

The Demands of Financial Education in the Face of the Markets' "Golden Calf": The Role of Artificial Intelligence

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Abstract: The growing pervasiveness of artificial intelligence in financial markets is exposing retail investors to unprecedented forms of cognitive and informational asymmetry, as recently underscored by ESMA's 2025 Warning on the use of AI-driven tools in investment decisions. The purpose of this article is to investigate the regulatory and dogmatic implications of this phenomenon at the intersection of the EU AI Act (Regulation 2024/1689), the MiFID framework, and the Italian Consolidated Law on Finance (TUF). The methodology adopted is dogmatic and comparative-regulatory: the notion of "AI system" is reconstructed as an organisational rather than a merely technological entity, and is then tested against the allocation of liability along the AI value chain (Article 25 AIA), the conceptual distinction between control and authority underpinning the deployer category, and the emerging paradigm of AI-as-a-service in financial intermediation. Particular attention is devoted to fin-influencers and large diffusion models (LDMs) as new vectors of systemic risk, and to the IOSCO 2025 Report's recommendations on supervisory convergence. The article concludes that, where algorithmic opacity erodes the traditional pillars of investor protection, financial education must be reconceived as a constitutional precondition for the effective exercise of the economic freedoms; the principle of technological neutrality, far from being a passive regulatory stance, is reinterpreted as an active duty to safeguard the human dimension of financial choice — the *actus humanus* — against the seductive promises of algorithmic infallibility, which the article evokes through the metaphor of the markets' "golden calf". Read in this key, the contribution intersects the agenda of sustainable finance: responsible AI practices, algorithmic accountability and a renewed investor awareness emerge as preconditions for the long-term resilience of capital markets and for the integration of ESG-oriented decision-making into retail investment behaviour.

Keywords: Artificial Intelligence, AI Act, Financial markets, Investor protection, Financial education, MiFID II, Technological neutrality, Sustainable finance.

1. INTRODUCTION

A brief methodological premise is in order. The analysis is dogmatic in so far as it reconstructs the legal type of the "AI system" from the positive definitions of the AI Act and tests them against the categories of Italian private and commercial law (organisation, firm, control, authority, trade secret). The comparative-regulatory dimension operates on two distinct planes: first, a vertical comparison between EU-level instruments (the AIA, MiFID II, IDD and PRIIPs Regulation) and their domestic implementation in the Italian Consolidated Law on Finance (TUF), aimed at identifying convergences and frictions in the protection of retail investors; second, a horizontal comparison among supervisory approaches taken by ESMA, IOSCO and national authorities (Consob in particular) towards AI-driven investment tools and fin-influencer activity. The comparative exercise is therefore not an end in itself: it is functional to assessing whether the principle of technological neutrality, as concretised across these layers, is capable of delivering equivalent protection irrespective of the technology used, and it informs the conclusions on the redefinition of financial education as a regulatory objective.

2. FROM THE 2015 ACTION PLAN TO THE 2025 ESMA WARNING ON ONLINE ADVICE

With the advent of artificial intelligence (hereinafter, AI), one fact has come to be established with a certain degree of certainty: we are facing a deep generational and cognitive divide — between those who master AI and those who are its slaves [2], between those who use it and those who are subjected to it [3]. Human history is full of industrial revolutions, but this one seems to touch the very root of democracy [4], since a people unable to tell truth from falsehood cannot be considered free, but rather risks being manipulable [5].

This widespread awareness, formed quite suddenly in recent times, appears far removed from the at times Faustian and Promethean attitude reserved for the advent of the digital in the field of financial advice — by definition one of the most delicate and difficult activities [6], as well as a high-risk one [7].

Suffice it to consider the enthusiastic favour with which the European Commission greeted the diffusion of online advice through the 2015 Action Plan for the Capital Markets Union [8]: faced with the limited prudence of investors — especially retail investors, who, moreover, were unwilling to receive an independent advisory service (which would have to be remunerated) — the spread of online advice, considered less expensive or even free, was viewed favourably.

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As regards policies for the promotion of institutional and retail investments, the Action Plan, with a view to better mobilising savings through capital markets, suggested that retail investors should be able to easily access a range of investment products that are appropriate and cost-effective, and to independent advisory services at affordable prices. The outcome of the consultation produced an overall picture in which retail investors were poorly incentivised to take on the higher risks linked to investment in markets, precisely because of the high intermediation and distribution costs. Indeed, in response to such concerns, the rules contained in MiFID II, in the Regulation on packaged retail and insurance-based investment products, and in the Insurance Distribution Directive would soon intervene, introducing important changes regarding investment advice and product information.

In particular, it was emphasised that the shift towards online distribution of investment products and the emergence of new fintech solutions would provide an opportunity to develop new advisory services and freely accessible online distribution platforms.

Ten years on, ESMA has published a *warning* in the form of an information sheet entitled "*Using artificial intelligence to invest: what you should bear in mind*" [9], in which it acknowledges the now common use of AI also in the world of investments, in light of the wide availability of online tools and applications accessible to the general public and the presence of significant risks in the use of such technologies, especially when used as the main — if not the sole — source of financial decisions.

In particular, the information sheet aims to make citizens aware of the main aspects to consider in using AI tools available online for selecting financial investments. It first recalls that such public AI tools are neither authorised nor supervised by financial regulators and that, accordingly, there is a protection gap relative to the services of authorised investment firms [10]; it also recalls that those AI tools are not developed and conceived for the specific purpose of providing investment advice, representing at most an application of AI systems of a different nature.

Among the risks linked to potential financial losses, on the one hand there is a "technological" problem, summed up in the well-known "*black box problem*" — that is, the very developers' inability to understand in depth the workings of certain AI systems [11] — which generates a potential spiral of risks when faced with complex and unpredictable financial markets; on the other hand, there is the risk of "*enforcement*", since such AI applications are not subject to the obligation to

comply with the same strict standards and rules as authorised entities [12].

In light of the above, ESMA recommends "caution" and "scepticism" when investors approach AI tools, urging full understanding of the risks linked to securities trading and a preference for authorised professionals capable of providing personalised advice and tailor-made recommendations. The European Authority also reminds investors that success in the stock market cannot be guaranteed by anyone — not even by algo-trading systems — and accordingly invites investors to careful research and reasoned financial decision-making.

Within the span of a decade, then, the move has been from initial optimism and the materialisation of a "gentle nudge" towards the said fintech tools to a sudden scepticism and alarmism vis-à-vis the evolution of technology applied to finance, in particular with the advent of AI.

3. THE CAPACITY OF AI SYSTEMS TO EMBED THEMSELVES IN ANOTHER'S ORGANISATION

The period preceding ESMA's warning was, in truth, marked by a series of significant changes in the technological field which must be taken into account in order to understand what may have led the supervisory bodies to speak of these tools in less than edifying terms when it comes to discussing transparency and stability of financial markets. In particular, it seems possible to classify these "upheavals" into two categories: technological turning points (*i.e.*, technical solutions known mainly to AI insiders) and meta-technological ones (which boast a more widespread impact on the population).

Among the former one may include, on the one hand, LLMs and GenAI and, on the other, RAG and Agentic Systems.

Specifically, RAG (acronym for *Retrieval-Augmented Generation*) is a technique in which a chatbot equipped with generative AI retrieves the most relevant data from a database, by way of real-time searches, on the basis of the domain provided and the user's request (input); these data are presented in the context window of an LLM in order to provide a "grounded" output. RAG is generally used to support employees in research, synthesis and summary activities relating to information contained in internal knowledge databases: indeed its use is often found in the consultation of sectoral databases [13].

Agentic AI refers to AI systems built on advanced LLMs and endowed with planning capabilities, long-term memory and, generally, access to external

tools such as the ability to run computer code, use the internet or carry out market operations [14]. What distinguishes the new generation of *agentic AI* — as compared with the autonomous trading developed through high-frequency trading — is that it possesses the planning capacity typical of state-of-the-art LLM models [5] and is able, for example, to autonomously analyse data, write code to create other agents, test it and update it as it sees fit. In essence, *agentic AI* has the potential to revolutionise multiple functions of financial institutions, just as autonomous trading agents have already transformed trading on financial markets [16].

Turning to the “meta-technological” turning points, certainly impactful have been LLMs (Large Language Models) [17], which create new content in response to user prompts on the basis of training data (measured in tokens) [18], collected from huge quantities of texts from a variety of sources, including public ones; their size can be measured by the number of parameters used [19] (*i.e.*, the part of the model that can be tuned and in which all the knowledge extracted from the data is stored, the number of which determines the level of complexity of that knowledge) [20].

On an even more “popular” level stands so-called *Generative AI* (*i.e.*, GenAI), a type of AI capable of creating original content — that is, outputs consisting of text, images, video, audio or software code, in response to a user’s prompt or request [21].

Two key aspects of GenAI are particularly useful for the financial sector [22]. First, while previous computational advances made the processing of traditional financial data more efficient, GenAI allows greater readability of new types of data (often unstructured), which can improve risk analysis, credit scoring, forecasting and asset management. Second, GenAI gives machines the ability to converse like human beings, which can enhance back-end processing, customer service, robo-advisory and regulatory compliance. Moreover, it also enables the automation of tasks until recently considered exclusively human, for example advising customers and persuading them to purchase financial products and services [23].

Indeed, the advent of ChatGPT in November 2022 contributed to the capillary diffusion, at unprecedented speed, of one of the many GenAIs developed and placed on the market, facilitating access to AI by non-technical users [24]. The capacity of these chatbots to engage in human-like conversations has highlighted advances in language and content processing and generation that allow the development of new and unprecedented applications. The

availability of instruction and embedding models through easily accessible application programming interfaces (APIs) has reduced the technical challenges that previously existed for the integration of state-of-the-art models into testing and production environments. AI technologies — such as these chatbots and their underlying LLMs — are able to ingest and process large quantities of data in formats that previously proved difficult, and to extract meaningful information from semi-structured, unstructured and multimodal texts from various sources. Moreover, they can generate new content, drastically simplify the way human beings interact with technology and use embeddings — which capture the semantically meaningful features of input data — for further downstream tasks (such as classification and search) [25].

One of the most disruptive elements, both from a sociological perspective and from an economic-managerial one, is represented by the replacement of human operators with chatbots (now powered by generative AI) [26], which have begun to upend the relationship between AI in general and corporate realities, especially in light of the difficulties encountered in the legal definition of AI systems.

3.1. AI Systems as an Organisation: From Notion to Legal Type

Starting from the definitional framework laid down at EU level, on 12 July 2024, with the publication in the Official Journal of the European Union of the “Regulation on Artificial Intelligence” (hereinafter, AIA), a long and complex legislative process undertaken by the European Union within its Digital Strategy in order to establish a regulation on AI came to a close [27]. This text [28] is the outcome of a gradual convergence of policymakers towards a notion of AI systems, arising from dialogue with experts in the field and with market forces, in which certain constants emerge even if differences of view persist regarding some distinctive elements [29]. In any event, it appears possible to outline the innovative character of the definition adopted, which has progressively converged on the version elaborated by the OECD [30]: a machine-based system which, on the basis of certain inputs, can produce informational outputs capable of influencing real or virtual environments through a “process” that can present various levels of autonomy.

The AI Regulation, on the other hand, aims to establish a technologically neutral regulatory framework capable of governing future developments — cross-sectoral and risk-modulated [31]: one need only run through the definitions in Article 3 AIA to understand how AI systems are identified irrespective

of the technical features chosen at the design and development stage [32].

Article 3, point 1) AIA defines an "AI system" as "a machine-based system designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments". Recital 12, in this regard, illustrates the main functional features of AI, essentially linked to its "inferential capacity" (whereas traditional software and simpler programming approaches that use "rules defined exclusively by natural persons to perform operations automatically" do not fall within AI systems). Inference refers to the process through which the AI system draws conclusions or provides predictions from available data or information. Such inference may be based on machine learning or on logic and knowledge. The former allows the system to learn "from data how to attain certain objectives"; the latter draws "inferences from coded knowledge or symbolic representation of the task to be solved". Inferential capacity allows the system "learning, reasoning or modelling".

The approach of the EU legislator, then, following the technological-neutrality method, is to prohibit or regulate only certain uses of new technologies, on the basis of the "intended purpose", i.e., *"the use for which an AI system is intended by the provider, including the specific context and conditions of use, as detailed in the information supplied by the provider in the instructions for use, in promotional or sales materials and statements, as well as in the technical documentation"* [33]. AI may indeed be designed for general purposes too and applied in scenarios and for purposes not initially foreseen, where integrated into other AI systems; the AIA, accordingly, includes "models" and "systems" of AI for "general purposes" [34].

On the other hand, the AIA is the result of a deliberate legislative choice in favour of flexibility, in order to be able to address the evolution of technologies in the AI environment without disincentivising innovation, and is consequently based on a so-called horizontal approach, with rules applicable across all sectors of use and to all types of AI [35].

