



European Securities and
Markets Authority

Report to the European Commission

Use of FinTech by CSDs



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Executive Summary

Reasons for publication

The European Commission has asked ESMA to prepare a report on the use of innovative financial technologies ('FinTech') by CSDs with the objective of informing the Commission's thinking on this topic in the framework of the review of CSDR.

Content

The present Report is structured in 6 Sections and 2 Annexes.

Section 1 describes the background for this exercise.

Section 2 sets out the scope of the report.

Section 3 details the sources of information used for the analysis in the report.

Section 4 covers the findings related to the experience of NCAs and CSDs with relation to the use of FinTech.

Section 5 covers the findings related to the current regulatory aspects which might merit being clarified or amended in order to allow the deployment of DLT.

Section 6 presents the conclusions.

As far as the Annexes are concerned, Annex I includes ESMA's survey on FinTech and the use of new technologies by CSDs, used as the basis for the preparation of this Report. Annex II provides the list of respondents to ESMA's survey and contributors to this Report.

Conclusions

CSDR is intended to be technology-neutral and, as such, it should be able to accommodate the use of new technologies. Some aspects would benefit from additional clarifications in order to provide legal certainty regarding the use of DLT by CSDs. ESMA consider that most of these aspects could first be clarified through Q&As and, following further experience gained through the EU pilot regime, it could then be assessed if amendments to CSDR may be needed.

ESMA is putting forward recommendations to the Commission mainly with regards to the following aspects:

Issues related to securities accounts, credits, debits, segregation requirements and reconciliation requirements: the contextualisation of a series of CSDR definitions in a DLT environment seems necessary to provide comfort to CSDs deploying this type of technology. ESMA recommends to the Commission clarifying several aspects through Q&As, in

particular: Whether digital addresses held in a DLT platform can be considered “securities accounts”; whether data recorded on a DLT platform can be considered as “credits” and “debits” within the meaning of CSDR; whether segregation requirements under Article 38 of CSDR would be respected when segregated records are maintained on the DLT platform enabling the identification, at any time, of the assets that belong to a particular client, distinct from another client’s assets or from the CSD’s own assets; whether reconciliation measures under CSDR can be satisfied through real-time data sharing on DLT ensuring that the integrity of the issue is preserved (the number of issued securities is equal to the sum of securities recorded on the DLT).

Operational requirements: ESMA recommends to the Commission to amend Article 35 of CSDR to allow CSDs to deploy DLT solutions using other communication standards or protocols if international open communication procedures and standards are not available for this specific type of technology. This amendment would be in line with an existing Q&A indicating that, in cases where internationally accepted standards are not “available on a fair, open and non-discriminatory basis to any interested party” or do not exist, the competent authority of the CSD may allow that CSD to use other messaging standards, until international standards become available.

Settlement of securities and of cash in a DLT environment: Several issues have been raised with regards to the definition of settlement in Article 2(1)(7) of CSDR. ESMA does not recommend to the Commission to modify the definition of settlement in Article 2(1)(7) of CSDR, but suggests that this could be initially clarified through a Q&A. Following the experience from the EU pilot regime, it can then be assessed if this should also be reflected as an amendment to CSDR.

Settlement finality: Several concerns have been raised with regards to the application of SFD in a DLT environment. ESMA considers it is important to assess those concerns through the SFD review.

Legislative references

CSDR	Regulation (EU) No 909/2014 of the European Parliament and of the Council of 23 July 2014 on improving securities settlement in the European Union and on central securities depositories and amending Directives 98/26/EC and 2014/65/EU and Regulation (EU) No 236/2012
ESMA Regulation	Regulation (EU) No 1095/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Securities and Markets Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/77/EC
Settlement Finality Directive	Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 on settlement finality in payment and securities settlement systems
Directive 2014/65/EU	Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU
Directive 2013/36/EU	Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC
Directive 2009/65/EC	Directive 2009/65/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS)
Delegated Regulation 2017/392	Commission Delegated Regulation (EU) 2017/392 of 11 November 2016 supplementing Regulation (EU) No 909/2014 of the European Parliament and of the Council with regard to regulatory technical standards on authorisation, supervisory and operational requirements for central securities depositories
Delegated Regulation 2018/1229	Commission Delegated Regulation (EU) 2018/1229 of 25 May 2018 supplementing Regulation (EU) No 909/2014 of the European Parliament and of the Council with regard to regulatory technical standards on settlement discipline

