

The Changing Nature of 'Regulation by Information': Towards Real-time Regulation?

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The Changing Nature of ‘Regulation by Information’: Towards Real-time Regulation?

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Abstract: The concept of ‘Regulation by Information’ is changing. Past such approaches consisted mainly of signalling regulatory intent and indirectly guiding how and when regulatory discretion should be exercised. We suggest that this conceptual understanding must be reviewed in view of developing regulatory technologies (RegTech) allowing for a far more pro-active integration of data flows into regulatory processes. RegTech is thereby changing conditions of Regulation by Information.

This article uses financial regulation as an information-intensive and highly-regulated policy field to illustrate and analyse RegTech-induced changes to conditions of Regulation by Information. It finds that the rise of near real-time information flows between market participants and regulatory bodies, and, consequently, the need for near real-time regulatory responses on the European Union level have led to an ever higher degree of integration of regulatory software into market data flows.

Regulatory software now increasingly shapes the definitions of reporting standards and formats, which in turn shape regulatory choices by influencing information flows. The article shows how this development will likely be used in other data- and information-dense policy areas outside of financial markets.

Critics of Regulation by Information argue that it can lead to a lack of accountability and transparency, increasing the democratic deficit within the European Union. This article scrutinises both continuities and changes in the role and significance of legal principles and procedures used in regulatory oversight, following the evolution of this new form of Regulation by Information within the EU.

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1. Introduction

Regulation by Information used to be characterised by unilateral announcements of regulatory intent – through binding or non-binding guidelines – that to a certain degree allowed for the steering of market behaviour of regulated entities. Examples thereof in the fields of EU competition law and more policy-specific regulatory fields such as telecommunications are plentiful. But Regulation by Information also once worked

through collection and provision of information. For example, where EU agencies did not have regulatory powers,

¹ these agencies assumed an essential function of collecting and providing information and networking with national bodies empowered to make binding regulatory decisions.²

This article argues that the introduction of regulatory technologies (RegTech) has fundamentally changed the ‘Regulation by Information’ paradigms. RegTech is shorthand for information technology (IT) in the form of software structuring, data reporting requirements, and data processing, allowing information-intensive regulatory activity. Tech-based information structuring, collection, and analysis have effects both on regulatory decision-making as well as on regulated entities. The term ‘RegTech’ thus describes the use of technology, particularly IT, for purposes of regulation, monitoring, reporting, compliance, and system design.³

Examples arise from financial regulation where the European Supervisory Authorities (ESAs) in the field of financial services have developed, and are developing, Regulation by Information through new tools for data collection and analysis. This article thus seeks to trace the changing nature of Regulation by Information, its effects on integration between regulated entities and regulators, and, especially, changes in the understanding of the legal framework and relations arising therefrom.

RegTech tools are not only being introduced into existing relations governing the relationship between regulated entities and supervisory authorities, but technology is actually shaping its own environment with profound consequences for users and regulators alike.

Critics of Regulation by Information argue that it can lead to a lack of accountability and transparency. In addition to the democratic deficit, Regulation by Information is less predictable and coherent than legislation since it can be updated quickly and

¹ Busuioc, *European Agencies: Law and Practices of Accountability*, (Oxford University Press, 2013), at 3, but more generally see also Chapter 2.

² See Majone, ‘The new European agencies: regulation by information’, 4(2) *J. Eur. Public Policy* (1997), 262-275.

³ See Enriques ‘Financial supervisors and Regtech: Four roles and four challenges’, 53 *Revue Trimestrielle de Droit Financier* (2017), *passim*; Micheler & Whaley, ‘Regulatory technology: Replacing law with computer code’, 20 *EBOR* (2019), 1-29, at 6–8; Arner, Barberis & Buckley, ‘FinTech, RegTech and the reconceptualisation of financial regulation’, 37 *Northwestern Journal of International Law & Business* (2017), 371–414, at 371; Weber, ‘RegTech as a new legal challenge’, 46 *Journal of Financial Transformation* (2017), at 10.

sometimes behind closed doors. The findings made in this article are thus not limited to the field of financial regulation but are transferable to various areas of European Union law.

The article is structured as follows: after introducing the topic, Part 2 focuses on the changing nature of Regulation by Information in the EU; Part 3 then applies these observations to the development of RegTech and the information flows in the field of EU financial law; Part 4 analyses the developments on the EU level and in the case of financial law and outlines targeted and actionable policy considerations for the use of RegTech; and, finally, Part 5 concludes.

2. The Changing Contexts of ‘Regulation by Information’

Information can be a powerful regulatory tool when requirements are set to provide or disclose it to regulators or, more broadly, market participants. Regulation by Information can also occur with regard to the publication of information by EU institutions, especially the Commission and EU agencies. Regulation by information is thus based on information collection or the provision of data through mutual assistance arrangements between authorities.

A pertinent example here is the enforcement and implementation of competition policy, including the rules on state aid. If successful, publishing guidelines informing interested parties about the Commission’s decision-making practices allows the Commission not only to coordinate its services internally, but also to influence conduct on the markets externally without using coercive instruments. The legal basis for such an approach to information by the Commission a competency annexed to the Commission’s duty to implement a policy determined in primary and secondary law.⁴ Critics of Regulation by Information argue that it can lead to a lack of accountability and transparency, increasing the democratic deficit within the European Union.⁵

In EU law, Regulation by Information has evolved, in our view, in **four** subsequent but overlapping phases, all of which still exist in the regulatory toolbox. Regulation by Information was in all of these designed to ensure that the public be informed by

⁴ For example, within the area of competition policy, the Commission not only has the competence, but, under a wider understanding of the principle of good administration, also an obligation to conduct a transparent information policy. This approach allows the Member States and citizens to establish to what extent and when they will be affected by competition policies.

⁵ E.g., Chiu, *Regulatory Convergence in EU Securities Regulation* (Kluwer 2008) 256-257;

regulatory choices and interpretations of the law, allowing regulated industries and individuals to adjust their behaviour according to the regulators approaches.

2.1. Early Dimension: Information Collection to Support Decision-making Powers

In the **early phase** of Regulation by Information, specific EU agencies were established to collect, structure, and publish information in their respective fields of competence to influence individual behaviour as well as policy developments on the Member State and the EU levels. From a legal perspective, the agency's mandate to collect and disseminate information was not coupled with the power to issue binding regulatory decisions or rules. Having initially been used by the earliest EU agencies,⁶ this approach is still applied, for example by the European Network Information Safety Agency (ENISA).⁷ The latter collects information and brings together expertise on issues of cyber-security and techniques for developing European data spaces in an advisory role to companies and policy makers.

2.2. Second Dimension: Steering Private Actors through Guidelines on Decision-making Practices

The **second phase** of development of Regulation by Information saw a shift in the approaches and mandates conferred on EU institutions and agencies.⁸ In this phase, EU institutions such as the Commission and EU agencies aimed to steer private actors' behaviour by virtue of publications. Institutions with the power

⁶ Examples include vocational training and drugs and drug addiction, see Cremona (eds), *Compliance and the Enforcement of EU Law*, (Oxford University Press, 2012), at 3.2.