What emerges from a reading of the definitional rules is a vision in terms of "system", which contributes a series of further elements useful in reconstructive terms. First, the concept of a "machine-based" system points to the feature of computational capacity, deriving

from a set of heterogeneous elements such as hardware, software, network infrastructure, data, binary computation and beyond. The structuring as an input/output system denotes a relational and interactive vocation of AI, based on structural interdependencies between internal and external elements, typical of any systemic model (akin, that is, to the representations of Leontief or Porter). The aptitude to condition a virtual or physical environment confirms these considerations, underlining AI's own ability to create value (and generally also externalities, including negative ones). Furthermore, the possibility of an adaptability profile after deployment of the system itself closely echoes the concept of network, with the AI system standing as a magmatic set of relationships that takes shape from time to time, accentuating its dynamism.

3.2. The Legal Type of AI Systems

The definitional framework just briefly outlined allows the interpreter to clear the field around the debate on the legal nature of AI, which has been dominated from the outset by the contrast between theories that locate AI in the category of subject and those that place it in the category of object. Probably, as has been keenly observed, that dichotomy is the fruit of the «most elementary and most general classification known to Western legal systems», that is, the Gaian tripartition into *personae, res, actiones*, in which one perceives «the tension generated with regard to the classification of AI» [36], in order to bring it within either subjects or objects of the law. The issue is no minor one, given the possibility of attributing utilities and disutilities differently.

Setting aside for another venue the analysis of the subjectivist and objectivist theories and their limitations [37], we can take stock of the structural core of AI in an effort to compose a legal type.

The current view of the EU legislator moves in the direction of freeing AI from a conception necessarily tied to intellectual property, since the phenomenon cannot be reduced to its individual components (such as, in particular, software, data sets, patents and trade secrets) — which moreover would have generated friction between, on the one hand, copyright protection and, on the other, typically industrial-property protection [38].

What emerges unequivocally is the perception of the phenomenon as a true "value chain" [39] with a high potential for outsourcing, as evidenced by the description of the heterogeneous array of "subjects" taking part in it [40].

AI thus appears as a complex system, based on a network of negotiated relationships designed to ensure

the availability of resources, both tangible and intangible, intended to produce an output. The very passage of those negotiated relationships is fragmented within the determinations of the meaning of “placing on the market” [41], “making available on the market” [42] and “putting into service” [43], such notions reflecting the various moments and types of contact between the value chain from which the AI system originates and third parties.

There emerges, then, the possibility of using, in a reconstructive function for the AI-system legal type, the presence of a relational dimension between different subjects and oriented to the coordinated use of a heterogeneous bundle of objects.

Adopting a functional approach and acknowledging the emergence of «processes of qualification of economic utilities not appropriable through the classical forms of property law» [44], one may proceed in the search for an interpretive medium, given the heterogeneous structure of AI systems.

Indeed, AI uses, just as does (for example) the trade secret (cf. Articles 98–99 of the Italian Industrial Property Code), a series of “inputs” mostly known or subject to the dominion of others, making clear that what really matters (at least with a view to building the legal type) consists, in addition to the informational output, in its production process — that very process and the ability to combine different elements and subjects in their precise organisation being the operational core of any AI system [45].

Along this line, then, it is equally important to grasp how the organisation as such may represent not only an element of the legal type but, above all, may guide the search for a criterion of attribution.

To this end, it seems advisable to investigate its boundaries by recalling first the classical concepts, according to which to have an organisation it is necessary to possess and control the factors of production (traditionally identified as capital and labour); but informational capitalism has partially revised the internal and external relationships of this binomial, since for some time now knowledge has changed its way of operating, becoming both means and instrument for producing and accumulating wealth [46].

The novel element of the AI system, which differs from the individual elements of which it is composed, is to be found precisely in the organisation, since the AI system is identified not with the individual organised elements but with the organisation itself, and thus with the set of links and functional fabrics established between them [47]. Those links encompass all the

elements that are coordinated through them in view of production, existing not only with respect to goods but also to services, software, networks, data, information, users and so on. Those very links, moreover, are interwoven both in material relationships and in purely ideal relationships: it is not a matter of a simple way of being or of a positioning of elements among themselves, but of something quite different that is above them, binding and dominating them. Confirmation of this is provided by the fact that the organisation persists even after the disappearance or necessary replacement of any element, in order to preserve the efficiency of the whole [48].

The attention paid to the firm (*azienda*) has enriched the debate around the concept of “organisation”: notoriously, in the firm the attribution and characterisation of assets is given not by the title that links the individual asset to the entrepreneur, but by the organisation impressed by the entrepreneur on the complex of (mutually heterogeneous and functionally and teleologically connected) assets, this being the objective counterpart of the organisation requirement under Article 2082 of the Italian Civil Code [49]. The firm is, in short, an expression of a productive logic in which the teleological element is entrusted with grasping the bond established between assets even significantly different from one another; this occurs irrespective of whether they correspond to a portion of material reality and, accordingly, of any physical link emerging between them.

From a legal standpoint, the firm requires that the creation of a “productive” structure be the result of an organisational process involving heterogeneous assets which a subject has at his or her disposal under titles not necessarily homogeneous [50].

From organisational work a new and different legal-subjective situation may arise on the complex of assets. But it is above all the economic acceptance [51] that offers the interpreter useful hints to grasp both organisation as such [52] and the “systemic” dimension of the firm itself (and potentially of AI), this being a necessary step in the attempt to coordinate various kaleidoscopic profiles.

The need to identify the ownership of the organisation requires shifting attention to systems theory [53], according to which, as is well known, the organisation is defined as an “autopoietic system” [54] that tends to reproduce itself through a recursive lattice of decisions that are both autonomous and teleologically ordered to a given outcome [55]. This invites us to locate the logical core of a situation of ownership in the person who takes such decisions, determining both the decisional premises and the

decisional programmes of an organisation [56]. This sets the present approach apart from the theory of the quasi-organisation [57], which seeks to frame the relationship between human beings and AI systems within the scope of association (*i.e.*, a collective actor) in order to address a number of issues, mainly centred on the civil-liability regime. That theory, however, situates itself within the relational and interactive dynamics between man and machine and, above all, formulates its conclusions by looking at outcomes — that is, downstream of production; the discussion of AI as organisation, by contrast, seeks to position itself upstream of production, attempting to articulate criteria of attribution *in apicibus*.

Thus, both from a legal-economic perspective and from a sociological and philosophical one, AI can not only be framed as an organisation, but, above all, that premise allows the construction of a relational status capable of grounding its ownership, drawing on familiar categories: one need only think of the systemic and organised profile of the value chain, capable of ontologically describing an AI system, where the very economic organisation finds its peculiarity in its ability to manage relationships through contracts (*i.e.*, the *nexus of contracts theory*).

3.3. Alternative Attribution Criteria: Liability Along the AI Value Chain and Consequences in Practice

From what has emerged so far, the fundamental feature of an AI system is its productive function, as the capacity to create new wealth — that is, outputs endowed with use value and exchange value.

One may therefore attempt to trace the coordinates for qualifying the AI system in organisational terms — as moreover Article 25 AIA expressly indicates (regulating risk-management responsibility, along the AI value chain, of providers, distributors, importers, operators and other third parties) — and as the very definition of AI essentially decrees in describing its architecture in terms of an input/output system.

From this perspective, indeed, a feature in common with the firm has emerged — in the economic rather than the technical-legal sense — through the ontological configuration of the organisation, with attention paid to the network of relationships and connections that makes its activity possible [58].

Conceiving AI as an “organised system” — and thus as an “organisation of relationships” — leads the interpreter to set aside any description of the phenomenon in dominical or proprietary terms, and to look for answers to the question of ownership elsewhere, starting precisely from that organisation and

identifying its centre of attribution and the relevant criteria.

Looking at the enterprise in the sense of the elective form of the organisation of the factors of production (typical of the economic sciences), capable of designing a different paradigm of the relationships of belonging, it may be useful to use the trade secret as a logical-comparative *medium*, since it — like AI systems — is characterised both by objective elements ascribable to so-called informational goods (such as data, knowledge and information) and by relationships with a series of subjects (internal or external to the firm's organisation, but in any case part of the value chain) who hold those objective elements and at times merge inextricably with them (as in the case of experiences) [59].

Thus, just as for the secret, one may state that, also for AI — being the fruit of an activity that incorporates both objective elements (first and foremost data and information) and subjective elements (think of the development of software by third parties) — there may correspond a relationship of belonging that can be modelled on the same “scheme” as the trade secret.

In this regard, one must first recall that Article 98(1) of the Italian Industrial Property Code, in describing the entitled relationship with information, expresses itself in terms of the “lawful control of the holder”, evoking the concepts of lawful control and possession.

The reflection on the legal-subjective situation under Article 98 of the Industrial Property Code has been elegantly summarised in the figure of “qualified disposability” [60], thereby referring to the lawful control of confidential information by the holder.

What is certain, when discussing control, is its irreducibility to a unitary conception [61], not only with respect to its definition [62] but also as regards its normative status [63]: indeed, it seems to be inherent in the very nature of control, as a factual situation, that its definition serves the purposes that the legislator pursues in the particular regulatory context in which it is laid down [64].

Among the indispensable features of control is its “relational” nature [65]; furthermore, its elasticity allows control to connect the two ends of the relationship: on one side the active side, embodied in a subject, and on the other the passive side, made up not only of subjects but also of a non-personified or non-entified complex of assets [66]. Indeed, the most relevant element that emerges from the analysis of “control”, regardless of its malleability [67] and its placement in the legal system [68], is «the conditioning of another's

decision or of other acts or facts, through one's own intervention» [69] — a phrase that may be condensed in the term “influence”: it is in influence that one perceives the uniquely peculiar trait of control and of the relationship that develops, since one is able to exert a more or less direct and incisive action on a course of conduct or an event [70].

Control allows the legal system to identify a rational and valid alternative to the typically proprietary framework. Accordingly, enterprise law represents a useful interpretive key for going beyond proprietary schemes, since it makes it possible to combine *personae* and *res* in a relationship of dominion, not only through the firm, but also through the very concept of enterprise-as-organisation; and indeed, it is precisely within this branch of private law that the pioneering alternatives to property arose, through, on the one hand, the hierarchical principle — whereby the holder of the enterprise is the “*dominus*” — and, on the other, market relationships and the contract, which design the ownership of the enterprise-organisation.

From this it appears possible to invoke the concept of control with reference to AI systems, since, exactly as for entrepreneurial activity, what is legally relevant for reconstructing the situation of dominion over an organisation is not the specific ownership but the recomposition [71] of the hierarchical “chain” of the activity [72].

When one speaks of organisation, one is speaking, accordingly, of function — and only the functional perspective can be employed to assert a different view from the proprietary framework [73]. One must, in other words, take stock of other legally relevant situations that arise not from property but from contract [74] or other sources [75]. Even by recalling an older theory of the enterprise [76] — the enterprise as subjective right, which assigns the entrepreneur a “right of enterprise” over the firm, the principal content of which is the power to manage it [77] — when faced with complex legal-subjective situations, the hermeneutical effort of property is not enough: the same scholarship indeed speaks of «a new subjective right (or, more generally, a new legal situation), over the complex destined to a productive end, and therefore not identifiable either with the sum of the rights existing on the individual assets or with any of those rights» [78].

According to that theory, in short, with the acquisition of the status of entrepreneur there is the acquisition of a complex active legal situation having the firm as its object and management power as its content, summarised in the expression “subjective right of enterprise” [79].

Although in a different context, the positive notion of AI may be linked to a subject of the legal order without passing through the constraints of property, but rather by qualifying it in terms of organisation and re-reading that *right of enterprise* in terms of “control” [80].

3.4. Control of the Organisation as a Criterion for Attributing the Ownership of “AI Systems”

The real turning point in the reconstruction of the apex of the AI value chain emerges through a systematic reading of a central provision, which makes it possible to identify that control, that hierarchical principle (one might say, borrowing from the concept of *subjective right of enterprise*, and in the perspective of a right over the organisation, a *subjective right to organise AI systems*) echoed in the definitions of the AIA: indeed, on close inspection, the regulatory framework reveals that ownership of the organisation is assigned to the person who has control of the AI system chain in its operation. After all, the idea had already been advanced that the enterprise could be more easily framed in a market relationship than in a hierarchical organisation [81], though in that context the reference was to the platform mechanism; in the case of AI systems, by contrast, the inquiry encounters a wider field, given that the platform itself is only one component of the AI system.

The investigation conducted thus far passes, by way of a series of illustrations, through the concept of *deployer*, which, both in recital 13 [82] and in Article 3, point 4) — at least in the Italian version — introduces another concept, that of “authority”: by *deployer* is meant a “natural or legal person, public authority, agency or other body using an AI system under its *authority*, except where the AI system is used in the course of a personal non-professional activity”. At first glance, and from a legal point of view, this expression should be a synonym of a position of power, that is of a «power to legally impose one's decisions on others» [83]. On a closer analysis, however, it seems possible to distinguish the notions of control and authority.