Acronyms

AI	Artificial Intelligence
CeBM	Central bank money
CBDC	Central bank digital currency
CSD	Central securities depository
DLT	Distributed ledger technology
EC	European Commission
ESMA	European Securities and Markets Authority
EEA	European Economic Area
EU	European Union
FinTech	Financial Technology
MTF	Multilateral Trading Facility
NCA	CSD National Competent Authority
SSS	Securities settlement system

1 Background

1. The European Commission asked ESMA to prepare a report on the use of innovative financial technologies ('FinTech') by CSDs with the objective of informing the Commission's thinking on this topic in the framework of the review of CSDR.
2. In September 2020, the Commission adopted a proposal for a Regulation of the Parliament and of the Council on a pilot regime for market infrastructures based on distributed ledger technology¹ (DLT)², hereafter the "EU pilot regime". The Commission's proposal seeks to provide legal certainty and flexibility for market participants who wish to operate a DLT MTF or a DLT SSS. The EU pilot regime should contribute to gaining further experience with the deployment of DLT, which to date is very limited. The EU pilot regime proposal is currently under negotiation and it is not analysed in this report.

2 Scope

3. This Report focuses on the use of FinTech by CSDs. ESMA has gathered the views of NCAs and relevant market players on the existing experience with the use of FinTech and in particular DLT, their plans to use this type of technology in the coming future and whether the current regulatory framework represents a barrier for them to implement their projects involving DLT.
4. DLT has attracted a lot of interest in the securities post-trade landscape since several years. As highlighted by the ECB's Advisory Group on Market Infrastructures for Securities and Collateral (AMI-SeCo) in its report on "The potential impact of DLTs on securities post-trading harmonisation and on the wider EU financial market integration" (September 2017)³, this technology "*could facilitate integration in post trading by providing an infrastructure ensuring that every user has a consistent and updated view of the assets for which it is responsible and that the same assets can be transferred with a high degree of automation*" (p.8). The impact that this technology could have among others in issuance and settlement justifies the attention it has attracted from the industry and from policy makers.

3 Sources of information

5. This ESMA Report takes into account the inputs received mainly from:
 - a) the CSD National Competent Authorities (NCAs);
 - b) 17 CSDs;
 - c) The European Banking Federation (EBF);

¹ **Distributed ledger technology (DLT)**: a means of saving information through a distributed ledger, i.e., a repeated digital copy of data available at multiple locations. DLT is built upon public-key cryptography, a cryptographic system that uses pairs of keys: public keys, which are publicly known and essential for identification, and private keys, which are kept secret and are used for authentication and encryption. (Source: https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf)

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0594>

³ https://www.ecb.europa.eu/paym/groups/ami/shared/pdf/201709_dlt_impact_on_harmonisation_and_integration.pdf

in response to an ESMA survey on the use of FinTech by CSDs conducted in February-April 2021, as well as ECSDA's response to the Commission's targeted consultation on the review of CSDR⁴ (which was sent by some CSDs in response to ESMA's questionnaire⁵). ESMA also performed a brief literature review which included in particular several reports prepared by the AMI-SeCo on the use of DLT in the post-trade processes (April 2021)⁶, a Report published by the European Supervisory Authorities (ESAs) with regards to FinTech: Regulatory Sandboxes and Innovation Hubs (January 2019)⁷, as well as the ESMA Advice on Initial Coin Offerings and Crypto-Assets (January 2019)⁸, and the ECB Opinion on the Commission Legislative Proposal on the DLT FMI's Pilot Regime⁹.

4 NCAs and CSDs experience with FinTech

6. This Section covers the findings related to the experience of NCAs with FinTech in the field of CSD services as well as the use (current or planned) of FinTech by CSDs. It takes into account the responses to ESMA's survey.

