can be that of a platform (such as Ethereum) that uses its own crypto currency and for this reason connectivity with different platforms is complicated.

Furthermore, when we talk about DAO, we refer to organizations without a leader, owned and managed by all their members through a collective decision-making process, with a flow of information that is transparent and known to all, and an open ICT structure[95].

A DAO demolishes the concept of hierarchy and enhances that of a network that intrigues for the future of organizations.

A first step towards the regulation of decentralized companies, a point of contact between virtual and real, which by assigning a legal framework to the DAO, meets the growing needs of companies and investors who want to enter the sectors of Web3, artificial intelligence, cryptocurrencies, NFT, Metaverse and more.

Metaverse, NFT and blockchain: new worlds are born to be discovered, new digital activities that affect the real world much more than you can imagine. The involvement of the visitor, the search for a unique experience are increasingly fundamental drivers for the launch of a product, for maintaining the “brand

[95] V. USKOV & N. CASALINO, New Means of Organizational Governance to Reduce the Effects of European Economic Crisis and Improve the Competitiveness of SMEs, Law and Economics Yearly Review Journal, Queen Mary University, London, UK, vol. 1, part 1, pp. 149-179, 2012.

reputation", for renewing attention towards an increasingly competitive[96] and a delocalized market. Already today we are witnessing fashion shows announced in the Metaverse, movie trailers screened in virtual cinemas, teams in different sports that give their supporters the opportunity to collect stickers, signatures, events through NFT, to exchange and collect them. All this with rewards that can only be used by those who own that specific "digital token" in the Blockchain, up to becoming real exclusive clubs, real "communities within communities", with private gatherings in innovation[97].

We do not know if DAOs will spread in the future, but certainly numerous have already arisen in the last year. Some DAOs already exist, but we are only at the beginning of a new way of thinking about organizations that originates from the desire to free themselves from corporate hierarchies[98] and from the potential of a technology - the blockchain - still unclear to most and we will evaluate its evolution in the economic markets from the organizational and legal point of views.

[96] M.E. PORTER, Competitive Advantage: Creating and Sustaining Superior Performance. The Free Press, New York, 1985.
[97] E.M. ROGERS, Diffusion of Innovation, London, The Free Press, 1993.
[98] H.A. SIMON, A formal theory of the employment relation, trad. it. Causalità, razionalità, organizzazione, Il Mulino, 1985.