Control is to be understood as influence over the organisation (thanks to the role played in the network of contractual relationships in which the AI system organisation consists); authority, by contrast, consists in the influence over the AI system's decision-making process and constitutes a “derivative power” relative to control [84]. Indeed, control identifies the holder of the legal-subjective situation over the system, from which derive not only the duty to manage risk but also the attribution of liability; authority, by contrast, identifies the subject required (in addition to properly managing the input data) to cooperate in risk management, and who is in turn responsible for damages to third parties

arising from the use of the system in his or her professional activity. Indeed, in this perspective, the *deployer* responds for damages from the malfunctioning of his or her own organisation (which makes use of AI), while only the holder of the system (or rather, the controller/*provider*) responds for AI as such, until and unless another operator engages in one of the conducts envisaged in Article 25(1) AIA.

What thus emerges is the possibility of introducing a "transfer" of derivative kind of part of the "power" residing in the controlling party: the effect of such transfer is what the EU legislator calls "authority", which gives the *deployer* the capacity to influence the system's functioning since he or she is entitled (besides feeding input data under his or her own responsibility: cf. Article 26(4) AIA) to adapt the system to specific needs, and may be called upon to cooperate in the testing phases (Articles 9 and 60(2) AIA). After all, the concept of "authority" seems entirely similar (if not in some respects superimposable) to the position of the "data controller" under the GDPR — that is, the person who, on an appropriate legal basis (first and foremost the consent of the data subject), has the power to "decide" over data (which, however, he or she does not own) [85].

Control (*i.e.*, the ownership of the organisation) refers, exactly as in company law, to the principle of effectivity, since such situation arises from the power that translates — in the specific content of the AIA — into the possibility, for whoever exercises control, of holding the reins of the contractual relationships on which the AI system rests [86], and of transferring portions of that "control" (*i.e.*, authority) to the *deployer* [87]. Bringing the discussion back for a moment to the shores of financial markets, all those who develop AI systems for financial services "in house" — for example through ChatGPT — would fall within the scenario of the exercise of "authority" understood as delegated power [88].

In relation to an organised activity such as the AI system, the same problems arise as those concerning the firm in the economic — rather than legal — sense, since human resources are also among the factors of production and, moreover, the very idea of value chain is properly economic. When one moves to the legal-structural description of the AI system, one disregards the dominical and appropriative logic, since with control the only thing that matters is the *ius excludendi alios*, in a sort of "house right" [89], the protection of which is rendered even simpler by platform technology: it is ensured at the outset by the *de facto* prerogative of the service provider to grant or refuse access, and subsequently by a right with a contractual basis and modes of enforcement independent of the will of external authorities — namely, the right to disconnect.

Recognising AI systems, as a legal type, in the form of an organisation makes it possible to address the most critical issues — that is, ownership and the attribution of risk.

Indeed, control allows for the identification of the subject holding the active and passive legal-subjective situations (such as the right to extract value from the system and the *ius excludendi alios*), and makes it possible to identify, within the value chain and the network of relationships among firms, the ultimate holder.

In other words, the holder of an AI system is the person who has control over the contractual relationships along the value chain [90], whose "power" arises from market relationships and the role he or she has carved out in contracts with the other subjects [91], being the holder of that organisation over which he or she exercises influence and external direction [92].

To assist the reader in navigating the conceptual articulation developed in sections 2.1 to 2.4, the following table synthesises the three pillars of the

Table 1: Organisation, Control and Authority in the AIA Value Chain

Concept	Legal content	Corresponding AIA figure	Liability consequence
Organisation	Network of negotiated relationships coordinating heterogeneous inputs (data, software, infrastructure, human resources) towards a productive output.	The AI system itself, as a value chain (Article 3(1) and Article 25 AIA).	Provides the systemic dimension against which liability is allocated along the chain.
Control	Original influence over the organisation, exercised through the contractual relationships that compose the value chain; akin to a "subjective right to organise AI systems".	Provider (Article 3(3) AIA) and, more generally, the apex of the value chain.	Primary liability for risk management and for the AI system as such (Articles 9, 16 and 25(1) AIA).
Authority	Derivative power transferred by the controller to a professional user: influence over the system's decision-making and input feeding, comparable to the GDPR "data controller".	Deployer (Article 3(4) and Article 26 AIA).	Co-operative duties in risk management and liability for harm caused in the deployer's professional activity (Articles 25(1) and 26(4) AIA).

proposed framework — organisation, control and authority — and links them to the corresponding figures of the AIA value chain and to the consequences in terms of liability allocation.

4. THE OUTPUT OF AN AI SYSTEM AS A SERVICE AND USE CASES IN FINANCE

Looking at the architecture of AI systems and applying it to the markets, if the premises so far formulated are correct [93], it is necessary to ask what is the nature of the output of an AI system (and of the APIs — Application Programming Interfaces — connected to an LLM).

Once the AI system is legally reconstructed as an organisation aimed at creating value (and thus capable of carrying out an organised economic activity) [94], evidently its object consists neither in the production of a good nor in an exchange activity, but in the provision of a service — that is, in private-law terms, in performances of doing rather than of giving [95] — thus allowing further distinctions depending on whether the obligation is one of means or of result [96].

This approach is also correct from an economic, in addition to a legal, point of view. Indeed, looking at the features of services in general, one notes that the concept of service is based on the hendiadys “*benefits without ownership*” [97], with its “dynamic” phase coming to the fore — that is, as «performance of activity» [98] which in any event presupposes a doing [99] and a creative-productive activity [100].

4.1. Use Cases of AI in the Financial Sector

The service nature of AI applications in the financial field emerges from the analysis of use cases, on the basis of the numerous studies conducted by international organisations and various supervisory authorities [101].

The principal applications of AI systems in business processes include performances such as profiling, customer segmentation, the design and distribution of financial products, and the creation, optimisation and rebalancing of investment portfolios [102].

A further example of recourse to AI systems is observed in the relationships between Authorities and operators of regulated markets. For some time now there has been a tendency towards the use of the same AI technologies (and thus shared between supervisors and supervised entities) [103]; this phenomenon has been framed under so-called *SupTech*, the mirror image of corporate compliance through AI systems (*RegTech*) [104]. A promising field of application is anti-money-laundering [105], in which

the use of technology is recommended to national authorities where it can facilitate the fulfilment of their institutional mandate, and is even prescribed for the European Anti-Money Laundering and Counter-Terrorist Financing Authority for the purpose of developing and making available to FIUs (Financial Intelligence Units) tools and services to enhance their analytical capabilities — such as IT and artificial intelligence services and tools [106]. Ultimately, it would seem that the adoption of integrated AI systems to detect anomalous transactions in order to deepen investigations — already widely used — is becoming mandatory [107]. In the present case too, the use of AI is functional to a performance of doing.

In the world of finance, new technologies are also used outside the institutional circuit, and not always transparently. The reference is to the so-called *fin-influencer* phenomenon — namely, an influencer who, by dispensing advice on various financial matters via short and lightweight videos posted on the main social-media platforms, produces a notable impact on his or her followers’ investment decisions [108]. Beyond cases of unauthorised use of unwitting celebrities’ images to influence the public [109], a particularly alarming figure is the virtual influencer — namely, a “subject” (or rather, a bot) created by combining different technologies, such as AI, computer graphics, augmented reality, motion capture and machine learning [110] — which could fall within the dissemination of advice relating to financial products or services [111], or could even be configured as a portfolio-management service (where the AI system, with the advent also of *agentic AI*, were combined with a smart contract) [112]. Both, as is easy to grasp, consist in the provision of services entrusted to machines.

A handful of recent episodes drawn from market practice helps to render the theoretical reconstruction more concrete. First, in the field of automated trading, the “flash sell-offs” that have intermittently affected major US and European equity indices in 2024–2025 have repeatedly shown how the synchronisation of algorithmic strategies — many of which now incorporate machine-learning modules — can amplify intraday volatility well beyond the level justified by underlying fundamentals, raising for supervisors the very “house of cards” concern that IOSCO has explicitly recorded. Second, in the area of retail robo-advice, the steady growth of platforms operated by both incumbent banks (such as Moneyfarm, ING Direct or Intesa Sanpaolo’s “Investo”) and pure-play fintechs offers a real-world testing ground for the deployer category: the firm running the front-end and feeding the inputs is typically not the developer of the underlying model, which is increasingly supplied as

AI-as-a-service by third parties — a configuration that maps almost exactly onto the control/authority distinction proposed above. Third, with respect to fin-influencer activity, the enforcement actions taken by the SEC against celebrity promoters of crypto-assets (the Kim Kardashian settlement of 2022 being the best-known precedent, followed by the 2023 Lindsay Lohan and Jake Paul orders) and, on this side of the Atlantic, the warnings issued by Consob and the AMF on unauthorised online "trading guru" activity, provide a stock of cases in which the regulatory perimeter of MiFID-style investor protection is openly tested by content that is formally informational but functionally advisory. Finally, the rapid spread of conversational interfaces powered by general-purpose models — ChatGPT, Gemini, Claude and Mistral, among others — among retail investors illustrates the empirical premise of the 2025 ESMA Warning: users frequently rely on outputs that are neither calibrated to their personal situation nor produced under any duty of suitability, blurring the very boundary between information, advice and recommendation that MiFID II was designed to police.

Likewise, the production of targeted content of a financial-information nature also constitutes a service: GenAI is used not only to evaluate textual data from earnings communications and regulatory disclosures in order to enhance the efficiency of services such as asset management or trading, but also for so-called ownership intelligence [113].

Ultimately, the very financial education delivered by "machines" [114] can be configured as a service [115]: according to the OECD, as is well known, financial education of the customer in general means the adoption of measures by Member States aimed at increasing consumer awareness in financial matters, by way of initiatives designed to facilitate the understanding of the basic features of a credit product [116]; in other words, financial education tends to be viewed sometimes as a form of financial literacy [117], sometimes as a form of knowledge of the basic mechanisms of the economy in order to take informed financial decisions and consciously face financial challenges [118].

In order to ensure that financial education is «an instrument of *financial inclusion* and *financial stability* that feeds not only on technical capacity but also on an acquired and mature capacity to act consciously, conjugating *financial literacy* with *financial capability*» [119], and to prevent the perverse effects of *information overloading* [120], the study of the specific propensity and savings/investment preferences of the future generations to be financially "educated" could also be entrusted to AI systems, and technological tools could

be used to dilute and make less burdensome the delivery of financial information [121].

4.2. Systemic Risks

Framing AI within the category of services is, in principle, indifferent to the qualities of the subject to whom the AI system offers its performance, the classification being insensitive to whether the system is made available to a consumer or to a professional user who integrates it into his or her own organisation. In the latter case, however, AI as a service acquires the capacity to embed itself, in turn, in another's organisation, becoming part of it; this on the one hand brings undoubted gains in efficiency, but on the other hand can prove "destructive", going so far as scenarios of "interdependence" and "interconnection".

As emerges from the latest IOSCO consultation report on AI in financial markets [122], a not insignificant aspect that the massive diffusion of AI entails is the growing interconnection between financial institutions and their providers, due to the increasingly frequent sharing of technologies, infrastructure software and data; this last aspect raises the danger that among service providers there may also be those who escape the regulation of firms operating in financial markets; moreover, the "interdependence" of AI systems [123] could trigger the so-called "*house of cards*" effect, in which a failure in one part of the system could lead to the collapse of the whole [124].

In order to limit distortive uses and risks, IOSCO, in the cited report, sets out a synthesis of the use cases and risks of AI systems in finance, given that companies are increasingly using AI systems to support decision-making across different applications and functions, such as robo-advising, algorithmic trading, investment research and sentiment analysis, alongside their use in enhancing surveillance and compliance functions. Moreover, AI is increasingly being employed to support internal processes and operations through the automation of activities.

In this respect, IOSCO's analysis reveals that the AI applications used by financial intermediaries fall predominantly within the following categories: internal operations and processes; customer interactions; and improvements to trading and investment products and processes [125].

As regards risks [126], four areas have been mapped where the use of AI systems presents the greatest critical issues: properly harmful uses of AI; the use of models and data by AI; concentration, outsourcing and dependence on third parties; and interactions between human beings and AI systems.

As to the first area in particular, a series of more frequent risks have been identified, linked to cybersecurity [127], privacy, data protection, fraud [128], market manipulation and the use of deepfakes [129]. As regards AI models, among the most significant issues are the explainability and complexity of the models themselves [130]; the limitations arising from the historicity and poor quality of the data feeding the models [131]; and the distortion generated by biases in the data used to build the model [132].