4.1 NCAs experience with FinTech

7. In the recent years, FinTech has attracted the attention of the regulatory community, including national authorities, regional and international organisations. Certain NCAs, not only in the Union but also worldwide, have created specific national regulatory and supervisory frameworks which allow entities to test an innovative technology in a well-defined context. This allows exempting them from the application of certain rules but often subject to some conditions and limits in the type of regulated activity or in the volume of the activity which can be carried-out in such a testing environment. This type of framework is commonly referred to as a "sandbox". As described in the 2019 ESAs report on Regulatory sandboxes and innovation hubs¹⁰ (p.16), the aim of such sandboxes is "to provide a monitored space in which competent authorities and firms can better understand the opportunities and risks presented by innovations and their regulatory treatment through a testing phase, and to assess the viability of innovative propositions, in particular in terms of their application of and their compliance with regulatory and supervisory requirements".
8. The following national authorities in the European Union (NCAs, central banks or ministries of finance) have put in place Fintech-dedicated regulatory sandboxes:

⁴ It is worth noting that, when responding to ESMA's questionnaire, several CSDs referred explicitly to the [ECSDA's response](#) to the [European Commission targeted consultation on the review of CSDR](#).

⁵ In this regard, when the report refers to a position expressed by "CSDs" in general, it is to be understood as the position reached by CSDs through ECSDA.

⁶ [The use of DLT in post-trade processes \(europa.eu\)](#)

⁷

https://www.esma.europa.eu/sites/default/files/library/jc_2018_74_joint_report_on_regulatory_sandboxes_and_innovation_hubs.pdf

⁸ https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf

⁹ https://www.ecb.europa.eu/pub/pdf/other/en_con_2021_15_f_sign-2c8a54eaa2..pdf

¹⁰

https://www.esma.europa.eu/sites/default/files/library/jc_2018_74_joint_report_on_regulatory_sandboxes_and_innovation_hubs.pdf

Country	National Authority	Link to sandbox
Austria	FMA	https://www.fma.gv.at/en/fintech-point-of-contact-sandbox/fma-sandbox/
Denmark	Finanstilsynet	https://www.finanstilsynet.dk/Tilsyn/Information-om-udvalgte-tilsynsomraader/Fintech/FT-Lab
Italy	Banca d'Italia, CONSOB, IVASS	http://www.dt.mef.gov.it/it/attivita_istituzionali/sistema_bancario_finanziario/fintech/
Hungary	Central Bank of Hungary	https://www.mnb.hu/en/innovation-hub/regulatory-sandbox
Latvia	FCCM	https://www.fctk.lv/en/licensing/innovation-and-fintech/innovation-sandbox/
Lithuania	Bank of Lithuania	https://www.lb.lt/en/regulatory-sandbox
Malta	MFSA	https://www.mfsa.mt/fintech/regulatory-sandbox/
Netherlands	Joint initiative AFM DNB	https://www.afm.nl/en/professionals/onderwerpen/innovationhub-maatwerk
Norway	Finanstilsynet	https://www.finanstilsynet.no/tema/fintech/finanstilsynets-regulatoriske-sandkasse/
Spain	Ministry of Finance	https://portal.mineco.gob.es/es-es/comunicacion/Paginas/201215_np_sandbox.aspx

9. Public authorities have also put in place “innovation hubs” which are a slightly different, yet complementary, approach to accompanying firms in the deployment of innovative technologies. As described in the ESAs report on regulatory sandboxes and innovation hubs (p. 5), innovation hubs “provide a dedicated point of contact for firms to raise enquiries with competent authorities on FinTech-related issues and to seek non-binding guidance on the conformity of innovative financial products, financial services or business models with licensing or registration requirements and regulatory and supervisory expectations”.
10. As shown in the table below, which has been updated for the purpose of this report, innovation hubs exist in the majority of Member States:

Country	National Authority	Link to innovation hub
Austria	FMA	https://www.fma.gv.at/en/fintech-point-of-contact-sandbox/fintech-navigator/fintech-point-of-contact/
Belgium	FSMA and National Bank of Belgium (NBB)	https://www.fsma.be/en/fintech-contact-point https://www.nbb.be/en/financial-oversight/general/contact-point-fintech