⁷ E.g., the objectives of the European Network Information Safety Agency (ENISA) are stated in Article 4(1) of Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act), OJ 2019 L 151/15 are as follows: 'ENISA shall be a centre of expertise on cybersecurity by virtue of its independence, the scientific and technical quality of the advice and assistance it delivers, the information it provides, the transparency of its operating procedures, the methods of operation, and its diligence in carrying out its tasks.'

⁸ An example of this shift is the field of trademarks. The EU Intellectual Property Agency (EUIPO)'s software to detect conflicts between existing trademarks and designs in their database and new applications allows potential applicants to pre-enter the relevant data online and let the service determine whether their bid to register their trademark will likely succeed. See the 'eSearch plus' database of the EUIPO: <https://www.euipo.europa.eu/ohimportal/en/esearch>.

to adopt binding regulatory decisions could publish information in the form of *guidelines* indicating how they would interpret regulatory powers conferred on them in legislative acts. Accordingly, EU institutions and bodies publishing such guidelines would indicate how future discretionary decision-making would be exercised, thereby allowing market participants to orient their actions toward this future use of regulatory discretion. Prime examples for this approach are the Commission's publications concerning the exercise of discretion concerning competition law enforcement powers.⁹ Other examples include agency powers to grant marketing authorisations for specific products.¹⁰

The first two dimensions of Regulation by Information are largely characterised by a predominantly one-dimensional collection and distribution of information. Information was directed by the agencies towards the 'outside', mostly to the regulated entities but also to other regulators within a regulatory network. Later developments of Regulation by Information we describe in the third and fourth phase below have then resulted in a more multi-directional approach.

⁹ In the field of competition law, the Commission regularly publishes guidelines (under various names sometimes called also 'vademecum', 'notice' or other) in order to announce the way in which certain legislative provisions will be interpreted. See, e.g., the Guidelines on the method of setting fines imposed pursuant to Art. 23(2)(a) of Regulation No 1/2003, OJ 2006 C 210/2.

¹⁰ For instance, under Council Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights (OJ 1994 L 227/1), Community plant variety rights are granted for varieties that are distinct, uniform, stable and new. Binding decisions are taken by an EU agency, the Community Plant Variety Office (CPVO), which publishes guidelines as to how it will undertake its assessment and which information needs to be provided for by applicants. As the CJEU summarises in C-625/15 P *Schniga v CPVO* ECLI:EU:C:2017:435, para. 8 under 'Article 56(2) of that regulation, the technical examination is to be conducted in accordance with test guidelines, issued by the CPVO Administrative Council ('the Administrative Council'), and any instructions given by the CPVO. Those guidelines describe, inter alia, the plant material required for the technical examination, how the tests are to be performed, the methods to be applied, the observations to be made, the grouping of the varieties included in the test and the table of characteristics to be examined. In the technical examination, plants of the variety at issue are cultivated alongside those of the varieties which the CPVO and the appointed examination office deem to be those to which the candidate variety comes closest according to the description of the candidate variety in the technical description forming part of the application for grant of a Community plant variety right.'

2.3. *Third Dimension: Imposing Information and Publication Standards to Feed Regulatory Decision-making*

The **third dimension** of Regulation by Information involves EU institutions and agencies having binding decision-making powers on individual cases and matters, as well as agencies at the EU Member State level implementing EU policies.

Increasingly, EU policies impose detailed reporting obligations on market participants and data formats. Often, delegation allows agencies to define precise regulatory standards which can in turn be imposed on individuals in the context of their reporting obligations. This allows decision-making agencies, for example, to aggregate market data and target enforcement activities.¹¹ The generalised ad-hoc or periodic obligations to provide information¹² can also be paired with requirements to deliver, on a case-by-case basis, information in the context of an investigation.¹³

Reporting and disclosure obligations can further impose a duty to publish information to the general public in order to pursue regulatory purposes. This dimension of Regulation by Information goes back to reporting duties developed in the 1960s under the so-called ‘right-to-know’ policies in the United States. These opened the information flows and regulators ensured broad informational transparency in governance.¹⁴ More recently, ‘smarter disclosure’ involved timely reporting and transmission of complex data in a standardized, machine-readable format in a way that empowers consumers to make informed decisions. It aims to avoid data overload and confusion, preferring specificity and occasionally permitting delegation.¹⁵

¹¹ E.g., in the field of data protection, Art. 49(1) third sentence GDPR requires that data controllers ‘shall inform the supervisory authority of the transfer’ of data to a third country when acting under the criteria of Art. 49 GDPR.

¹² Relevant examples include mergers and data protection. In the field of merger regulation under Regulation (EU) 139/2004, OJ L24/1. Concerning the field of data protection, Art. 49(1) third sentence of the GDPR (Regulation (EU) 2016/679, OJ L119/1) is relevant when a transfer of data to a third country occurs, such transfer must be reported ad-hoc by the regulated entity. Data controllers ‘shall inform the supervisory authority of the transfer’.

¹³ E.g., in the context of investigative powers of agencies regarding competition law.

¹⁴ See, for instance, Schudson, *The Rise of the Right to Know: Politics and the Culture of Transparency, 1945–1975*, (Belknap Press, 2018), esp. Ch. 2.

¹⁵ See, e.g. Tombal, *Imposing Data Sharing Among Private Actors: A Tale of Evolving Balances*, (Wolters Kluwer, 2022), at Pt. 3.

The obligation to disclose information can result in regulatory effects, directly and indirectly, changing business behaviours. Direct changes are imposed on firms to provide information in a specific context and form – an approach well known from tax law. This will have internal effects in that an information-based regulation imposes disclosure, guidance, and mandatory requirements on firms, which will also affect internal measurement, reporting, and disclosure systems.

2.4. Fourth Dimension: Towards a Reporting Integration of Regulated Entities and Regulators and the Evolution of RegTech

EU agencies are increasingly entitled to require, *and they require*, not only ad-hoc reporting but also a reduction in the intervals at which information must be supplied to the regulator (**phase four**).

The latter has become increasingly prevalent in the field of financial regulation, used as a case study in this article. Obligations for transaction reporting on derivatives trading are a prime example: regulated entities are required to report millions of data points on a monthly basis.¹⁶ This is characterised by an increasing integration of ongoing information provision by regulated entities into the agencies' (almost) real-time decision-making based on that information. The move towards integration of information flows and regulatory decision-making stems from developments in regulatory technology enabling such integrated approaches.¹⁷

¹⁶ See, among the latest: EBA, *Final report. Draft implementing technical standards on supervisory reporting requirements for institutions under Regulation (EU) No 575/2013*. EBA/ITS/2020/05, 24 June 2020.