Among the most-feared risks, moreover, are those linked to concentration, outsourcing and dependence on third parties, especially considering the use of AI systems in algorithmic trading, robo-advising and asset management. Specifically, concentration risks materialise in the use of AI technologies relating to technology infrastructure, data aggregation and model supply: think of cloud-service providers, where reliance on a small number of providers can certainly create concentration risks in technical supply and associated services [133]. Even more concerning is the risk linked to outsourcing and dependence on third parties, which represents one of the major challenges for market regulators, since most technology providers are not directly regulated and AI tools can be developed and managed in-house, with combinations of open-source systems supplied by third parties [134]. Indeed, the news has reported [135] on the bans imposed on employees of Wells Fargo, Barclays Bank, Citigroup, Bank of America, Goldman Sachs and Deutsche Bank against importing generative AI systems from their homes.

Finally, there is the issue of interactions between human beings and AI systems: on this point IOSCO [136] denounces the lack of accountability and possible regulatory non-compliance. Indeed, the use of AI systems by financial-market intermediaries could entail non-compliance, the perpetuation of breaches of sectoral rules, as well as harm to investors and to the market and potential reputational damage to firms — particularly if the use of AI systems by a firm is not adequately overseen with policies, procedures and controls in matters of risk management and governance [137].

What has been observed so far seems to be confirmed by a series of further sources, including the data-security report *Enterprise GenAI 2025*, which states that the overwhelming majority of AI use in the workplace takes place outside organisational supervision, with 71.6% of access to GenAI tools occurring through non-corporate accounts. Even among users employing corporate accounts, only 11.7% of total accesses meet the SSO-supported corporate-account security standard. In other words,

this means that approximately 90% of AI-tool usage remains invisible to organisations [138].

On the same line is the open letter from JP Morgan to third-party providers [139], which warns that so-called software-as-a-service offerings (*i.e.*, SaaS, including ChatGPT) generate the risk that competitive pressure may unleash a race for new features at the expense of security: indeed, providers are urgently required to redefine their security priorities, placing them on a par with — or above — the launch of new products. The phrase “*Secure and resilient by design*” must go beyond mere slogans: it should require continuous and demonstrable evidence that controls are working effectively, and not rely simply on annual compliance checks; in other words, «*The ecosystem must address trustworthy integration*» [140].

5. THE RESILIENCE OF THE PRINCIPLE OF TECHNOLOGICAL NEUTRALITY

A consequence of no small importance, as regards framing AI-system activity in terms of “service”, concerns the principle of technological neutrality, which in this context plays both a causal and a consequential role.

It is well known that this principle is the fruit of a debate held within the United Nations Commission on International Trade Law (UNCITRAL), according to which the law must remain neutral as to technology, despite the identification of the technical solution capable, in theory, of implementing the legal principles affirmed; moreover, the law should confine itself to setting the goal to be achieved, without indicating the technical means for its pursuit [141].

The principle of “technological neutrality” should therefore amount to a “procedural feature of regulation” [142]. That this principle informs (or at least should inform) [143] both AI regulation [144] and market regulation [145] is a settled matter; what attracts attention and presents novelty is rather the regulatory approach adopted to AI systems in the context of financial markets [146].

Following its causal role, then, one can see why technologically neutral regulation, also for AI systems applied to financial markets, must lay down uniform rules — with reference to the typical activities and risks — eliminating the possibility of distinctions based on the tools used to carry out those activities. The trend in the markets field is, on the one hand, to enact technologically neutral rules and, on the other, to issue complementary regulations on specific fields of application and technological solutions [147]; however, the issue of the governability of technologies in the financial field has been raised from various quarters,

going beyond the mere imposition of requirements on the technological tool [148], since a financial market populated by AI systems would generate dynamics different from the past, as has been seen above.

On the consequential side, conversely, one should look to the other horn of the principle of technological neutrality — that is, the “functional” approach of the law, where what is regulated is not the object but the function [149]: it is therefore necessary that the provision of AI-system “services” in the financial field take place according to the same standards of protection of the recipient, regardless of the nature of the operator (human or machine) [150].

6. CONCLUSIONS

Translating the consequential dimension into operational terms, in the case of advisory and portfolio-management services, the standards already known, developed and contained in MiFID and in the Italian Consolidated Law on Finance (TUF) would apply; whereas, in the case of the financial-education-as-service, they would still need to be built.

By way of example, and to better grasp this proposition — so that it does not appear more apodictic than it already is — consider the role of supervisory authorities also as data-vendors and data-trainers in line with the model of Large Database Models (LDMs) [151].

LDMs are models optimised to extract information from large datasets and transaction flows rather than from human language and text — which, as analysed above, are the domain of LLMs and chatbots [152]. Whereas LLMs are “trained” on publicly available data (such as books, articles, Wikipedia and various other sources), their training materials generally do not include the enormous quantity of data held within companies. Indeed, only 1% of corporate data is currently used in large language models.

LDMs, by contrast, are trained on transaction records, product information, customer-relationship data, training records and employee records, alongside other corporate data sources. Accordingly, companies could use LDMs to leverage the meaning of the 99% of unused data within their databases, through conversational queries, in a process known as semantic search. And semantic search goes well beyond simple keyword matching to grasp the meaning and context behind a user’s query [153].

LDMs would therefore represent a new way to leverage the data embedded in corporate applications and transaction flows in order to extract new

information and new value for the company, using less energy, with lower costs and more targeted outputs [154].

Applying these paradigms to supervisory authorities (one might think of Consob or ESMA), which today could already perform a validation and verification function, what could be the potential of LDMs applied to financial markets and the renewed role of financial Authorities?

Nor would this be entirely far-fetched in the framework of action under the Savings and Investment Union, as emerges from the European Commission’s January 2025 Communication “*A Competitiveness Compass for the EU*”, which seeks to create a financial environment more favourable to start-ups and scale-ups, with measures designed to stimulate European venture capital but with due prudence [155].

After all, it is always a matter of data; and information is what financial markets live on and feed off. A reading in this sense, capable of providing a connecting thread with what has been said so far, emerges from the April 2024 Letta Report “*Much more than a market. Speed, Security, Solidarity. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens*” [156], where, in setting out the fifth freedom (alongside the well-known four freedoms of movement of persons, goods, services and capital) — that is, the freedom to carry out research, innovation and education within the single market — it is stated that the four freedoms are not enough to address the shift from an ownership-based economy to a new economy based on access and sharing. Precisely on access and sharing, perhaps as the new paradigm of contemporary relationships? Another problem is the identification of the subject or subjects holding the power to decide who controls access and sharing.

In this magmatic scenario, particular attention to financial education should certainly be paid to the use of AI by retail investors [157].

Translating the foregoing analysis into operational guidance, a number of concrete proposals can be addressed to the three classes of actors most directly involved in the governance of AI applied to financial markets.

To regulators (ESMA, IOSCO, Consob and equivalent national authorities). First, the supervisory perimeter should be extended to capture fin-influencer activity that is functionally advisory in nature, irrespective of whether the content is delivered by a natural person, a virtual

avatar or a chatbot, recovering the “same activity, same risk, same rules” logic underlying the principle of technological neutrality. Second, mandatory transparency standards should be developed for retail-facing AI tools (including general-purpose chatbots used to obtain investment ideas), modelled on the suitability and appropriateness duties of MiFID II and including a clear “regulatory disclaimer” informing the user that the tool is neither authorised nor supervised. Third, supervisory convergence should be pursued along the lines of the IOSCO 2025 Report, with the development of common taxonomies and reporting templates for AI incidents, model failures and concentration risks linked to a small number of cloud and model providers.

To financial institutions (banks, investment firms, asset managers, fintechs). The control/authority framework reconstructed above should be internalised through clear contractual allocation of liability with AI providers (especially in AI-as-a-service arrangements), explicit governance of the deployer role within compliance and risk-management functions, and the adoption of “human-in-the-loop” controls for any AI output that may concretely influence an investment recommendation or a portfolio decision. The shadow use of generative AI by employees on non-corporate accounts — documented at striking levels in recent data-security reports — calls for binding internal policies, secure-by-design integration of approved tools, and the inclusion of AI competences in suitability assessments under Article 9 IFD and in the ESMA Guidelines on the knowledge and competence of staff.

To policymakers and financial-education actors (the EU Commission, national ministries, the Italian Financial Education Committee). Financial education should be recognised, in line with the Letta Report’s “fifth freedom”, as a constitutional precondition for the effective exercise of the economic freedoms and, accordingly, integrated into school curricula and lifelong-learning programmes with a dedicated AI-literacy module covering the limits, biases and proper uses of algorithmic tools. National strategies should also link financial education to the sustainable-finance agenda, so that retail investors are equipped to understand both the opportunities and the limits of AI-driven ESG scoring, green-asset selection and impact-investing platforms; only on this basis

can AI become an instrument of long-term financial stability rather than an additional source of systemic fragility.

Ultimately, if it is true — as it is — that AI is transforming the world, this is happening above all through the change in how we produce and work, also in financial markets, where the transitive dimension has gained the upper hand over the intransitive. Yet an obstacle (or at least a slowdown) in this trajectory may be offered by the analogy between *actus humanus* and *labor humanus*, where repetition (*habitus*) can become *habitus* (Thomas Aquinas would say *habitus operativus bonus*) only through the performance of a specific virtuous function [158]. In this regard, financial education can (still) do much — also in order to avoid contributing to the forging of a new “golden calf” of finance, and in order to anchor the development of AI-driven services to the broader objective of a sustainable, resilient and human-centred financial system.

CONFLICT OF INTEREST

The author declares no conflict of interest.

FUNDING

This work received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ACKNOWLEDGEMENTS

This paper reproduces, with expansions and the addition of references, the report presented at the Conference on “Financial education, digital transition and artificial intelligence”, held at the University of Sassari — Department of Economic and Business Sciences — Olbia campus, on 14 May 2025 [1].