Bulgaria	Financial Supervision Commission	https://www.fsc.bg/bg/finansovi-inovacii/innovation-hub/
Croatia	HANFA	https://www.hanfa.hr/fintech1/
Cyprus	CySEC	https://www.cysec.gov.cy/en-GB/cysec/innovation-hub/
Denmark	Finanstilsynet	https://www.finanstilsynet.dk/Tilsyn/Information-om-udvalgte-tilsynsomraader/Fintech/Vejledning-haandholdt-tilsyn?sc_lang=en
Estonia	FI	https://www.fi.ee/en/finantsinspektsioon/innovation-hub
Finland	FIN-FSA	https://www.finanssivalvonta.fi/en/fintech--financial-sector-innovations/innovation-help-desk-advises-on-licence-issues/
France	ACPR, Banque de France and AMF	https://acpr.banque-france.fr/search-es?term=fintech+innovation+unit
Germany	Bafin	https://www.bafin.de/SiteGlobals/Forms/Kontakt/Fintech_Integrator.html?nn=7851648
Greece	HCMC	www.hcmc.gr/en_US/web/portal/home#
Hungary	Central Bank of Hungary	https://www.mnb.hu/en/innovation-hub
Ireland	CBol	Central Bank of Ireland (CBI) Innovation Hub emailinbox
Iceland	Central Bank of Iceland	https://www.fme.is/thjonustuvefur/fintech-thjonustubord
Italy	Banca d'Italia	https://www.bancaditalia.it/compiti/sispagamercati/fintech/index.html
Italy	CONSOB	Innovation Hub in the process of being established
Latvia	FKTK	https://www.fktk.lv/en/licensing/innovation-and-fintech/expert-advice/
Liechtenstein	FMA	https://www.fma-li.li/de/fintech-und-tvtg/fintech-in-liechtenstein.html
Luxembourg	CSSF	https://www.cssf.lu/en/financial-innovation-fintech/
Netherlands	Joint initiative AMF DNB	https://www.afm.nl/en/professionals/onderwerpen/innovation-hub
Norway	Finanstilsynet	https://www.finanstilsynet.no/tema/fintech/
Poland	KNF	https://www.knf.gov.pl/en/MARKET/Fintech/Innovation_Hub
Portugal	ASF, Banco de Portugal and CMVM	https://www.portugalfinlab.org/
Romania	ASF	https://insurtech-hub.asfromania.ro/

		https://asfromania.ro/ro/a/850/fintech-hub
Slovakia	National Bank of Slovakia	https://www.nbs.sk/en/financial-market-supervision1/fintech
Slovenia	Banka Slovenije	https://www.bsi.si/en/about-us/banka-slovenijes-fintech-innovation-hub
Spain	CNMV	https://www.cnmv.es/Portal/Fintech/Innovacion.aspx?lang=en
Sweden	Finansinspektionen	https://www.fi.se/en/fis-innovation-center/

11. When asked about the benefits of implementing sandboxes and innovation hubs, NCAs broadly agree that sandboxes and innovation hubs (i) allow NCAs to improve their knowledge on FinTech, which helps also in informing adequate policy responses to the different innovative technologies which can be used in the provision of regulated services; (ii) facilitate the dialogue with regulated and unregulated firms; and (iii) help firms (in particular the unregulated ones) enhance their understanding of the regulatory and supervisory expectations regarding innovative business models products and services (in some jurisdictions, this might include guiding the firms towards the appropriate supervisory authority).
12. Furthermore, several NCAs have also highlighted that sandboxes allow firms to test, within a pre-determined framework which might include certain exemptions to regulatory requirements and other conditions, financial products, financial services, or business models. These innovative products or services can be observed and assessed in a pre-determined framework on how they offer value to the investors and the wider financial services sector, while ensuring financial soundness, market integrity and consumer protection.
13. Finally, through its questionnaire on the use of FinTech by CSDs, ESMA has gathered information on the actual use of sandboxes and of innovation hubs by CSDs. According to the information received by ESMA, despite the various benefits described by NCAs with regards to sandboxes and innovation hubs, the majority of CSDs that have responded to the survey have not made use of any sandbox and only in four Member States NCAs have received requests through their innovation hubs from existing CSDs willing to use DLT solutions or from other entities with an interest in becoming a CSD or offering similar services with an innovative business model based on DLT. In France this is the case of ID2S, which is currently authorised as a CSD under CSDR. In addition, the non-CSD LiquidShare, which leverages DLT to facilitate operations by CSDs on digitalised assets, has also made use of the innovation hub.