¹⁷ See Zetzsche, Arner, Buckley, and Weber, 'The evolution and future of data-driven finance in the EU', 57 *Common Market L. Rev.* 331 (2020); Arner, Barberis & Buckley, *The Emergence of Regtech 2.0: From Know Your Customer to Know Your Data* (January 1, 2016). (2016) 44 *Journal of Financial Transformation* 79, UNSW Law Research Paper No. 17-63, <https://ssrn.com/abstract=3044280>; Arner, Barberis, & Buckley, *FinTech and RegTech in a Nutshell, and the Future in a Sandbox* (July 1, 2017). CFA Institute Research Foundation Vol. 3, Issue 4, pp. 1-20, July 2017, University of Hong Kong Faculty of Law Research Paper No. 2017/040, Available at <https://ssrn.com/abstract=3088303>; Arner, Zetzsche, Buckley & Barberis, *Fintech and Regtech: Enabling Innovation While Preserving Financial Stability* (January 1, 2017). (2017) 18(3) *Georgetown Journal of International Affairs* 47, UNSW Law Research Paper No. 18-41, University of Hong Kong Faculty of Law Research Paper No. 2018/036, Available at <https://ssrn.com/abstract=3211708>; Yang & Tsang, *RegTech and the New Era of Financial Regulators: Envisaging More Public-Private Partnership Models of Financial Regulators*

The integration of information reporting by regulated entities and regulatory decision-making go hand-in-hand with the deployment of advanced IT – both in the form of RegTech used by businesses, as well as RegTech used by agencies.¹⁸

One of the characteristics of the advent of RegTech's structuring of reporting and integrating regulatory decision-making into the stream of reported data is that RegTech serves many of the purposes laid out in old guidelines.¹⁹ Where reporting according to certain software standards is imposed as an obligation, these software standards become akin to binding administrative rulemaking in that they contribute to translating abstract legislative requirements into specific regulatory decision-making addressed at individuals.

Information provision standardised through RegTech has further-reaching effects: the standards regulating which information is provided and in which format structure both business tools and processes. At the same time, technological solutions have a considerable impact on administrative procedures within the regulatory agencies.

The procedures are not neutral and may shape the decision-making outcome. The technology's influence on decision-making will thus need to be carefully scrutinised against legal principles governing the process. Given these mutually-influencing effects, some space for experimentation in the definition of rules and their application has been created in the form of 'regulatory sandboxes.'²⁰

But, equally importantly, the increasing relevance of information and the speed at which it is generated in certain regulated industries requires real-time decision-making. Real-time reporting enables real-time decisions. The combination of

(May 3, 2019). University of Pennsylvania Journal of Business Law, Vol. 21, No. 2, 2018, <https://ssrn.com/abstract=3382005>.

¹⁸ Financial Stability Board, *The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions Market developments and financial stability implications*, 9 October 2020, <https://www.fsb.org/wp-content/uploads/P091020.pdf>.

¹⁹ Financial Stability Board, *The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions Market developments and financial stability implications*, 9 October 2020, <https://www.fsb.org/wp-content/uploads/P091020.pdf>, at 3-4.

²⁰ See, with regard to sandboxes, Financial Stability Board, *The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions Market developments and financial stability implications*, 9 October 2020, <https://www.fsb.org/wp-content/uploads/P091020.pdf>, at 68.

business development, the increased amount and speed of information generated, as well as advancements in IT allowing an integrated regulatory approach to be undertaken are all markers of the current state of integrated Regulation by Information.

The information flow is designed to enable checking for compliance with regulatory standards in information-intensive businesses. It triggers a RegTech cycle on the regulator's side since the amount of information provided is such that automated systems are required for its analysis.

Additionally, such Regulation by Information may be subject to outsourcing and delegation to private parties in various policy fields.²¹ These alternative regulatory models could be described as 'self-regulation of information-use' imposing regulatory obligations on private actors. With the RegTech applied being in the hands of private entities, challenges arise concerning decision-making, the balancing of individual rights and establishing proper standards of decision-making, and possibilities of review.²² Critics of regulation by information argue that it increases the democratic deficit within the European Union because it lacks accountability and transparency

Today's Regulation by Information takes place in the context of the multi-level nature of EU policies, where the collection of information and decision-making is distributed between the EU and Member State levels.²³ Databases are often shared. Indeed, the composite aspect of Regulation by Information in the EU is widely illustrated in the context of financial regulation and information flows.

Using the example of EU financial law and regulation, the following section will show how these various dimensions of Regulation by Information not only co-exist, but also what impact the latest (fourth) dimension has on decision-making.

²¹ Shapiro, *Outsourcing Government Regulation*, 53 *Duke Law Journal* (Nov., 2003), 389-434 and, in practice, European Banking Authority, 'Final Report on EBA Guidelines on outsourcing arrangements', EBA/GL/2019/02, 25 February 2019.

²² For example, under Art. 17(4) of the Directive on copyright and related rights in the Digital Single Market (DSM) (Directive (EU) 790/2019, CDSM Directive, OJ 2019 L 130/92). Questions about the legality of Art. 17 are currently pending before the CJEU. Directive (EU) 790/2019, CDSM Directive, OJ 2019 L 130/92). Questions about the legality of Art. 17 are currently pending before the CJEU.

²³ Stephenson, 'Twenty years of multi-level governance: 'Where Does It Come From? What Is It? Where Is It Going?''', (2013) 20 *Journal of European Public Policy*, 817-837.

3. The Case of Regulation by Information Flows in EU Financial Regulation

Financial regulation is an area which contains all of the elements of Regulation by Information described above. Equally, it is at the forefront of introducing and rolling-out advanced IT and RegTech.²⁴ The discussion of financial regulation and RegTech being used as a model for further development results from the transformation of much of the real-world economy into a data-driven economy.²⁵ By its very nature, the financial industry increasingly uses information as a central piece of its business models. Regulatory oversight is thus often linked to the information flows generated by the financial industry.

3.1. Information Collection and Distribution

Parallel to the EU's financial regulation moving from a mutual recognition framework to a Single Rule Book approach, the highly sophisticated form of market supervision framework was paired with the increasingly intense information-gathering and evaluation processes of the EU authorities.

²⁴ See, *inter alia*, in the academic literature, Zhou, Arner, Buckley, 'Regulation of Digital Financial Services in China: Last Mover Advantage' (September 1, 2015). (2015) 8(1) *Tsinghua China Law Review* 25-62, University of Hong Kong Faculty of Law Research Paper No. 2015/044, UNSW Law Research Paper No. 2015-62, available at <https://ssrn.com/abstract=2660050>.

See also FINANCIAL STABILITY BOARD, *The Use of Supervisory and Regulatory Technology by Authorities and Regulated Institutions Market developments and financial stability implications*, 9 October 2020, <https://www.fsb.org/wp-content/uploads/P091020.pdf>; EXPERT GROUP ON REGULATORY OBSTACLES TO FINANCIAL INNOVATION (ROFIEG), *30 Recommendations on Regulation, Innovation and Finance. Final Report to the European Commission*, December 2019, https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/191113-report-expert-group-regulatory-obstacles-financial-innovation_en.pdf and EUROPEAN CENTRAL BANK, *ESCB/European banking supervision response to the European Commission's public consultation on a new digital finance strategy for Europe/FinTech action plan*, October 2020, <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.esbceuropeanbankingsupervisionresponsetoeuropeancommissionpublicconsultationdigitalfinancestrategyeuropefintechactionplan2020~b2e6cd0dc4.en.pdf>.