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- by imitating real human beings and manipulating results without leaving any trace.
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- [7] D. Maffei, *I contratti del mercato finanziario*, in *Trattato Cicu Messineo*, Milano, 2024, p. 157.
- [8] See Action Plan on Building a Capital Markets Union, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 20.09.2015, COM(2015) 468 final. As is well known, this document collects the results of a public consultation conducted by the European Commission following publication of a Green Paper entitled Building a Capital Markets Union [COM(2015) 63 final], Brussels, 18 February 2015, with the aim of identifying the actions necessary to improve access to financing for all businesses and infrastructure projects in Europe, to help SMEs raise financing as easily as large enterprises, to create a single market for capital by removing obstacles to cross-border investment, and to diversify the sources of financing of the economy and reduce the cost of raising capital. On the outcome of the consultation see European Commission, Feedback Statement on the Green Paper "Building a Capital Markets Union" accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Action Plan on Building a Capital Markets Union" [SWD(2015) 184 final], Brussels, 30 September 2015.
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- [16] Suffice it to refer to the August 2025 Forrester study commissioned by AWS Marketplace (How Financial Services Leaders Are Approaching Security And Innovation. The Advancing Role Of Cloud-Native Systems And Agentic AI), available at https://pages.awscloud.com/rs/112-TZM-766/images/Forrester_AWS%20Marketplace_How%20Financial%20Services%20Leaders%20Are%20Approaching%20Security%20And%20Innovation.pdf?version=1, which shows how agentic AI is radically transforming financial services, currently based on the use of chatbots; in particular, three areas are identified in which agentic AI is transforming financial services, creating what industry experts call autonomous finance or services based on algorithms capable of taking financial decisions on customers' behalf: AI-powered customer service (account management, processing of loan applications, dispute resolution); AI in financial operations (AI agents can analyse market conditions, adjust risk parameters in real time and optimise everything from trading strategies to compliance monitoring, not merely following rules but taking "intelligent" decisions based on continuously evolving data); hyper-personalised financial advice (an AI agent can help customers monitor their financial situation, looking for opportunities to save money, optimise investments or detect potential risks).
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- Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act).
- [28] For an initial analysis, see R. Petruso, G. Smorto, Il Regolamento europeo sull'intelligenza artificiale: una prima lettura, in *Nuova giur. civ. comm.*, 2024, 989 ff.; see also A. Mantelero, G. Resta, G.M. Riccio (eds.), *Intelligenza artificiale. Commentario*, Milano, 2025; O. Pollicino, F. Donati, G. Finocchiaro, F. Paolucci (eds.), *La disciplina dell'intelligenza artificiale*, Milano, 2025.
- [29] For a diachronic overview, see G. Proietti, Definire l'indefinibile? I sistemi di intelligenza artificiale alla ricerca di un inquadramento sistematico, in *Contr. impr.*, 2024, 882 ff.
- [30] The OECD, in a 2022 recommendation document to the European Council on AI (OECD, Recommendation of the Council on Artificial Intelligence, OECD/LEGAL/0449), defines an AI system as "An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations, or decisions influencing real or virtual environments. AI systems are designed to operate with varying levels of autonomy".
- [31] See European Parliament resolution of 20 October 2020 with recommendations to the Commission on a framework of ethical aspects of artificial intelligence, robotics and related technologies (2020/2012(INL)), § 12.
- [32] See recital 4: "AI is a fast-evolving family of technologies that contributes to a wide array of economic, environmental and societal benefits across the entire spectrum of industries and social activities. By improving prediction, optimising operations and resource allocation, and personalising digital solutions available for individuals and organisations, the use of AI can provide key competitive advantages to undertakings and support socially and environmentally beneficial outcomes, for example in healthcare, agriculture, food safety, education and training, media, sports, culture, infrastructure management, energy, transport and logistics, public services, security, justice, resource and energy efficiency, environmental monitoring, the conservation and restoration of biodiversity and ecosystems and climate change mitigation and adaptation".
- [33] Article 3, point 12), AIA.
- [34] See Article 3, point 63), AIA: "'general-purpose AI model' means an AI model, including where such an AI model is trained with a large amount of data using self-supervision at scale, that displays significant generality and is capable of competently performing a wide range of distinct tasks regardless of the way the model is placed on the market and that can be integrated into a variety of downstream systems or applications, except AI models that are used for research, development or prototyping activities before they are placed on the market;" see also Article 3, point 66), AIA: "'general-purpose AI system' means an AI system which is based on a general-purpose AI model and which has the capability to serve a variety of purposes, both for direct use as well as for integration in other AI systems;"
- [35] On this point, see R. Petruso, G. Smorto, Il Regolamento europeo sull'intelligenza artificiale, cit., 991. It should be added that the notion of AI must be read in the perspective of the problem the AIA seeks to address, namely a problem of risk management and consequently of activating accountability mechanisms. Following a "risk-based" approach, under which the higher the risk the stricter the rules, the AIA establishes obligations for providers and operators of AI systems depending on the level of risk that the AI may generate: (i) unacceptable risk; (ii) high risk; (iii) low or minimal risk. Specific transparency obligations are also set out. On this point, see S. Orlando, Gli emendamenti alla proposta di AI Act approvati dal Parlamento europeo il 14.6.2023, in *Pers. merc.*, 2023, 378 ff.; Id., Linguaggi di programmazione e responsabilità, in V.V. Cuocci, F.P. Lops, C. Motti (eds.), *La responsabilità civile nell'era digitale* (Atti della Summer school 2021), Bari, 2022, 139 ff.; Id., Regole di immissione sul mercato e «pratiche di intelligenza artificiale» vietate nella proposta di Artificial Intelligence Act, in *Pers. merc.*, 2022, 343 ff. See also the recent monographs by A. Bertolini, *Intelligenza Artificiale e Responsabilità civile. Problema, sistema, funzioni*, Bologna, 2024, 88 ff.; T. De Mari Casareto dal Verme, *Intelligenza artificiale e responsabilità civile. Uno studio sui criteri di imputazione*, Trento, 2024, 176 ff., 207 ff. and 319 ff.
- [36] F. Astone, *Intelligenza artificiale e diritto civile*, in V.V. Cuocci, F.P. Lops, C. Motti (eds.), *La circolazione della ricchezza nell'era digitale*, Atti della Summer School 2020, Pisa, 2021, 9.
- [37] A. Altieri, *L'Artificial Intelligence come organizzazione. Profili giuridici*, Torino, 2024, p. 57 ff.
- [38] J. Drexel et al., *Artificial Intelligence and Intellectual Property Law. Position Statement of the Max Planck Institute for Innovation and Competition of 9 April 2021 on the Current Debate*, in Max Planck Institute for Innovation and Competition Research, 2021, Paper No. 21-10, p. 18 ff.; <https://doi.org/10.2139/ssrn.3822924>
- D. Kim et al., *Artificial Intelligence Systems as Inventors? A Position Statement of 7 September 2021 in view of the evolving case-law worldwide*, in Max Planck Institute for Innovation and Competition Research Paper, 2021, No. 21-20, passim.
- [39] Indeed, the heading of Article 25 AIA reads: "Responsibilities along the AI value chain"; on which point see below.
- [40] Even from a mere reading of the definitions, one becomes aware of the actors potentially involved in the network unfolded by the AI system. Article 3, point 3), AIA, refers to the "provider", that is a natural or legal person, public authority, agency or other body that develops or has developed an AI system or a general-purpose AI model and places that system or model on the market, or puts the AI system into service under its own name or trademark, whether for payment or free of charge. Article 3, point 4), AIA, defines the "deployer", that is a natural or legal person, public authority, agency or other body using an AI system "under its authority". Article 3, point 5), AIA, defines the "authorised representative", namely a natural or legal person located or established in the Union who has received and accepted a written mandate from a provider of an AI system or general-purpose AI model in order, respectively, to fulfil and carry out on its behalf the obligations and procedures set out in the AIA. Then, point 6) sets out the concept of importer ("a natural or legal person located or established in the Union that places on the market an AI system that bears the name or trademark of a natural or legal person established in a third country"), point 7) defines "distributor" ("a natural or legal person in the supply chain, other than the provider or the importer, that makes an AI system available on the Union market") and point 8) clarifies "operator" ("a provider, product manufacturer, deployer, authorised representative, importer or distributor"). To this set of subjects must be added the data trainers and data vendors, that is the holders of rights over the training data, and (to mention but a few) the operators of platforms and communication infrastructures, cloud service providers and API developers.
- [41] Article 3, point 9), AIA: "the first making available of an AI system or a general-purpose AI model on the Union market".
- [42] Article 3, point 10), AIA: "the supply of an AI system or a general-purpose AI model for distribution or use on the Union market in the course of a commercial activity, whether in return for payment or free of charge".
- [43] Article 3, point 11), AIA: "the supply of an AI system for first use directly to the deployer or for own use in the Union for its intended purpose".
- [44] A. Zoppini, *L'informazione come bene*, in M. D'Auria (ed.), *I problemi dell'informazione nel diritto civile, oggi. Studi in onore di Vincenzo Cuffaro*, Roma, 2022, 77.
- [45] On this point see N. Cristianini, *Machina sapiens*, cit., passim; S.J. Russell, P. Norvig, *Artificial Intelligence. A Modern Approach*, IV ed., Harlow, 2022, passim.
- [46] See A. Altieri, *L'Artificial Intelligence come organizzazione*, cit., 1 ff.
- [47] See, although in a different sense, R. Franceschelli, *L'imprenditore nel nuovo codice civile*, Torino, 1943, 105; in a not dissimilar sense F. Ferrara jr., *La teoria giuridica dell'azienda*, (reprint of II ed.), Milano, 1982, 113.
- [48] See R. Müller-Erbach, *Deutsches Handelsrecht, Erster Teil*, Tübingen, 1921, p. 65 ff.; but also F. Ferrara jr., *La teoria*

- giuridica dell'azienda, cit., 59.
- [49] See, among many, G. Racugno, Azienda (voce), in *Enciclopedia Treccani.it*, 2015; M. Casanova, Azienda (voce), in *Dig. disc. priv., sez. comm.*, II, Torino, 1987, 75 ff., esp. 77; G. Ferrari, Azienda (dir. priv.) (voce), in *Enc. dir.*, IV, Milano, 1959, 680 ff.; G. Auletta, Azienda. I) Diritto commerciale (voce), in *Enc. giur.*, Roma, 1988, 1 ff.; G.E. Colombo, L'azienda, in F. Galgano (ed.), *Tratt. dir. comm. e dir. pubbl. dell'econ.*, III, Padova, 1979, 1 ff.; Id., *Il trasferimento dell'azienda e il passaggio dei crediti e dei debiti*, Padova, 1972, 12 ff.; G. Racugno, *Lo "scorporo" d'azienda*, Milano, 1995, 9 ff.
- [50] Thus A. Iannarelli, *Affitto di fondo rustico e affitto di azienda agraria*, in *Riv. dir. agr.*, 1991, 445. But see also C. Motti, *Il mercato come organizzazione*, in *Banca, impr. e società*, 1991, 455 ff., esp. 473, where the Author highlights the typically incremental dimension of organisation: "by 'organisation' one must not understand only the setting up and management of a series of equipment and technical services [...], but rather that minimum of structures and/or disciplines (as a rule, a combination of both) needed to confer on exchanges a degree of efficiency higher than that expressed by the 'spontaneous market', given the specificities of each form of market".
- [51] See A. Amaduzzi, *L'azienda nel suo sistema e nell'ordine delle sue rilevazioni*, Torino, 1969, 20.
- [52] Already with regard to the "subjective" side of organisation in the field of enterprise and activity, the limits of law as an explanatory tool have been noted: on this point, particularly incisive, V. Buonocore, *L'impresa*, in Id. (ed.), *Trattato di Diritto Commerciale*, sec. I, t. 2.1, Torino, 2002, 111 ff.
- [53] See in this sense N. Luhmann, *Introduzione alla teoria dei sistemi* (It. trans.), Lecce, 2018, esp. 89 ff. For early — albeit altogether primitive — references to organisation and cybernetics, see N. Wiener, *Introduzione alla cibernetica. L'uso umano degli essere umani* (It. trans.), Torino, 1966, 140 ff.
- [54] N. Luhmann, *Organizzazione e decisione* (It. trans.), Milano, 2005, 29 ff.
- [55] *Ibid.*, 47 ff.
- [56] For a more thorough analysis of the interpretive steps, see A. Altieri, *L'Artificial Intelligence come organizzazione*, cit., 146 ff. and 159 ff.
- [57] A. Beckers, G. Teubner, *Human–algorithm hybrids as (quasi-)organizations? On the accountability of digital collective actors*, in *J. Law Soc.*, 2023, 50, 100 ff.; <https://doi.org/10.1111/jols.12412>
Beckers, G. Teubner, *Three Liability Regimes for Artificial Intelligence. Algorithmic Actants, Hybrids, Crowds*, Oxford et al., 2021. In particular, treating the collective actor as a network, in order to overcome the hierarchical and institutional principle, (quasi-)organisation theory tends towards a distributed collective liability, in which individual and collective orientations are simultaneously institutionalised. This theory, however, in addition to considering attribution criteria in terms of limited legal personality, certainly shifts attention towards the network, but for that very reason ends up emphasising this aspect, institutionalising it and not departing from personalist theories.
<https://doi.org/10.5040/9781509949366>
- [58] M.E. Porter, *Competitive advantage: creating and sustaining superior performance*, New York, 1985; O.E. Williamson, *Economic Organization: Firms, Markets and Policy Control*, Brighton, 1986.
- [59] V. Sgroi, *L'invenzione non brevettata*, Milano, 1961; A. Ottolia, *Big Data e innovazione computazionale*, cit., p. 43 ff.; A. Bianchi, *Regime del segreto e tecniche dipendenti*, Torino, 1990; F. Massa Felsani, *Contributo all'analisi del Know-How*, Milano, 1997; M. Libertini, *Le informazioni aziendali segrete come oggetto di diritti di proprietà industriale*, in *Riv. it. sc. giur.*, 2011, 2, p. 137 ff., and the further extensive bibliography there cited on trade secrets and know-how in Italian and comparative scholarship (Galli, Ghidini, Falce, Mansani, Traverso, Giudici, Moro Visconti, Arezzo, Bonelli, Gambino, Mastrelia, Ciccone-Ghini, Barbera, Magelli, Venturello, Franchini Stuffer, Vanzetti, Sena, Scarpa, Banterle-Blei, Crespi, Auteri, Ottolia, Blandini, Frignani, Ruffolo, Sarti, Civello, Gualtieri, Crespi, Kastoris, Mazzacuva, Giavazzi). See also T. Aplin, *Right to property and trade secrets*, in C. Geiger (ed.), *Research Handbook on Human Rights and Intellectual Property*, Cheltenham, UK – Northampton, MA, USA, 2015, p. 421 ff.; W. van Caenegem, *Trade Secrets and Intellectual Property. Breach of Confidence, Misappropriation and Unfair Competition*, Alphen aan den Rijn, 2014.
- [60] P. Perlingieri, *L'informazione come bene giuridico*, in *Rass. dir. civ.*, 1990, 326 ff., esp. 338 ff., who uses it as a juridical paraphrase of the title of the right over the secret to justify the exercise of bundles of generally homogeneous rights by a plurality of subjects, in line with the theory of the legal good.
- [61] M.S. Spolidoro, *Il concetto di controllo nel codice civile e nella legge antitrust*, in *Riv. soc.*, 1995, 457 ff.
- [62] L. Acciari, F. Salerno, G. Visentini, *Il controllo delle imprese nella legislazione italiana. Alla ricerca di una nozione comune*, Pisa, 2023.
- [63] M. Lamandini, *Il "controllo". Nozioni e "tipo" nella legislazione economica*, Milano, 1995, 51 ff., where, despite the effort to counter the "atomistic" tendency in theories on control, in reconstructing the type the differences are nonetheless drawn out.
- [64] P. Marchetti, *Note sulla nozione di controllo nella legislazione speciale*, in *Riv. soc.*, 1992, 1 ff.
- [65] M. Notari, *La nozione di "controllo" nella disciplina antitrust*, Milano, 1996, 186.
- [66] And this premise is conferred precisely by antitrust legislation which, with regard to so-called "objective" control, departs from the classical relational scheme and aims, from a competition perspective, at identifying the productive means available to an undertaking or a group of undertakings. On this point see M. Notari, *La nozione di "controllo"*, cit., p. 252 ff.; M. Libertini, *Diritto della concorrenza dell'Unione Europea*, Milano, 2014, 343 ff.
- [67] See most recently the conclusions of G. Visentini, F. Salerno, *Considerazioni conclusive*, in L. Acciari, F. Salerno, G. Visentini (eds.), *Il controllo delle imprese nella legislazione italiana. Alla ricerca di una nozione comune*, Pisa, 2023, 375 ff.
- [68] The vast subject arose, as is well known, in an attempt to grasp the connecting links in the theory of corporate groups: see L. Acciari, *Introduzione*, in L. Acciari, F. Salerno, G. Visentini (eds.), *Il controllo delle imprese nella legislazione italiana. Alla ricerca di una nozione comune*, Pisa, 2023, XIII ff.; but also M. Lamandini, art. 2359 c.c., in P. Abbadesse, G.B. Portale (eds.), *Le società per azioni. Codice civile e norme complementari*, t. 1, Milano, 2016, 743 ff., esp. 757.
- [69] M. Notari, *La nozione di "controllo"*, cit., pp. 241-242.
- [70] *Ibid.*, p. 242.
- [71] See A. Altieri, *L'Artificial Intelligence come organizzazione*, cit., 135 ff.
- [72] Just as occurs for controlled and affiliated companies under Article 2359 of the Italian Civil Code, or as occurs in antitrust law when reconstructing market relationships.
- [73] A. Zoppini, *L'informazione come bene*, cit., 69 ff.
- [74] Even those who attempt to set out the dogmatic discourse on information through the theory of the legal good are forced to invoke the contract: see P. Perlingieri, *L'informazione come bene giuridico*, cit., 339-340.
- [75] See also A. Zoppini, *L'informazione come bene*, cit., 74.
- [76] The parallel as an object of inquiry between enterprise and AI systems may be permitted, since at least from a speculative point of view both phenomena seem to share a quite similar opening phase: the literature shows that in 1942, with regard to the "enterprise", there were the same conceptual uncertainties that still surround AI today.
- [77] R. Nicolò, *Riflessioni sul tema dell'impresa*, in S. Rodotà (ed.), *Il diritto privato nella società moderna*, Bologna, 1971, 412 ff. (and previously Id., *Riflessioni sul tema dell'impresa e*