4.2 The deployment of FinTech by CSDs

14. ESMA has gathered CSDs' general views on the industry's appetite for innovative financial technologies such as DLT, Smart contracts, Cloud computing, Artificial

Intelligence/Machine Learning, the Internet of Things (IoT), Biometrics and Quantum computing. Some of these technologies seem relatively widespread (e.g. cloud computing and AI), while others are less deployed despite their disruptive potential (e.g. DLT, smart contracts, quantum computing). ESMA has also gathered concrete experiences on the use of these FinTechs and their application for core and non-core CSD services and activities. Among these concrete experiences, several examples of partnerships between CSDs and start-ups or other firms have been included in this section of the report. Finally, ESMA also asked in its questionnaire to CSDs some prospective questions in order to analyse the trends on the possible evolution of the use of FinTech by CSDs in the coming years.

a) CSDs views on the industry's appetite for innovative technologies

15. When asked to provide their opinions about whether they consider CSDs as being prone or reluctant to using innovative technologies, most respondents (13 CSDs out of 17) consider CSDs as prone, one CSD is neutral and the other three CSDs consider CSDs as reluctant to use new or innovative technologies. Some of the CSDs in the first category have highlighted their high interest in examining new technologies and exploring the possibilities they offer when there is a clear regulatory and legal framework. Other CSDs in same category have added that they are prone to use new technologies if they can be leveraged safely to increase efficiency and resilience of capital markets. Another CSD has indicated that there has been an evolution in the recent years in the way in which CSDs perceive innovative FinTech, going from a certain scepticism to considering new technologies as synonyms of efficiency. One of the respondents considering CSDs as reluctant to use new technologies suggested that CSDs in most instances will be driven by the adoption of new technologies by their participants.

b) CSDs' experience on the use of FinTech

16. The responses on the appetite of CSDs for FinTech are rather aligned with the responses related to the actual use of such innovative technologies. Almost the same CSDs who considered CSDs as prone to use innovative technologies have confirmed that they actually use or are planning to use FinTech in their businesses. However, to date, none of the CSDs having responded to the questionnaire currently provide services in relation to crypto-assets¹¹.

17. More concretely, the responses to the ESMA's questionnaire show that AI is already used by some CSDs mainly for operational processes such as investors' onboarding and AML/KYC checks (rather than core services) while others are planning to implement solutions based on AI in the near future (i.e. 1 to 5 years from now). In both cases, CSDs' responses seem to indicate that AI is or would be used to strengthen operational processes. Cloud computing is also either currently being used by several CSDs or should

¹¹ **Crypto-asset:** a type of private asset that depends primarily on cryptography and Distributed Ledger Technology (DLT) or similar technology as part of their perceived or inherent value. Unless otherwise stated, ESMA uses the term to refer to both so-called 'virtual currencies' and 'digital tokens'. Crypto-asset additionally means an asset that is not issued by a central bank. (Source: https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf)

be used in the near future by some others. Cloud computing seems to be rather used for administrative functions or when developing new projects or products due to the system's flexibility, its cost-effectiveness and ease of use. It is worth noting though that a group of CSDs has explicitly mentioned the compliance with ESMA Guidelines on outsourcing to cloud service providers¹² as well as the General Data Protection Regulation (GDPR) as potential challenges for the implementation of cloud computing.