²⁵ OECD, *Going Digital: Shaping Policies, Improving Lives*, 11 March 2019, Chapter 1, https://www.oecd-ilibrary.org/science-and-technology/going-digital-shaping-policies-improving-lives_9789264312012-en?itemId=/content/component/58ee7fe5-en&csp_489848dd2a09959e17511494b5e661ea&itemIGO=oecd&itemContentType=chapter and WORLD ECONOMIC FORUM, *Data-driven Economies: Foundations for Our Common Future. White Paper*, April 2021.

The Committee of European Securities Regulators (CESR) took the first step towards centralised information-gathering in 2001.²⁶ Starting with its earliest work, the so-called Himalaya Report of 2004,²⁷ the CESR identified as a priority the creation of an adaptive supervisory strategy, capable of gradually integrating markets without necessarily introducing a dedicated new institutional body. Based on information-gathering conducted by the Member States, the Report itself outlined the desirability of adopting a model of joint supervision on a case-by-case basis with the help of mutual assistance and information-sharing tools.²⁸

3.2. *Introducing Interpretative Guidelines*

The next generation of tools for Regulation by Information in the financial sector was then initiated with the Lamfalussy model that, through its advisory role in the rule-making process, enhanced the role of the CESR. Specifically, the model established that the CESR would gather and submit to the European Commission central information about the functioning of the financial market.²⁹

The Lamfalussy model also assigned the CESR a leading role at the third level of the EU regulatory process (consisting of administrative guidance documents), primarily aimed at addressing supervisory convergence and consistency in the

²⁶ Set up as loose network of national financial regulators, unlike the US Federal Securities & Exchange Commission (SEC), the establishment of CESR was designed as an EU agency to support coordination among national supervisory authorities - each applying similar and only partially harmonised, financial legislation. From the outset, CESR also assisted the European Commission in the development of EU financial regulation, and advised on issues such as the correct and timely implementation of the EU legislation in Member States.

²⁷ Committee of European Securities Regulators, *Preliminary Progress Report. Which Supervisory Tools for the EU Securities Market? An Analytical Paper by CESR (2004)* (CESR 04-333f).

²⁸ Niamh Moloney, *EU Securities and Financial Markets Regulation* (Oxford, 2014), 953 and, for a comprehensive description of the activities, at 862-880.

²⁹ Lamfalussy level 2 acts are today's delegated and implementing acts under Articles 290 and 291 TFEU. These acts of administrative rule-making by the Commission were based on legislative mandates, notably the Market Abuse Directive 2003/6/EC. For the background on the Lamfalussy method: Final Report of the Committee of Wise Men on the Regulation of European Securities Markets, 15 February 2001, https://www.esma.europa.eu/sites/default/files/library/2015/11/lamfalussy_report.pdf.

implementation of both Level 1 and Level 2 rules.³⁰ Owing to their non-binding effect, CESR guidelines could become important only due to their significant persuasive authority, requiring in-depth data collection and analysis.³¹ The CESR made use of that option quite effectively. As Niamh Moloney summarised, the CESR ‘had generated, by the time of CESR’s replacement by ESMA at the end of 2010, a substantial but informal ‘soft rulebook.’”³² This was key to the establishment of the Regulation by Information strategy. The approach guided authorities and regulated entities by distributing information about regulatory approaches and ensuring compliance with a uniform interpretation of relevant rules.

As part of its Regulation by Information, the CESR functioned as a moderator among many national authorities, ‘inject[ing] regulatory and market intelligence into the rule-making process [as] exemplified by the 2010 level 2 UCITS reforms, adopted towards the end of the CESR era, which grappled with technically complex conduct-of-business and risk management rules and the novel KIID, and by the 2006 MiFID I level 2 rules on market transparency, which similarly engaged with highly technical issues related to market structure.’³³ The CESR thus facilitated a true Europeanisation of EU financial law and, through its trust-generating function, paved the way for the ESMA’s establishment ten years later.

3.3. From Interpretative to Case-by-Case Guidelines

The ESMA has gradually emerged as a fully-fledged securities regulator. According to Articles 10 and 15 of the ESMA Regulation (referring to Arts 290 and 291 TFEU),³⁴ the ESMA has a key role in drafting delegated and implementing acts. It has amassed considerable expertise in shaping regulation based on data gathering and analysis.³⁵ Moreover, the ESMA has also introduced innovative legislative guidance tools based on

³⁰ Alford, ‘The Lamfalussy Process and EU Bank Regulation: Another Step on the Road to Pan-European Regulation?’, *25 Annual Rev. Bank. & Fin. L.* 389 (2006), 402.

³¹ As regulatory tools, CESR was equipped with two main tools: the joint interpretations and peer-reviews of regulatory practices. See: CESR, *The Role of CESR at ‘Level 3’ Under The Lamfalussy Process Action Plan For 2005*, Ref: CESR/04-527b, October 2004, https://www.esma.europa.eu/sites/default/files/library/2015/11/04_527b.pdf, at 3-4.

³² Moloney, *EU Securities and Financial Markets Regulation*, (Oxford University Press, 2014), at 866. See also, *ibid.*, at 2.3.

³³ Moloney (*ibid.*) 866-7.

³⁴ Regulation (EU) 1095/2010 OJ L331/84.

³⁵ Moloney, *EU Securities and Financial Markets Regulation*, ((Oxford University Press, 2014), at 286-7.

extensive gathering of case-by-case expertise, as evidenced by its supervisory convergence guidance efforts in relation to ‘key concepts’ under the AIFMD and AIFMR reporting,³⁶ and its adoption of an AIFMD Q&A.³⁷ In Regulation by Information terms, this amounts to guidance of Member State regulatory bodies and individual market participants as to the regulators’ interpretation of the law and, accordingly, the expectations to be met by regulated entities.

Additionally, this dimension of Regulation by Information in the financial sector has developed increasingly detailed reporting standards. For example, under the European Single Electronic Format,³⁸ EU-regulated listed companies must now draft ‘their annual reports in the eXtensible HyperText Markup Language (XHTML) for reporting periods beginning on or after 1 January 2020 and International Financial Reporting Standards (IFRS) reporters must use Inline XBRL (iXBRL) to make the consolidated data in the primary financial statements machine-readable.’³⁹

The European Banking Authority, one of the EU agencies active in the supervision of financial actors, is also engaged in publishing supervisory reporting requirements, called reporting frameworks.⁴⁰ These include a series of technical information related to the Validation rules, the EBA Data Point Model(s) (DPM), as well as the XBRL Taxonomies. Altogether, these provide a comprehensive overview of the reporting requirements applicable for each reference date. These requirements cover information on own funds requirements, financial information, large exposures, leverage ratio, liquidity, asset encumbrance, funding plans, and benchmarking of internal models.

³⁶ See, ESMA, AIFMD Reporting IT Technical Guidance (Rev 4) [updated], 2013/1358, <https://www.esma.europa.eu/document/aifmd-reporting-it-technical-guidance-rev-4-updated> and ESMA, ESMA Publishes Second Report on Sanctions under AIFMD, 20 July 2021, <https://www.esma.europa.eu/file/120267/download?token=76JMZNRS>.

³⁷ ESMA, *Q&A on the Application of the AIFMD*, 16 July 2021, <https://www.esma.europa.eu/file/23444/download?token=P6ElbtcC>. In the literature, see Moloney, *EU Securities and Financial Markets Regulation* (Oxford, 2014), 286-7.