- su talune esigenze di una moderna dottrina del diritto civile, in Riv. dir. comm., 1965, I, 177 ff.); contra, G. Auletta, *Impresa e azienda*, in Temi nap., 1958, III, 23 ff.; G. Ferri, *Manuale di diritto commerciale* (eds. C. Angelici and G.B. Ferri), XV ed., Torino, 2016, 33 ff.; G. Minervini, *L'imprenditore. Fattispecie e statuti*, Napoli, 1970, 135 ff.; G. Santini, *Le teorie sull'impresa (civilisti e laburisti a confronto)*, in Riv. dir. civ., 1970, 422 ff.; V. Panuccio, *Teoria giuridica dell'impresa*, Milano, 1974, 78 ff. Some authors have to some extent developed Nicolò's line of thought: see P. Rescigno, *Per una strada sulla proprietà*, in Riv. dir. civ., 1961, 61 ff.; S. Rodotà, *Rapporti privati e leggi di nazionalizzazione*, in Riv. dir. comm., 1969, 96 ff.; O.T. Scozzafava, *Rosario Nicolò e il diritto di impresa*, in Riv. dir. comm., 2008, 847 ff.; M. Tanzi, *Godimento del bene produttivo e impresa*, Milano, 1998, 75 ff.
- [78] R. Nicolò, *Riflessioni sul tema dell'impresa*, cit., 415.
- [79] *Ibid.*, 419.
- [80] A concept which, on the other hand, escaped the doctrine of the time and matured with the change of modern capitalism. On this point, see extensively D.S. Landes, J. Mokyr, W.J. Baumol (eds.), *The Invention of Enterprise. Entrepreneurship from Ancient Mesopotamia to Modern Times*, Princeton, 2010, passim (and especially the essay by J.M. Murray, *Entrepreneurs and Entrepreneurship in Medieval Europe*, *ibid.*, 88 ff.); and in some respects also H. Hansmann, *The Ownership of Enterprise*, Cambridge-London, 1996, 11 ff.
- [81] L. Enriques, D.A. Zetsche, *Corporate Technologies and the Tech Nirvana Fallacy* (March 25, 2020), European Corporate Governance Institute (ECGI) – Law Working Paper No. 457/2019, *Hastings Law Journal*, Forthcoming, available at SSRN: <https://ssrn.com/abstract=3392321>.
<https://doi.org/10.2139/ssrn.3392321>
- [82] “The notion of ‘deployer’ referred to in this Regulation should be construed as any natural or legal person, including a public authority, agency or other body, using an AI system under its authority”.
- [83] C.M. Bianca, *Le autorità private*, Napoli, 1977, 4.
- [84] See S.J. Shapiro, *Authority*, in J.L. Coleman, K.E. Himma, S.J. Shapiro (eds.), *The Oxford Handbook of Jurisprudence and Philosophy of Law*, Oxford, 2004, 383 ff.;
K.E. Himma, *The Nature of Authority*, Cambridge, 2024, 3 ff.;
<https://doi.org/10.1017/9781009255790>
J. Raz, *The Problem of Authority: Revisiting the Service Conception*, in *Minnesota Law Review*, 2006, 1003 ff.;
<https://doi.org/10.24926/265535.919>
W.R.P. Kaufman, *Beyond Legal Positivism: The Moral Authority of Law*, Lowell (MA, USA), 2023, 53 ff.;
https://doi.org/10.1007/978-3-031-43868-4_3
J.R. Graham, C.R. Harvey, M. Puri, *Capital Allocation and Delegation of Decision Making Authority within Firms*, in *Journal of Financial Economics*, 2015, vol. 115, is. 3, 449 ff.
<https://doi.org/10.1016/j.jfineco.2014.10.011>
- [85] And there is talk of control with reference to privacy. See generally S. Rodotà, *Tecnologie e diritti*, Bologna, 1995, 122.
- [86] Although in a different context from that under examination, see A. Astone, *Situazioni di fatto e schemi legali. La delimitazione della categoria*, Milano, 2017, 11 ff. and, on contractual relationships, 17 ff.
- [87] Who carries out a professional activity which, as is well known, in the language of the EU legislator denotes the exercise of an economic activity. Furthermore, the concept of authority as a derived power (and note the parallelism with the GDPR) is contrasted with that of control, that is the ownership of the data, which remains with the data subject, while the data controller acquires only the authority to determine the purposes thereof.
- [88] But on this point, see below.
- [89] The reference is to A. Romano, *Le concessioni dei posti di vendita nei mercati all'ingrosso*, in *L'indennità di espropriazione. I mercati all'ingrosso. Atti del XVI Convegno di Studi di Scienza dell'Amministrazione*, Varenna – Villa Monastero, 17-20 settembre 1970, Milano, 1972, 209 ff.; on the organisational function of stock-market markets, see C. Motti, *Mercati borsistici e diritto comunitario*, Milano, 1997, 47 ff., and earlier Ead., *Il mercato come organizzazione*, cit., 455 ff., esp. 468 ff.
- [90] See O.E. Williamson, *L'organizzazione economica. Imprese, mercati e controllo politico* (It. trans.), Bologna, 1991, 135 ff., and the bibliography there cited.
- [91] On the function that the contract assumes today, also (and above all) in a regulatory capacity, see V. Roppo, *Il contratto del duemila*, IV ed., Torino, 2020, passim; but see also AIA, recital no. 90 and Article 56(2)(d).
- [92] On this point, with broader references, see A. Altieri, *L'Artificial Intelligence come organizzazione*, cit., 197 ff.
- [93] For an initial confirmation in this sense, see F. Pacileo, *Intelligenza Artificiale nell'impresa. Tra organizzazione e spersonalizzazione*, Milano, 2025, who frames the problem in terms of “technological organisation” and “articulation of the organisation” of an entrepreneurial activity (the system's outputs being “acts pertaining to the exercise of the enterprise”, and AI systems being identified as a criterion both for attributing effects (which would fall on the entrepreneur because they are the result of a collective and depersonalised action, comparing AI to an auxiliary of the entrepreneur) and for regulating liability (“the joint-stock enterprise that uses AI systems on a cost-benefit logic responds according to the criteria of liability for enterprise risk — depending on the case, aggravated or strict, but always depersonalised — for damages caused by the malfunctioning of the AI systems”)).
- [94] Generally, P. Ferro-Luzzi, *I contratti associativi*, Milano, 1976; G. Auletta, *Attività (dir. priv.) (voce)*, in *Enc. dir.*, Vol. III, Milano, 1958, p. 981 ff.; M.S. Giannini, *Attività amministrativa (voce)*, in *Enc. dir.*, Vol. III, Milano, 1958, p. 988 ff.
- [95] Among many, see P. Rescigno, *Obbligazioni (diritto privato) (voce)*, in *Enc. dir.*, Vol. XXIX, Milano, 1979, p. 133 ff., esp. p. 190; C.M. Bianca, *Diritto civile. L'obbligazione*, vol. 4, Milano, 1993, p. 112 ff.; more recently, A. Nicolussi, *Le obbligazioni*, Milano, 2021, p. 37.
- [96] This observation makes it possible to deepen the discussion on the nature of the output of such an organised activity. It is well known that a fundamental distinction within obligations to do (obbligazioni di fare) relates to the object of the obligation, namely whether it consists in the performance of a work or service as a result of the activity, or, conversely, in the activity itself, irrespective of the outcome and the perfection of an opus. As this is not the place to elaborate on this aspect, also given its evident implications in terms of contractual liability, the discussion is referred to a forthcoming update of the monograph by A. Altieri, *L'Artificial Intelligence come organizzazione*, cit.
- [97] J. Wirtz, Ch. Lovelock, *Services Marketing. People, Technology, Strategy*, Hackensack, NJ, 2021, p. 16 ff.: “Services are economic activities performed by one party to another. Often time-based, these performances bring about desired results to recipients, objects, or other assets. In exchange for money, time, and effort, service customers expect value from access to labor, skills, expertise, goods, facilities, networks, and systems. However, they do not normally take ownership of the physical elements involved” (p. 18); the Authors continue: “We define services as economic activities between two parties, implying an exchange of value between the seller and buyer in the marketplace. We describe services as performances that are most commonly time-based. We emphasize that purchasers buy services because they are looking for desired results. In fact, many firms explicitly market their services as ‘solutions’ to prospective customers’ needs. And finally, our definition emphasizes that while customers expect to obtain value from their service purchases in exchange for their money, time, and effort, this value comes from access to a variety of value-creating elements rather than transfer of ownership”.
- [98] G. Santini, *Commercio e servizi. Due saggi di economia del diritto*, Bologna, 1988, p. 420: “the service does not come into relevance in its ‘static’ phase, that is as an element of the assets of the one who is to receive or render it; but rather in its ‘dynamic’ phase: it is the performance of activity, it is ‘activity’ tout court, and this implies a close link with the subject who carries it out”.