18. When talking about DLT, the experience of CSDs in the EU with the use of this technology is extremely limited to date and it is currently in most cases at a stage of study or of developments of pilot projects. Until now only one CSD authorised under CSDR uses DLT to provide notary services, and central maintenance services to keep record of every change resulting from transactions settled through T2S. This CSD expressed its intention to extend progressively the use of DLT, in particular through the integration of smart contracts which should allow it to extend the asset servicing model over the entire life cycle of a debt instrument. According to this CSD, integrating smart contracts has the potential to increase transparency to investors, regulators, and other interested parties, reduce or eliminate reconciliation issues and drive down costs associated with asset servicing, among others. This CSD highlights the flexibility offered by the DLT to develop new products and services as the main benefit of using this technology. The use of DLT by this CSD is limited to notary services and central maintenance services to keep record of every change resulting from transactions settled through T2S. Even though the use of DLT in this case does not cover the full range of CSDR services, **ESMA** considers that the fact that a CSD using DLT has been authorised under CSDR shows that CSDR is mostly technologically neutral. Some amendments or clarifications (as shown in the next section of this report) might be required in order to provide more legal certainty to CSDs with regards to the application of certain regulatory requirements in a DLT environment and promote the take-up of this technology.
19. Other CSDs have indicated in their responses to ESMA's questionnaire that they intend to use DLT and smart contracts in the coming years for core and non-core activities.
20. One of the CSDs among those planning to use DLT and smart contracts has highlighted that there are many challenges at this stage with regards to the use of these innovative technologies. The challenges mentioned include the uncertainty regarding advanced DLT features such as advanced cryptography, the tokenization of cash, the creation of digital assets and the reluctance of some participants to change business processes due to the impacts suffered by traditional models. Furthermore, this same CSD indicated that the use of DLT does not come without risk, as potential new custody or other types of risks can arise from new features of this technology. Furthermore, the lack of regulatory guidelines at this stage might also represent a risk for CSDs. The Commission proposals for a Regulation on markets in crypto-assets (MiCA)¹³ and the EU pilot regime are yet to be adopted, therefore this CSD indicates that any project being developed at the moment

¹² https://www.esma.europa.eu/sites/default/files/library/esma50-157-2403_cloud_guidelines.pdf

¹³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593>

would be impacted by the differences between the original Commission's proposal and final texts which will be adopted by the co-legislators.

21. CSDs do not work on the development and implementation of FinTech in isolation. For many years, innovative start-ups and other third parties have played a pivotal role in fostering innovation in financial markets. More than half of the CSDs having responded to ESMA's questionnaire have established partnerships with start-ups and other third parties for the development and use of FinTech. The type of partnership varies significantly, ranging from bilateral agreements between a CSD and a start-up or a joint venture created with the support of different market players. Some of the examples provided by CSDs are the following:

- **LiquidShare**¹⁴: In July 2017 several market players, including Euroclear, announced the creation of the non-CSD LiquidShare, a suite of services based on a private and restricted blockchain network that issuers and infrastructures can use in the context of the issuance, holding and transfer of securities. This platform became operational in June 2020. The entirety of the issuance can be registered onto LiquidShare's blockchain and accounted for via an issuance smart contract that keeps track of the total number of securities for each issuance.
- **Deutsche Börse and HQLA**¹⁵: In March 2018, Deutsche Börse Group and HQLAX announced a partnership for the creation of a new securities lending & collateral management operating model based on a blockchain platform developed by the software firm R3. The securities are issued in a conventional environment and grouped in the form of baskets of securities. For the purpose of DvD (Delivery versus Delivery), the ownership of baskets is tokenised, (i.e. represented on distributed ledgers by tokens) and exchanged on the HQLAX platform (the Digital Collateral Registry). It aims to facilitate more efficient collateral management of high-quality liquid assets (HQLAs) across a fragmented securities eco-system. Further investments into this project have been announced by the Deutsche Börse Group in early 2021¹⁶.
- **FundsDLT**¹⁷: Clearstream, together with other partners announced in March 2020 a Series A¹⁸ investment in FundsDLT to develop a decentralised technology platform to facilitate the distribution of funds based on DLT. FundsDLT is built using permissioned blockchain technology based on Ethereum.
- **Euroclear and Algomi**¹⁹: Euroclear's data and information business, Euroclear Information Solutions, announced in July 2018 investing in the FinTech company Algomi, which is a software company that provides technology to bond market participants.

¹⁴ <https://www.liquidshare.io/>

¹⁵ <https://www.hqla-x.com/>

¹⁶ <https://www.deutsche-boerse.com/dbg-en/media/press-releases/HQLAx-Secures-EUR-14.4m-Series-B-Funding-from-BNY-Mellon-Goldman-Sachs-BNP-Paribas-Securities-Services-Citigroup-and-Existing-Shareholder-Deutsche-B-rse--2400622>

¹⁷ <https://www.clearstream.com/clearstream-en/newsroom/200317-1845040>

¹⁸ Type of funding chosen by a company which has developed a track record, to optimise its user base and product offerings.