³⁸ Available at <https://www.esma.europa.eu/policy-activities/corporate-disclosure/european-single-electronic-format>.

³⁹ <https://www.pwc.com/gx/en/services/audit-assurance/capital-markets-and-accounting-advisory/european-single-electronic-format.html>.

⁴⁰ Available at <https://www.eba.europa.eu/risk-analysis-and-data/reporting-frameworks>.

Furthermore, the European Insurance and Occupational Pensions Authority (EIOPA) is actively setting out reporting templates, including Financial Stability Reporting, in the context of ‘quantitative reporting templates.’⁴¹ It aims to provide stakeholders with a ‘full view of the future reporting and disclosure requirements, as a complement of the legislative proposals in this area.’⁴²

3.4. The Advent of the RegTech Age

As banking technology evolves – often referred to as FinTech – so too does the need for regulatory bodies to keep pace with it, hence the advent of RegTech.⁴³

Through RegTech we are witnessing the building of extraordinary momentum in the EU's digital transformation of finance, impacting both industry players and financial supervisors, who have shifted towards more data-driven regulation. Drivers of this shift include the extension of digital reporting regulatory requirements,⁴⁴ especially the post-crisis financial regulatory reform and data protection regulation.⁴⁵ In

⁴¹ Available at https://www.eiopa.europa.eu/sites/default/files/solvency_ii/eiopa-bos-20-754-quantitative-reporting-templates.pdf and https://www.eiopa.europa.eu/sites/default/files/solvency_ii/eiopa-bos-20-754-quantitative-reporting-templates.pdf.

⁴² Available at https://www.eiopa.europa.eu/sites/default/files/solvency_ii/eiopa-bos-20-754-quantitative-reporting-templates.pdf.

⁴³ Zetzsche, Buckley, Arner, and Barberis, ‘Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation’, 23 *Fordham Journal of Corporate and Financial Law* 31-103 (2017), European Banking Institute Working Paper Series 2017 - No. 11, University of Luxembourg Law Working Paper No. 006/2017, University of Hong Kong Faculty of Law Research Paper No. 2017/019, UNSW Law Research Paper No. 17-71, Center for Business and Corporate Law (CBC) Working Paper Series 001/2017, <https://ssrn.com/abstract=3018534>.

⁴⁴ For instance, on 24 September 2020, the European Securities and Markets Authority (ESMA) published a Consultation Paper seeking stakeholders’ views on some suggested amendments to the respective MiFIR Level 1 texts. Later on, based on the consultation feedback received, ESMA published a final report, dated 30 March 2021, containing recommendations – particularly relevant for trading venues, systematic internalizers, investment firms, data reporting service providers, and AMCs – as well as possible legislative amendments to the MiFIR transaction reporting regime.

⁴⁵ *Inter alia*, see Arcuri, ‘General Data Protection Regulation (GDPR) Implementation: What was the Impact on the Market Value of European Financial Institutions?’, 13 *Eurasian J. Bus. and Econ.* (2020), 1-20 and European Data Protection Supervisor, *Guidelines on data protection in EU financial services regulation*,

relation to this last aspect, the interaction between RegTech and data regulation, two phenomena which are markedly connected and which share, also at a temporal level, a long-term horizon in terms of digitalization and datafication, is of particular importance. Indeed, it is expected that the use of technology for compliance, monitoring, enforcement, and system design in financial regulation, as well as for data computation, will necessarily continue to increase.⁴⁶

The growth of RegTech in the financial industry goes hand in hand with the expansion of machine-readable regulations, in which each rule is paired with a tag that ultimately allows for computerized regulatory reporting. Proponents of this point to three merits, namely making compliance automatic, immediate, and cost-effective.⁴⁷ This would lead to the digitising of aspects of regulatory reporting by connecting regulators, on the one hand, and financial institutions, on the other, directly and through programming interfaces. Both parties would then aim to monitor how risks evolve, using comprehensive data, operating in real time, with the expectation of reducing reporting errors and the costs that such operations would otherwise impose. At the same time, this would provide for greater and deeper customer insight, enhanced consumer protection, improved sharing of instrumental data between banks, and allow for testing a model developed by the FCA called ‘tech sprints.’ The latter constitutes a mechanism capable of codifying and translating regulatory improvements into a living code.⁴⁸

The ESMA’s reporting is an extensive and complex system. Examples of such reporting tools include a reporting requirement for all derivatives to trade repositories (TRs). The TRs receive,

https://edps.europa.eu/sites/default/files/publication/14-11-25_financial_guidelines_en.pdf.

⁴⁶ Zetzsche, Arner, Buckley, and Weber, ‘The evolution and future of data-driven finance in the EU’, 57 *Common Market L. Rev.* 331, 358 (2020). See also Buckley, Arner, Zetzsche and Weber, ‘The Road to RegTech: The (astonishing) example of the European Union’, 20 *Journal of Banking Regulation* (2019).

⁴⁷ Computerised regulatory reporting also gained attention in other areas of law, for instance concerning consumer contracts, see e.g. Brownsword, ‘Smart Contracts: Coding the Transactions, Decoding the Legal Liability’ in Hacker, Lianos, Dimitropoulos, Eich (eds), *Regulating Blockchain: Techno-Social and Legal Challenges*, (Oxford University Press, 2019), at 317ff. He argues that this benefits consumers and regulators, in this case to spot unfair contract terms. See also Micklitz on automated detection of unfair contract terms, EU project CLAUDETTE: <http://claudette.eui.eu/about/index.html>.

⁴⁸ Barefoot, ‘BankThink Banking needs a regtech sandbox’, *Am. Banker* (November 2, 2018), <https://www.americanbanker.com/opinion/banking-needs-a-regtech-sandbox>.

store, and maintain real-time records of all derivative contracts⁴⁹ and, according to the ESMA, are, therefore, ‘enhancing the transparency of derivative markets and reducing risks to financial stability.’⁵⁰

The advancement of RegTech is also evidenced by the increasing requirements of compliance with reporting standards set by ESMA, such as the development of the ESMA’s Financial Instruments Reference Data System (FIRDS), which covers the Markets in Financial Instruments Regulation (MiFIR) and Market Abuse Regulation (MAR) requirements for reference data collection and publication.

The advent of FinTech and RegTech has also allowed for faster and much more immediate regulatory reporting and, thus, regulatory oversight. Understanding the post-trade transparency (PTT) obligations defined under Articles 6, 10, 20, and 21 of the MiFIR requires understanding the timebound publication of trade data to an APA, namely within one minute of execution for equity and equity-like products. Publication of non-equity products had to occur within 15 minutes of execution, falling to five minutes in 2020. Such a form of single-sided disclosure regards trade details, whereby the seller should report the trade, subject to the disclosure hierarchy.⁵¹

Recent legislative developments outside financial regulation have also incorporated the use of RegTech and steering by information, for instance, the Data Governance Act⁵² and the proposed AI Act.⁵³

4. From Supervision to Real-time Regulation

Advancements in IT are having far-reaching impacts on the exercise of regulatory discretion and the nature and speed of public decision-making procedures. They thereby also affect the

⁴⁹ This is governed by a number of regulatory and implementing technical standards on the EU level that define the , see Regulation (EU) 2017/104 and Commission Implementing Regulation (EU) 2017/105. Moloney, *The Age of ESMA: Governing EU Financial Markets* (Hart 2018) 122-123.