- [99] G. Ferri, *Le società*, in *Trattato di diritto civile*, founded by F. Vassalli, X, Torino, 1988, p. 15.
- [100] F. Nieddu Arrica, *Il conferimento di prestazione d'opera e servizi nella s.r.l.*, Milano, 2009, p. 33 ff., who emphasises the creative-productive value of services and, on the subjective side, their attribution to intellectual professionals or entrepreneurs.
- [101] Financial Stability Institute, *Regulating AI in the financial sector: recent developments and main challenges*, FSI Insights on policy implementation no. 63, December 2024, <https://www.bis.org/fsi/publ/insights63.pdf>; ESMA, *Artificial intelligence in EU securities markets*, ESMA50-164-6247, February 2023; IOSCO, *The use of artificial intelligence and machine learning by market intermediaries and asset managers*, Final Report, September 2021; FSB, *Artificial intelligence and machine learning in financial services. Market developments and financial stability implications*, November 2017; OECD, *Artificial Intelligence, Machine Learning and Big Data in Finance*, August 2021; OECD, *Generative artificial intelligence in finance*, December 2023; N. Linciano, V. Caivano, D. Costa, P. Soccorso, T.N. Poli, G. Trovatore, *L'intelligenza artificiale nell'asset e nel wealth management*, in *Quaderni FinTech Consob*, June 2022.
- [102] See G. Serafin, *Intelligenza artificiale, attività e responsabilità dell'impresa di investimento*, Torino, 2025, p. 53 ff., who notes the proximity between AI systems and the provision of investment services.
- [103] A. Blandini, M. Gigliotti, *Fintech e innovazione digitale, prospettive applicative nella liquidazione coatta amministrativa*, in *Banca borsa tit. cred.*, 2024, 5, p. 736.
- [104] It is well known that the term RegTech denotes the application of technological innovation in support of controls over regulated intermediaries; while the term SupTech refers to the use of technologies that support the external supervision of supervisory authorities. On this point, see extensively L. Enriques, *Financial Supervisors and Regtech: Four Roles and Four Challenges* (December 13, 2017), *Revue Trimestrielle de Droit Financier* 53 (2017), available at SSRN: <https://ssrn.com/abstract=3087292>; S. Zeranski, I.E. Sancak, *Digitalisation of Financial Supervision with Supervisory Technology (SupTech)* (August 1, 2020), *Journal of International Banking Law & Regulation*, available at SSRN: <https://ssrn.com/abstract=3632053>, where the Authors state that "SupTech is the name of FinTech when it is used for supervisory purposes".
- [105] The reference is to Regulation (EU) 2024/1624 of 31 May 2024 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing (the so-called AMLR), Regulation (EU) 2024/1620 of 31 May 2024 establishing the Authority for Anti-Money Laundering and Countering the Financing of Terrorism (the so-called AMLAR), and the sixth Directive (EU) 2024/1640 of 31 May 2024 on the mechanisms to be put in place by Member States for the prevention of the use of the financial system for money laundering or terrorist financing (the so-called AMLD6). See, among many, A. Minto, *Navigating AML Requirements for Payment Initiation Service Providers (PISPs): The Challenging Fulfillment of Customer Due Diligence*, in *EBLR*, 2025, p. 815 ff.
- [106] See Article 5(5)(i), AMLAR ("5. The Authority shall carry out the following tasks regarding FIUs and their activities in the Member States: [...] (i) it shall develop and make available to FIUs tools and services to enhance their analytical capabilities, as well as IT and artificial intelligence services and tools for the secure sharing of information, including by hosting FIU.net;"); but see also recital 9, AMLAR ("The Authority's powers aim at enabling it to enhance AML/CFT supervision in the Union in various ways. [...] Overall, the Authority should contribute to the convergence of supervisory practices and the promotion of high supervisory standards. The Authority should also coordinate and support the conduct of joint analyses by FIUs, or request the launching of joint analyses, and make available to FIUs IT and artificial intelligence services to strengthen their data analysis capabilities, as well as tools for the secure sharing of information, including by hosting FIU.net, the dedicated IT system that allows FIUs to cooperate and exchange information among themselves and, where appropriate, with their counterparts in third countries and with third parties").
- [107] See G. Schneider, *La proposta di regolamento europeo sull'intelligenza artificiale alla prova dei mercati finanziari: limiti e prospettive (di vigilanza)*, in *Resp. civ. prev.*, 2023, 3, p. 1023, who laments the absence of specific rules on the design and use of AI systems applied to AML/CFT.
- [108] On this topic, without claim to exhaustiveness, see C. Brescia Morra, D. Colonnello, M. Gargantini, G. Sandrelli, G. Trovatore, *La gamification degli investimenti finanziari*, *Quaderni giuridici Consob*, no. 32, January 2025, p. 25 ff., p. 47 ff.; N.M.F. Faraone, *Quando le piattaforme (anche social) incontrano la divulgazione finanziaria: appunti sparsi su "Fintok", IA e funzioni di vigilanza*, in *Rivista di Diritto Bancario*, suppl. fasc. 4, 2023, p. 163 ff.; N. Aggarwal, D.B.V. Kaye, C. Odinet, #Fintok and Financial Regulation, in *Arizona State Law Journal*, 2023, p. 1036 ff.; A. Canepa, *Social media e fin-influencers come nuove fonti di vulnerabilità digitale nell'assunzione delle decisioni di investimento*, in *Rivista trimestrale di diritto dell'economia*, suppl. 1/2022, p. 307 ff.; S. Guan, *The Rise of the Finfluencer* (December 1, 2022), 19 *New York University Journal of Law and Business* 489 (2023), Santa Clara Univ. Legal Studies Research Paper No. 4400042, available at SSRN: <https://ssrn.com/abstract=4400042>; see also D. De Filippis, *La consulenza finanziaria prestata tramite gli influencers: spunti per un inquadramento della fattispecie*, in *ELFR*, p. 106 ff.
- [109] See IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 20 ff.
- [110] See I. Demuro, *Trasparenza e correttezza dell'"influencer marketing"*, in *Analisi Giuridica dell'Economia*, 2025, pp. 12 and 13.
- [111] On this point see the reflections of D. De Filippis, *La consulenza finanziaria prestata tramite gli influencers*, cit., p. 113 ff., who, with the proper systemic and interpretive caveats, concludes by assimilating the activity carried out via fin-influencers to financial advice. The aspect mentioned here has, in other respects, been the subject of broad debate concerning the phenomenon of robo-advice: for a synthesis, see N. Linciano, V. Caivano, D. Costa, P. Soccorso, T.N. Poli, G. Trovatore, *L'intelligenza artificiale nell'asset e nel wealth management*, in *Quaderni FinTech Consob*, no. 9, June 2022; F. Sartori, *La consulenza finanziaria automatizzata: problematiche e prospettive*, in *Riv. trim. dir. econ.*, 2018, p. 256 ff.; C. Picciau, *La consulenza finanziaria automatizzata*, in M. Cian, C. Sandei (eds.), *Diritto del Fintech*, II ed., Padova, 2024, p. 417 ff.; F. Accetella, *Gli strumenti di robo gestione di patrimoni e le DAO*, *ibid.*, p. 475 ff.; M.T. Paracampo, *Robo-advisor, consulenza finanziaria e profili regolamentari: quale soluzione per un fenomeno in fieri?*, in *Riv. trim. dir. econ.*, suppl. to no. 4 of 2016, p. 256 ff.; Ead., *La consulenza finanziaria automatizzata*, in M.T. Paracampo (ed.), *Fintech. Introduzione ai profili giuridici di un mercato unico tecnologico dei servizi finanziari*, Torino, 2017, 127; Ead., *L'adeguatezza della consulenza finanziaria automatizzata nelle linee guida dell'ESMA tra algo-governance e nuovi poteri di supervisione*, in *Riv. dir. bancario*, 2018, p. 535 ff.
- [112] On this scenario, already within reach of the major players in financial markets, see the Assogestioni White Paper (ed. R. D'Apice), *AI nell'asset management: dalla visione all'azione. Strategie, policy e nuove prospettive nel risparmio gestito italiano*, June 2025, available at https://www.assogestioni.it/sites/default/files/docs/assogestioni_whitepaper_ai_nellasset_management_giugno2025_ita_0.pdf.
- [113] FSB (2024), *The Financial Stability Implications of Artificial Intelligence*, available at <https://www.fsb.org/uploads/P14112024.pdf>. Industry reports indicate that financial firms are experimenting with the use of LLMs for client assistance and training. Examples reported in public documentation include chatbots that allow clients to ask questions about corporate documents, news and historical prices, and that allow institutional clients to ask for the assessment of hypothetical transactions or to execute them. Another application consists in assisting

- customer-service employees by training LLMs on internal documents relating to policies and operations, so that customer-service employees can interact with the chatbot when responding to customer inquiries. Industry reports also indicate that firms are using LLMs to generate marketing material, including both the content of investment solicitations and investment-banking activities such as creating presentations, summarising sector knowledge, and highlighting key sales points. LLMs would be used to assist staff in generating alerts and themes for client marketing. Companies plan to use LLMs to assist in customer segmentation, profiling and personalisation for marketing. On this point, see again IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 27; but see also AI: *Beyond the Hyperbole*, Plato (Oct. 2024), available at <https://static1.squarespace.com/static/6310c0b9bb63a25599f4418c/t/671a1bdf5a0a972a9a43617/1729764321806/AI+Beyond+the+Hyperbole+Final.pdf>.
- [114] For a brief mention, see A. Blandini, M. Gigliotti, *Fintech e innovazione digitale*, cit., p. 736 ff., esp. p. 737, where, in the field of SupTech, the use of AI techniques to enhance the analysis of the informational assets that can be drawn from private complaints would allow in-depth and comparative analyses to be carried out in support of, among other things, financial-education activities (see esp. p. 737, n. 78, where it is stated that “Reports, often characterised by extensive documentation that is unstructured in format and language, lend themselves to the application of advanced search techniques (text mining) and forms of automatic interpretation of the meaning of texts to extract recurring concepts and phenomena (machine learning). The use of AI technologies makes it possible to significantly reduce analysis times and improves the early identification of relevant phenomena”).
- [115] For not dissimilar considerations, see I. Molenaar, D. Baten, I. Bárd, M. Stevens, *Artificial Intelligence and Education. Different Perceptions and Ethical Directions*, in N.A. Smuha (ed.), *The Cambridge Handbook of the Law, Ethics and Policy of Artificial Intelligence*, Cambridge, 2025, p. 261 ff. <https://doi.org/10.1017/9781009367783.017>
- [116] See OECD 2020 Report on financial education, OECD/INFE 2020 International Survey of Adult Financial Literacy; see also F. Trapani, *La nuova Direttiva 2023/2225/UE sul credito al consumo: note in tema di educazione finanziaria, merito di credito e servizi di consulenza sul debito*, in *Nuove leggi civ. comm.*, 2024, p. 756 ff., who (p. 757) states that “the purpose of financial education is not – and should not be – to eliminate the informational gap between consumer and professional, but only to give the consumer basic literacy in relation to credit products”.
- [117] In these terms, M. Cossu, *Delle scelte di investimento dei Post-Millennials, e del difficile rapporto tra analfabetismo finanziario e finanza sostenibile*, in *Riv. soc.*, 2021, 5-6, p. 1253 ff.
- [118] B. Russo, sub Art. 25, in G. Martina, M. Rispoli Farina, V. Santoro (eds.), *Legge capitali* (5 marzo 2024, n. 21). *Commentario*, Torino, 2024, p. 297 ff. In particular, Article 25 of the so-called “capitals law” (Law no. 21 of 5 March 2024) amended the rules on the teaching of civic education in schools: it provided that financial, insurance and pension education should also be the subject of teaching within civic education, in a multidisciplinary perspective and including with reference to the use of new digital money-management technologies.
- [119] M. Cossu, *Delle scelte di investimento dei Post-Millennials*, cit., pp. 1262-1263.
- [120] N. Linciano, *La consulenza finanziaria tra errori di comportamento e conflitti di interesse*, in *AGE*, 2012, p. 135 ff.; see also M. Cossu, *L'educazione finanziaria della “generazione Z”. Riflessioni in tempo di pandemia*, in C. Costa, A. Mirone, R. Pennisi (eds.), *Studi di diritto commerciale per Vincenzo di Cataldo*, Vol. II, Tomo I, Torino, 2021, p. 232.
- [121] See IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 64 ff., where, to address the risks arising from the use of AI systems in financial markets, it is observed that one of the best practicable strategies for retail investors may be to conduct “due diligence prior to deciding to invest in AI focused companies or invest with the assistance of AI technology”: probably, the service to be enhanced is to integrate AI into due diligence.
- [122] See IOSCO, *Artificial Intelligence in Capital Markets: Use Cases, Risks, and Challenges*, Consultation Report (Board/2025/017), March 2025, <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD788.pdf>, p. 44 ff.; but already FSB, *The Financial Stability Implications of Artificial Intelligence*, 14 November 2024, <https://www.fsb.org/uploads/P14112024.pdf>.
- [123] Indeed, the vulnerability of one firm in the financial markets could simultaneously affect many firms. An event of this kind could disrupt basic institutions and vital services and potentially cause market disturbance. A failure in one AI system can have cascading effects on others, potentially leading to systemic risks and economic instability. AI systems can interact and influence each other in complex ways, creating feedback loops that can amplify risk.
- [124] With effects not dissimilar from those already foreseen for so-called algorithmic trading: on this point, reference may be made to A. Altieri, *La regolamentazione del trading algoritmico, tra incontinenza dei dati e abusi di mercato*, in *Dir. banca merc. fin.*, 2023, 3, p. 359 ff.
- [125] See IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 15 ff. Specifically, IOSCO has noted that recent advances in AI are being considered by firms to support internal operations and processes through the automation of certain activities, such as coding, information extraction, classification, clustering, text summarisation, transcription, translation and drafting, and the improvement of customer communication through conversational agents (so-called chatbots). With regard to GenAI in particular, capital-market operators appear to have prioritised internal, low-risk implementations focused on enhancing internal productivity, generating insights or improving risk management, rather than customer-facing applications. This is apparent from the results of the survey conducted by the AMCC (Affiliate Member Consultative Committee). See IOSCO, *Artificial Intelligence in Capital Markets*, cit., Annex III, p. 71 ff.
- [126] See also K. Langenbacher, *Artificial Intelligence and Financial Services*, in N.A. Smuha (ed.), *The Cambridge Handbook of the Law, Ethics and Policy of Artificial Intelligence*, Cambridge, 2025, p. 322 ff. <https://doi.org/10.1017/9781009367783.020>
- [127] Indeed, depending on their use and diffusion, AI systems can introduce new cybersecurity threats and exacerbate existing ones, with the challenges for financial firms compounded by limited resources. Cybersecurity risks, in particular those associated with advances in AI, can be classified according to whether AI is used to perpetrate the attack, whether the attack is directed at the AI system, or whether there are AI design and implementation errors. See Workshop Report, *Securing Critical Infrastructure in the Age of AI*, Center for Security and Emerging Technology (Oct. 2024), available at <https://cset.georgetown.edu/publication/securing-criticalinfrastructure-in-the-age-of-ai/>.
- [128] AI-powered tools used for malicious purposes can lower the entry barriers for bad actors, allowing them to carry out fraud, cyberattacks and other activities more cheaply, in an increasingly automated manner, and more sophisticatedly. As GenAI becomes increasingly available and its outputs more convincing and realistic, bad actors are likely to exploit it to set up schemes to defraud investors or to engage in other improper conduct linked to the financial sector. See United Nations Office on Drugs and Crime, *Transnational Organized Crime and the Convergence of Cyber-Enabled Fraud, Underground Banking and Technological Innovation in Southeast Asia: A Shifting Threat Landscape* (Oct. 2024), available at https://www.unodc.org/roseap/uploads/documents/Publications/2024/TOC_Convergence_Report_2024.pdf (UNODC Report), p. 9.
- [129] IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 33 ff.
- [130] On the concept of “explainability” of the algorithm see A. Frür, *Transparency in the Patent System – Artificial Intelligence*