¹⁹ <https://www.algomi.com/company-news/euroclear-invests-in-algomi>

22. Another CSD has indicated having a partnership with a software company specialised in the area of high-performance process automation. One CSD has also indicated collaborating with academia in the field of research related to the use of blockchain solutions. Finally, one CSD has also partnered with a start-up providing blockchain solutions to issue bonds by using DLT, however this project is still at an early stage.

c) CSDs' prospective views on the use of FinTech

23. Finally, ESMA has also asked for CSDs' views on the perceived trends with regards to the use of FinTech in relation to CSD services. In particular, CSDs were asked whether innovation is currently growing or slowing, which technologies attract more interest and how the use of these technologies might evolve in the next three to five years.

24. When asked in broad terms whether innovation is growing or slowing, a majority of CSDs (11 out of 17) see innovation generally growing. A group of CSDs considers that innovation is a much broader topic than the use of new technologies and, in this sense, this group sees CSDs as frontrunners in terms of innovation since many years. This group recognises though that FinTech applications which have appeared in the recent years (in particular AI, DLT, Cloud and application programming interfaces or API) are the source of a growing innovative mindset among CSDs. Another CSD has indicated that in the past three years it has launched an important number of innovative applications, introduced AI, made progress towards big data, and extracted value for clients from all these innovations. This CSD has observed a similar evolution in other CSDs, some of which have also announced pilots on DLT in the near future. All these would be evidences of the growing interest of CSDs in new technologies.

25. Concerning the technologies which attract higher interest, several CSDs have not indicated any specific technology as attracting more interest than others. One of them however recognises that DLT, due to its possible disruption of the Post-Trade world, is seen with more interest than others. Some other CSDs agree that DLT represents a high potential for CSDs' business.

26. Finally, with regards to the possible evolution of FinTech in the coming years, most of the CSDs seem to include DLT in their business to different extents in the next three to five years. One of them has expressly indicated that the next three to five years will still be a testing phase for this type of technology and it expects a lot of lessons learnt although minor real impacts in its business.

27. Independently of the type of use of DLT in the coming years, it is interesting to note that a group of CSDs believes that running CSD services in a DLT environment will require an evolution in the role of the CSD. This group sees the role of CSDs changing from centrally maintaining all securities in its system to operating a network and ensuring its integrity in a legal, technical and operational sense such that participants are still enabled to run parts of the operations themselves and especially act autonomously and even bilaterally with each other under the protected framework of a network with legally and technologically defined rulebooks.