⁵⁰ ESMA. EMIR Reporting (ESMA 2022) <https://www.esma.europa.eu/policy-rules/post-trading/trade-reporting>.

⁵¹ Available at <https://www.afme.eu/portals/0/globalassets/downloads/publications/afme-mifidii-mifir-post-trade-reporting-requirements.pdf>.

⁵² Regulation (EU) 2022/868 on European Data Governance OJ 2022 L152/1.

⁵³ Proposal for a Regulation Laying Down Harmonised Rules on Artificial Intelligence COM 2021 206 final.

exercise of rights and principles protecting regulated entities and individuals. Crucially, understanding the historic changes over time to the notion of Regulation by Information helps when assessing ongoing developments.

4.1 From Delayed to Real-time Supervision

The first significant development in this stage was the transition from delayed supervision to real-time supervision. As depicted in the case of financial regulation, supervision was initially delayed, with regulators increasingly asking for further information provision to supervise financial entities in real time. Examples here include the ESMA's reporting requirements for all derivatives to TR.⁵⁴ The latter allow a prompt and expeditious reaction to unexpected events. Similar to human analysis, data-driven analysis is not perfect per se. In particular, deficiencies range from the data used for that analysis (carrying the risk of 'dash-board myopia')⁵⁵ to the software used for those purposes, which are beset with human cognitive biases and selective decisions based on bounded rationality. This has prompted demands for tailor-made modes of (corporate technology) governance in the private sector⁵⁶, which is nothing less than what is already demanded of the administrative (supervisory) process.

The consequences of this evolution at a higher level of supervision should also be noted. Supervision that cannot be human-based but must be data-driven has to use the most advanced and sophisticated computational tools to guarantee the highest level of precision and adequacy. This will require technical resources and adjustments to the administrative process adequate to the cause, which, as we know from financial regulation literature, is far from ensured.⁵⁷ Bureaucracy lags

⁵⁴ See, Section 3.4 of the present paper.

⁵⁵ Lin, 'Artificial Intelligence, Finance, and the Law', 88 *Fordham Law Review* (2019) 531, 536.

⁵⁶ Enriques & Zetsche, 'Corporate Technologies and the Tech Nirvana Fallacy', 72 *Hastings Law Journal* (2020), 55-98, <https://ssrn.com/abstract=3392321>.

⁵⁷ Channelling technological expertise to regulators is, besides facilitating contact between innovators and regulators as such, the rationale for 'regulatory sandboxes'. See Allen, 'Regulatory Sandboxes', 87 *George Washington Law Review* (2019) 579; Mangano, 'The Sandbox of the UK Financial Conduct Authority as Win-Win Regulatory Device?', 34 *Banking & finance Law Review*, (2018), 31-40; Dostov, Shoust, Ryabkova, 'Regulatory sandboxes as a support tool for financial innovations', 2 *Journal of Digital Banking* (2017), 179-188; Alaassar, Mention, Aas, 'Exploring a new incubation model for FinTechs: Regulatory Sandboxes', 103 *Technovation* (2021), 102237 and Alaassar, Mention, Aas, 'Exploring

behind industry actors in terms of technical expertise and resources. In other words, as noted by Bailey and Barley: ‘significant barriers and constraints have prevented a more diffused adoption of ICTs – and potentially also AI – by governmental organisations so far, notably including lack of dedicated resources, knowledge, organisational resistance and other specific factors, such as quality of available datasets. This has led to a significant gap in the take-up rates between private and public sector organisations, where the former are usually much faster in using best of breed solutions to improve their products and services and stay ahead of competition.’⁵⁸

The evolution of Regulation by Information (i.e. the increasing integration of regulatory structures into information flows and the shaping of these flows by regulatory requirements), has a profound effect on the administrative process. This challenges the current paradigms underlying the legal principles designed to ensure the protection of procedural rights of participants and the quality of decision-making.

A noteworthy case was decided by the Court of Justice of the European Union in July 2021.⁵⁹ The ESMA's data transfer guidelines were subject to judicial review through the preliminary ruling procedure, despite the fact that they are not binding *per se*. Data transfer guidelines could potentially include requirements to use certain regulatory-inspired software and server tools to report data or to enable agencies to link into the data flow. Since, as we have laid out, the system design defines

how social interactions influence regulators and innovators: The case of regulatory sandboxes’, 160 *Technological forecasting & social change* (2020), 120257.

⁵⁸ See Bailey & Barley, ‘Beyond design and use: How scholars should study intelligent technologies’, 30 *Information and organization*, 2020, 100286.

⁵⁹ Judgment of the Court (Grand Chamber) of 15 July 2021. C-911/19, *Fédération bancaire française (FBF) v Autorité de contrôle prudentiel et de résolution (ACPR)*. Request for a preliminary ruling from the Conseil d’État. Case C-911/19, <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:62019CJ0911>.

Finally, the CJEU examined the EBA guidelines in light of the applicable secondary EU legislation and rejected the challenge based on the EBA’s lack of legal basis for such guidelines (§§[66]-[132]). In particular, the Court endorsed the objective of the EBA guidelines to ensure that financial establishments bear in mind, and design risk processes tailored towards, their target audience (in particular retail customers) (at §[104]). Such an initiative was held to establish principles designed to guarantee the efficacy of processes to detect, manage and respond to risks, as well as to adequate internal control mechanisms (at §[106]). The Court accordingly found that the EBA Guidelines fell within the scope of the EBA’s functions (at §§[120] and [130]).

what is possible to do in a RegTech world, who is accountable for the design in a ‘Compliance by Design’ set-up becomes a crucial question.⁶⁰

Another factor to bear in mind is that collecting sensitive data on a big scale requires adequate safeguards for RegTech systems.⁶¹ Cyberattacks and data leaks would not only undermine public trust, but would also raise the question of legal liability, especially because RegTech is becoming an integral element of public administrations and is thus part of critical national infrastructure.⁶² There is, therefore, a duty to the public to ensure that it is adequately protected, requiring suitable levels of investment⁶³ in order to avoid the risk of liability in the event of unauthorised access to data.⁶⁴

There is also a need to ensure the accountability of the regulated entity. RegTech simultaneously requires recalibration of more immediate and frequent legal concepts, such as due diligence, professional conduct, and fiduciary standards. In fact, the era of Regulation by Information showcases a change in the type of information that is being handled, in the sense that data asked for by regulators will also influence company-internal reporting and will thus directly shape internal procedures. It also allows reveals a change in legal responsibility (i.e. it may be possible that supervised entities can invoke the steering effect of RegTech as a defence).

The final point to consider here concerns the usability of data. While RegTech data can improve regulatory systems, there is a risk that the underlying data are improperly interpreted or used. Granular and sensitive data are sampled, stored, and analysed, but a question arises as to whether and to what extent RegTech algorithms and underlying data should be accessible to stakeholders or the wider public.

⁶⁰ See Butler, ‘Obligations Imposed on Private Parties by the GDPR and UK Data Protection Law: Blurring the Public-Private Divide’, 24(3) *European Public Law* (2018), 555ff.