- and the Disclosure Requirement, in R. Sikorski, Z. Zemla-Pacud (eds.), *Patents as an Incentive for Innovation*, Alphen aan den Rijn, 2021, p. 235; T.Y. Ebrahim, *Artificial intelligence inventions & patent disclosure*, in Penn. St. L. Rev., vol. 125, 2020, p. 178 ff.
- [131] Among the major limitations one must mention the difficult adaptability of models to market conditions, since a model based on an AI system is probabilistic and not deterministic, with a high risk of "hallucinations": on this point, see the New York Times article "A.I. Is Getting More Powerful, but Its Hallucinations Are Getting Worse" by Cade Metz and Karen Weise, of 6 May 2025, where it is observed that power is nothing without control; in particular, it is documented how artificial intelligences analyse increasing amounts of data but also make more mistakes — bots rely on complex mathematical systems that nevertheless cannot determine what is true and what is false. Sometimes they make things up: a phenomenon researchers call "hallucinations", and which, far from decreasing, is rising. In the most recent AI tests it has reached 79%.
- [132] On this topic, generally, T. Numerico, *Big data e algoritmi. Prospettive critiche*, Roma, 2021, passim. LLMs trained on data from the internet, including social media, in particular, may perpetuate or amplify the biases inherent in those data and lead to discriminatory outcomes in the provision of services. Data bias may lead to promoting the products and services offered by one service provider over potentially more affordable or more suitable products offered by a competing firm. Bias may also lead to favouring or disfavouing a particular group of investors and to exacerbating inequalities if this happens frequently. Data, and in particular alternative data, may suffer from selection bias. See IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 40.
- [133] Big-Tech companies are currently investing massively in AI and related technologies, in intense competition for AI development. For instance, leading firms are reportedly racing to build new and enormous data centres to train and power GenAI and other applications. There is a risk of high concentration in a small number of technology providers in the financial sector, given the resource demands of AI development in terms of development costs, computing power, data access, talent and existing market penetration. The impact of the recent emergence of DeepSeek, an open-source AI model claimed to have achieved results comparable to those of leading closed-source models using a fraction of the training resources, must however also be considered: see DeepSeek-V3 Technical Report (Dec. 27, 2024), available at <https://arxiv.org/html/2412.19437v1>; DeepSeek-R1: Incentivizing Reasoning Capability in LLMs via Reinforcement Learning (Jan. 22, 2025), available at <https://arxiv.org/html/2501.12948v1>.
- [134] Not to mention the data used, which may be proprietary, commercial, open-source or a combination of all the above.
- [135] <https://www.forbes.com/sites/brianbushard/2023/02/24/workers-chatgpt-use-restricted-at-more-banks-including-goldman-citigroup/>;
<https://www.bloomberg.com/news/articles/2023-02-24/citigroup-goldman-sachs-join-chatgpt-crackdown-fn-reports>;
<https://www.fnlondon.com/articles/citigroup-and-goldman-sachs-join-jpmorgan-with-chatgpt-crackdown-20230224?mod=Searchresults>.
- [136] IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 42 ff.
- [137] IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 42: "Financial products and service providers could attempt to disclaim liability for investor or market harm resulting from the use of AI systems, or could attempt to shift responsibility to others in the AI system supply chain. Depending on the facts and circumstances, there could be enforcement challenges if AI systems are used in connection with violations of law, in terms of identifying and holding accountable responsible persons, and gathering and presenting evidence due to an AI system's complexities".
- [138] LayerX Security, *Enterprise GenAI Security Report 2025*, February 2025, available at <https://layerxsecurity.com/blog/layerxs-enterprise-genai-security-report-2025-exposing-hidden-ai-security-blind-spots/>.
- [139] <https://www.jpmorganchase.com/about/technology/blog/open-letter-to-our-suppliers>.
- [140] Ibidem.
- [141] Among many, see the interesting study by M.A. Lasmar Almada, *Delegating the Law of Artificial Intelligence. A Procedural Account of Technology-Neutral Regulation*, Fiesole, European University Institute, 2024, p. 25 ff., who states that "Technology neutrality is, ultimately, a proposition of indifference". On the other hand, it has been argued that technological neutrality is an incoherent ideal (see M. Thompson, *The Neutralization of Harmony: The Problem of Technological Neutrality, East and West*, in (2012) 18 BU J Sci & Tech L, p. 303); while others have argued that neutrality is impossible because regulation always rests on certain assumptions concerning current technologies (see M.D. Birnhack, *Reverse Engineering Informational Privacy Law*, in (2012) 15 Yale J L & Tech, p. 24). Even among those who consider it possible, technological neutrality is interpreted in different and at times conflicting ways (B.J. Koops, *Should ICT Regulation Be Technology-Neutral?*, in Id. and others (eds.), *Starting Points for ICT Regulation Deconstructing Prevalent Policy One-Liners*, TMC Asser Press, 2006);
W.J. Maxwell, M. Bourreau, *Technology Neutrality in Internet, Telecoms and Data Protection Regulation*, in (2015) 21 Comp Telecomm L Rev, p. 1).
<https://doi.org/10.2139/ssrn.2529680>
- [142] Thus M.A. Lasmar Almada, *Delegating the Law of Artificial Intelligence*, cit., p. 26, who continues: "When we speak about indifference to technology, we mean that the policymaker is not in charge of deciding how to apply that policy to specific technological artefacts and use cases. That is, regulation is technology-neutral if it delegates the interpretation of the technical context to other actors, who might be private rule-makers, courts, administrative enforcers, or even the regulated actors themselves" (pp. 26-27); on that basis, the Author proposes two distinctive qualities of such a "procedural account": "First, it offers an explicative definition of technology neutrality, which encompasses the core exemplars of both functional and substantive approaches to neutrality. Second, it highlights aspects of technology-neutral regulation that are not emphasized by the alternative accounts" (p. 27).
- [143] Its deceptive application is denounced by A. Bertolini, *Artificial intelligence does not exist! Defying the technology neutrality narrative in the regulation of civil liability for advanced technologies*, in *Europa dir. priv.*, 2022, p. 379 ff.; and now Id., *Intelligenza artificiale e responsabilità civile. Problema, sistema, funzioni*, Bologna, 2024, p. 160 ff., where mention is made of the "idolum neutralitatis".
- [144] Among many, see G. Finocchiaro, *La proposta di regolamento sull'intelligenza artificiale: il modello europeo basato sulla gestione del rischio*, in *Dir. inf.*, 2022, 2, p. 305 ff.; Ead., *Intelligenza artificiale. Quali regole?*, Bologna, 2024, p. 49 ff.; Ead., *Diritto dell'intelligenza artificiale*, Bologna, 2024, p. 1 ff.
- [145] See F. Annunziata, *La disciplina del mercato dei capitali*, XII ed., Torino, 2023, p. 517, on the discipline of crypto-assets; in the same sense, Id., *La disciplina europea del mercato delle crypto-attività (MiCAR)*, in *Riv. soc.*, 2023, 5-6, p. 923 ff. See in particular European Parliament Resolution of 17 May 2017 on FinTech: the influence of technology on the future of the financial sector (2016/2243(INI)), (2018/C 307/06).
- [146] Initial mentions are in G. Falcone, *Tre idee intorno al c.d. «FinTech»*, in *Riv. dir. banc.*, 2018, I, p. 37 ff.; see also A. Sciarone Alibrandi, *Innovazione tecnologica, regolazione e supervisione dei mercati*, in V. Falce (ed.), *Financial Innovation tra disintermediazione e mercato*, Torino, 2021, p. 9 ff.; G. Schneider, *La proposta di regolamento europeo sull'intelligenza artificiale*, cit., p. 1023 ff.
- [147] See W. Buczynski, F. Steffek, F. Cuzzolin, M. Jamnik, B.J. Sahakian, *Hard Law and Soft Law Regulations of Artificial Intelligence in Investment Management* (May 12, 2023), *Cambridge Yearbook of European Legal Studies*, 24 (2022), pp. 262–293, University of Cambridge Faculty of Law Research Paper 15/2024, available at SSRN:

- <https://ssrn.com/abstract=4786682>.
<https://doi.org/10.1017/cel.2022.10>
- [148] On this point, see D. Foà, Modelli di regolazione (e supervisione) per l'AI finanziaria: neutralità tecnologica, etica e tutela dell'investitore, in *MediaLaws*, 2024, special issue, p. 235 ff.; F. Mattassoglio, Algoritmi e regolazione. Circa i limiti del principio di neutralità tecnologica, in *Rivista della Regolazione dei mercati*, 2018, 2, p. 226 ff.
- [149] G. Finocchiaro, *Intelligenza artificiale. Quali regole?*, cit., p. 49.
- [150] Applying precisely those principles affirmed by UNCITRAL in the regulation on electronic signatures, where no constraints were imposed on a particular technological or commercial development, but principles were established that may remain unchanged for a certain period of time, without the constraint of technological change. See G. Finocchiaro, *Intelligenza artificiale. Quali regole?*, cit., pp. 49-50.
- [151] See <https://www.ibm.com/think/news/meet-large-database-model-s-ldms>; but see also <https://www.forbes.com/sites/ericsiegel/2025/01/13/the-rise-of-large-database-models/>.
- [152] And on the further applications of LLMs in finance, see Y. Li, S. Wang, H. Ding, H. Chen, *Large Language Models in Finance: A Survey*, 8 Jul. 2024, at <https://arxiv.org/html/2311.10723v2#bib>.
- [153] See P. Kudva, R. Bordawekar, A. Nitsure, *A Scalable Space-efficient In-database Interpretability Framework for Embedding-based Semantic SQL Queries*, 1 March 2023, at <https://arxiv.org/abs/2302.12178>; J.L. Neves, R. Bordawekar, E. Tzortzatos, *Demonstrating Semantic SQL Queries over Relational Data using the AI-Powered Database*, in *International Workshop on Applied AI for Database Systems and Applications (AIDB)*, co-located with the VLDB conference, <https://aidb-workshop.github.io/aidb2019-proceeding/6-neves.pdf>.
- [154] <https://www.ibm.com/think/news/meet-large-database-model-s-ldms>.
- [155] See *A Competitiveness Compass for the EU*, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 29.1.2025, COM(2025) 30 final.
- [156] E. Letta, *Much more than a market. Speed, Security, Solidarity. Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens*, April 2024, <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>.
- [157] As repeatedly mentioned throughout this paper; and see again IOSCO, *Artificial Intelligence in Capital Markets*, cit., p. 64 ff.
- [158] Š. Hosta, *Labor e habitus. Per una comprensione teologico-morale del lavoro umano*, Roma, 2024.

<https://doi.org/10.31875/2755-8398.2026.02.07>

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