⁶¹ See Luca Enriques, *Financial Supervisors and Regtech: Four Roles and Four Challenges*: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3087292.

⁶² See e.g. Jennifer Callen-Naviglia and Jason James, ‘Fintech, Regtech and the Importance of Cybersecurity’ (2018) 19(3) *Issues in Information Systems* 222-223.

⁶³ Arner, Zetzsche, Buckley & Weber, ‘The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II’ 25(2) *Stan JL Bus & Fin* (2020), 286.

⁶⁴ Fines for data breaches are already possible under the GDPR, see for instance the case of a data breach at British Airways: Evans, *Enterprise Cybersecurity in Digital Business: Building a Cyber Resilient Organization*, (Routledge, 2022), 43-44.

Against this background, the shift from delayed to real-time supervision creates new regulatory opportunities and challenges that must be addressed.

4.2 From Supervision to Regulation

The second major policy shift was from supervision to regulation.

In the first dimension of the development of Regulation by Information, the initial approaches to regulation by publication of information were twofold. Agencies publishing information had to act within the confines of their mandate and could not act *ultra vires* beyond their field of competence. Moreover, they could be held liable for damages arising from the publication of wrong information or illegally publishing harmful information. These standards were founded on principles of legality and good administration,⁶⁵ and continue to form the basis of the development of information-related regulation.

At the second level, next to competence and issues of liability for wrongful action, the publication of guidelines announcing the future exercise of discretionary powers in regulatory decision-making gave rise to additional possibilities in terms of creating individual rights. In regulatory law, Regulation by Information used to refer to the situation where agencies spread information about their potential future decision-making, the legality Regulation by Information in an agency context is linked not only to the limits of their decision-making competence. Even though agencies' guidelines tend to only be binding internally, it was nevertheless possible to 'harden' these to confer rights on individuals. Specifically, individuals could then rely on legal principles such as legality, legal certainty, the protection of legitimate expectations, equality before the law, and the principle of non-discrimination. When behaving in accordance with non-binding guidelines, agencies may be less prone to discretionary decision-making. Here, the agency's self-proclaimed standards become enforceable against itself. These parameters are very much relevant today in the context of obligations of reporting and expectations by businesses in that context.

Where the regulation of information is increasingly relying on binding administrative rule-making to classify the data to be reported and the relevant formats, a whole set of different legal

⁶⁵ See, e.g., Case T-48/05 *Franchet and Byk v Commission* [2008] ECLI:EU:T:2008:257 regarding damages claims for violation of standards of good administration in the context of press releases.

requirements becomes relevant. Pertinently, any reporting requirements place limitations on individual freedoms. EU law respects, as a fundamental right in the form of a general principle of EU law, ‘protection against arbitrary or disproportionate intervention by public authorities in the sphere of the private activities of any natural or legal person.’⁶⁶ Moreover, the freedom to conduct a business and the individual rights of data subjects whose data might be reported under the rights of privacy and the protection of personal data⁶⁷ set limits on the possibilities of administrative rule-making by agencies requiring the provision of information. These rights require that the justification for each individual data point be reported as well as justification for the subsequent use and possible storage of such data. These requirements are applicable in the context of administrative rule-making procedures, to be specified in the reasoning of an act. The mere roll-out of software requesting reporting will quite possibly not comply with these requirements.

In this context, the request for information from an administrative agency raises questions that must be aligned with the considerations regarding the role and function of EU agencies. First, agencies must comply with the principles of transparency and some are obliged in their legal basis to undertake consultative processes,⁶⁸ such as regulatory impact assessments. At the same time, various EU agencies have different powers with respect to the adoption of administrative rules. In absence of a common EU administrative procedural rulebook, each of them follow their own rule-making procedures. Generally speaking, however, the precise distinction between ‘binding implementing rules’ and ‘soft law measures’ may often not always be sufficiently clearly distinguished.⁶⁹

⁶⁶ See joined cases C-245/19 and 246/19 *Etat Luxembourgeoise v B and others* ECLI:EU:C:2020:795 paras. 52-57 and 100; C-682/15 *Berlioz Investment Fund SA* ECLI:EU:C:2017:373 para. 51; C-121/04 *P Minoan Lines v Commission* ECLI:EU:C:2005:695 para 30; C-94/00 *Roquette Frères* ECLI:EU:C:2002:603 para 27; joined cases 46/87 and 227/88 *Hoechst v Commission* EU:C:1989:337 para 19. This fundamental right under EU law that can be limited only under the conditions (restated for Charter rights in Article 52(1) of the Charter), on the basis of law, respecting the essence of the right and complying with the principle of proportionality. C-59/17 *Chateau du Grand Bois* ECLI:EU:C:2018:641 para. 30.

⁶⁷ Articles 7 and 8 of the Charter.

⁶⁸ See Alemanno, ‘Levelling the EU participatory playing field: A legal and policy analysis of the Commission's public consultations in light of the principle of political equality’ 26(1-2) *European Law Journal* (2020), 114ff.

⁶⁹ Chiti, ‘European Agencies’ Rulemaking: Powers, Procedures and Assessment’, 19 *Eur. J. Law* (2013), 93.

Where the imposition of reporting duties and subsequent decision-making procedures appear not to comply with legal standards, they can be challenged implicitly via a request to review the legality of a single case decision. Such reviews will bring to light some of the legal consequences of the changing nature of Regulation by Information on the basis of RegTech-based transformations.

Based on our previous analysis, it is pertinent to inquire about the impact of RegTech on what we have termed as ‘Regulation by Information’. The ultimate goal of regulation is to steer individuals towards achieving legally-defined objectives, particularly in the realm of financial law. However, with the increasing flow of data and information, the manner in which facts are generated and transmitted directly affects decision-making. Therefore, it is important to examine how RegTech has influenced this phenomenon.

The effectiveness of Regulation by Information, on the one hand, has severe repercussions for the enforcement. Data-driven enforcement allows the passage from a human-based horizon, with limited resources, to rapid self-enforcement by data engines with potentially unlimited resources allowing for increasing attention to detail thus rendering regulatory oversight potentially more intense and stricter.⁷⁰

On the other hand, the progression of modern tools in the context of Regulation by Information elevates the human compliance mechanisms already in place to auto-compliance mechanisms. This has an immediate effect on organizations as regulatory software sets limits for human actors: what is not foreseen in the technology, does not exist as an option for ordinary employees of the firm. Regulatory decisions limit to a certain degree the freedom to carry out business, as some conduct will be compliant with the law and other conduct will contravene it. Following a

⁷⁰ *Inter alia*, see the example of auto-enforced aspects of the law, as on traffic controls, referred to in Winder, *Automatic Traffic Enforcement Systems: International Approaches*, <https://trid.trb.org/view/728981> and, in different fields, also de Fuentes, González-Tablas, Hernández-Ardieta, and Ribagorda, ‘Towards an automatic enforcement for speeding: enhanced model and intelligent transportation systems realisation’, 6 *IET intelligent transport systems* (2012), 270; Dreyfuss, ‘Policies for operating enforcement cameras’, *Journal of Transportation Safety & Security* (2020), 746-763; Gitelman, ‘The effectiveness of red-light cameras: a meta-analysis of the evaluation studies’, 13 *Road & transport research* (2004), 34-50 and Satiennam et al., ‘Change in helmet use behavior enforced by CCTV cameras with automatic helmet use detection system on an urban arterial road’, 21 *Traffic injury prevention* (2020), 494-499.

RegTech mode, supervised entities will embed such decision-making processes in their business strategy. Once embedded in technology, these decisions limit the freedom to conduct business legally. In addition, the software does not foresee the possibility of conduct being in violation of the regulatory decisions. These alternative modes of actions do not exist as options, and thus illegal conduct is prevented technically – a feature referred to by experts as ‘Compliance by Design’.⁷¹ From a legal perspective, we may understand the design effect of software systems as ‘de-facto

⁷¹ A definition of the concept can be retrieved in a report by the Boston Consulting Group (*Compliance by design*, December 2017, https://image-src.bcg.com/Images/Compliance-by-Design-Dec2017_tcm9-198779.pdf), stating that ‘[c]ompliance by design means applying a systematic approach to integrating regulatory requirements into manual and automated tasks and processes. By creating a bespoke compliance function, banks increase the likelihood of aligning themselves with global and local rules (in some cases fulfilling regulatory requirements and completing documentation in parallel), reduce error rates, and boost efficiency through a reduction of unit costs and processing time.’ (at 4). *See also* Chong, *Compliance by Design*, Ely, England: IT Governance Publishing, 2011; Lohmann, *Compliance by design for artifact-centric business processes, Information systems* (Oxford), 2013, vol. 38 (4), 606-618 (underlining that ‘[c]ompliance requirements are usually formulated in a set of rules that can be checked during or after the execution of the business process, called compliance by detection. If noncompliant behavior is detected, the business process needs to be redesigned. Alternatively, the rules can be already taken into account while modeling the business process to result in a business process that is compliant by design. This technique has the advantage that a subsequent verification of compliance is not required. This paper focuses on compliance by design and employs an artifact-centric approach. In this school of thought, business processes are not described as a sequence of tasks to be performed (i.e., imperatively), but from the point of view of the artifacts that are manipulated during the process (i.e., declaratively). [This is why it is worth extending] the artifact-centric approach to model compliance rules and show how compliant business processes can be synthesized automatically’); Leiendecker, Lienke, Gehra, ‘Compliance-by-Design’, in *Risk, fraud & compliance*, 2018-01-26; Ostern, Riedel, ‘Know-Your-Customer (KYC) Requirements for Initial Coin Offerings Toward Designing a Compliant-by-Design KYC-System Based on Blockchain Technology’, in *Business & information systems engineering*, 8 December 2020 (using an ‘objective-centered design science research approach to develop a blockchain-based KYC-system for the conduct of ICOs that is compliant-by-design, [more specifically] providing a blueprint for compliant-by-design blockchain-based KYC-systems, in the paper, integrated into the investment flow of an ICO [and] propos[ing] a KYC-system that is applicable in the real world, by making - due to legal certainty - KYC-processes cost-effective, i.e., the proposed blockchain-based KYC-system expectably reduces compliance costs for customers and financial organizations’).

law-making' of Regulation by Information, as, akin to law-making, it defines the legal space for any regulated business activity.

4.3 A Shift Towards Real-time Regulation?

Finally, taking the lessons into account from, on the one hand, the transition from delayed to real-time supervision and, on the other, the switch from supervisory to regulatory powers, we would argue that these mark a move towards the possibility of *real-time regulation*.

For instance, let us assume that prudential requirements of banks are adjusted on the spot based on regulators' daily risk analysis. Certainly, capital provisioning would fluctuate. Meanwhile, one can understand this as part of intense supervision, yet, in truth, this means constant changing of a bank's capital requirements. This may be particularly true in the field of derivatives and certain alternative assets as the exposure stemming from the underlying fluctuates every second, but also the supervisory (or regulatory) perspective may change with material, yet current changes. We could also assume immediate requests for more detailed information once a risk becomes apparent to regulators. For illustration, consider a financial institution, exposed to a certain type of digital asset, which would then be subject to regulators' requests. Such requests for additional information would then function as a barrier to increasing exposures to that digital asset, resulting in an increase in the cost of compliance and, through that mechanism, a de-facto prohibition.

These developments potentially come with significant legal challenges, for instance, concerning the rule of law, procedural principles ensuring accountability such as principles of good administration including proper rule-making, and the right to an effective judicial review. They also present obstacles to the protection of fundamental rights including the right of non-discrimination and equality, property, and the freedom to conduct business, as well as, more generally, private individuals' rights to be free from unlawful regulatory limitations. The possible ways of realising these values must keep pace with, and be adjusted to, technological progress as well. This is a requirement of a system governed by the rule of law with limitations to rights based on democratically legitimated legislative decisions.

Using the right to equal treatment as an example,⁷² it is possible that RegTech systems will need to ensure that all data are

⁷² For a general overview, see for instance Muir, 'The Essence of the Fundamental Right to Equal Treatment: Back to the Origins', 20(6)

presented in the pre-defined format as a pre-condition for the equal treatment of economic actors, and to make certain that software designed to analyse that data applies consistent methodologies allowing for decision-making processes to be compared. Many aspects regarding the transparency of the collection and use of data here are being discussed in the context of the regulation of artificial intelligence (AI). Such normative requirements include, rightly in our view, demands for software to elaborate complete and uniformed reports that make it possible to understand decision-making, regulatory requirements arising from the computation of data, and an elaboration of the justification for the ensuing limitations to individual rights.

5. Conclusions and Theses

The emergence of RegTech tools profoundly impacts regulators and regulated entities alike. Moreover, the ‘de-facto rule-making’ of Regulation by Information has led to increasing integration of regulatory structures into information flows. Shaping these flows also impacts the legal principles designed to ensure the quality of decision-making and the protection of fundamental rights in a world not equally integrated, designed for fewer data to be taken into account, and with a relatively slow pace of decision-making. The move towards real-time regulation accentuates these questions, since the speed at which decision-making takes place and the amount of information used renders the conditions of decision-making opaque as it is based on programmed software and data interfaces designed to handle a steady flow of information.

RegTech may have a significant impact on businesses by being intrusive and restrictive. First and foremost, such a system needs to contain and comply with various forms of safeguards linked to administrative procedures used by regulators especially regarding the collection and use of data, the reasoning behind decision-making, and the right to an effective judicial remedy. The increasing trend towards RegTech also involves delegating important decisions to third-party software vendors. When in financial regulation, the legal obligations of regulated entities are translated into a code/algorithm by third-party providers to ensure compliance in (almost) real time, the software developers potentially assume a role akin to a de facto ‘lawmaker’. In addition, accountability mechanisms must be in place to secure procedural and substantive (fundamental) rights.

German Law Journal (2019), 817. Muir examines the right to equal treatment under the EU’s Charter of Fundamental Human Rights at 820-821.

The advent of RegTech has transformed the nature of Regulation by Information, from mere guidance towards potentially what we have dubbed herein 'real-time regulation'. This development presents a wealth of opportunities for future research, particularly with regards to the legal challenges it brings.