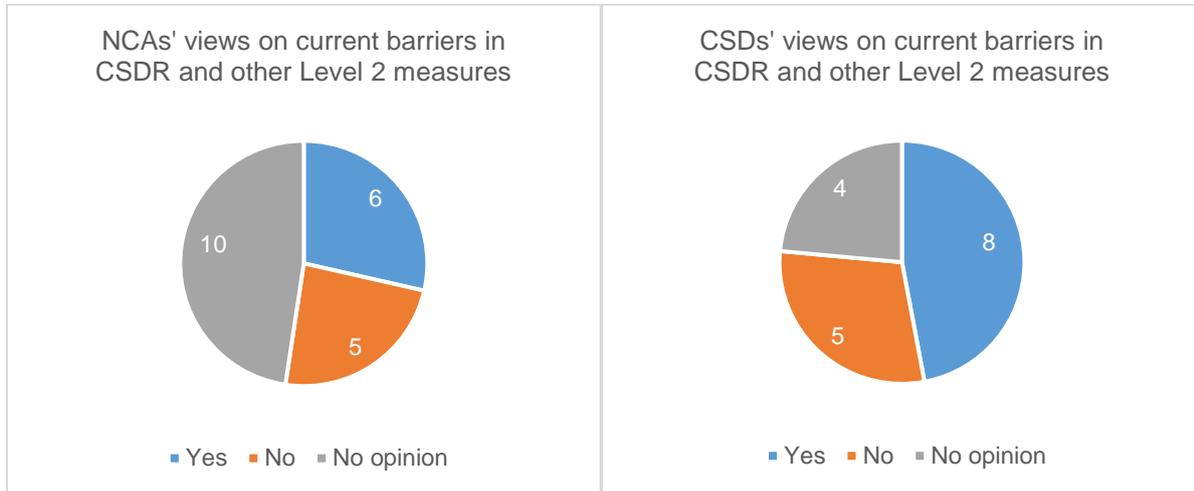
28. According to other CSDs, DLT will also potentially allow to increase the exchange efficiency of securities or similar products (e.g. tokenized securities) among a larger number of clients, standardise pre-issuance and/or issuance processes through smart contracts and enhance asset servicing.
29. One CSD has highlighted several challenges to the development of FinTech in the coming future, in particular: the need to create a real level playing field in terms of interoperability, cross border links and passporting. It further suggests that a strategy to move from limited scope/pilot/proof of concept to a viable industry supported initiative will be necessary.
30. The continuing evolution of AI and its use by CSDs for automation and efficiency gains has also been highlighted by some CSDs.
31. Taking into consideration the expectations from CSDs with regards to the use of DLT in the coming three to five years as well as the benefits expected from this technology, ESMA considers it important to ensure that CSDR is technologically neutral and does not create undue barriers to the use of DLT by CSDs. As assessed in the following section of this report, the deployment of DLT by CSDs might require that some regulatory requirements are clarified or even amended to facilitate the use of DLT. ESMA considers that in some instances these clarifications should be done without waiting for further experience to be gained through the EU pilot regime, while in other cases the current experience is too limited to propose further clarifications or amendments to the regulatory framework. For the latter, the EU pilot regime should allow market players, competent authorities and ESMA the possibility to gain useful experience. With regards to the tools for providing clarity on the issues identified, ESMA suggests mainly convergence instruments such as Q&As at least as a first step and until further experience on the actual use of DLT by CSDs is gained. On one occasion ESMA is suggesting already amending CSDR along the lines of an existing ESMA Q&A.

5 Regulatory aspects

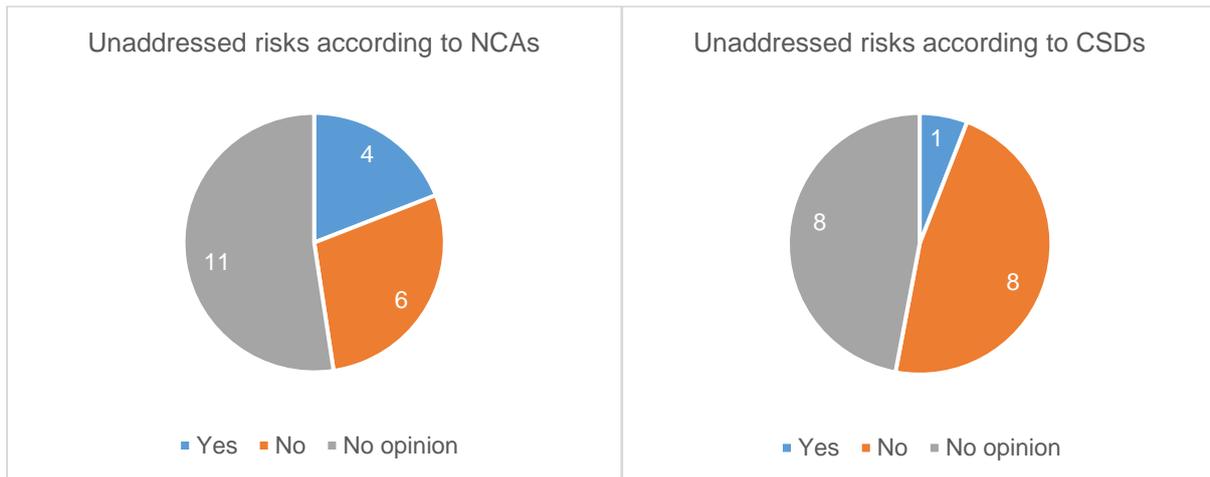
5.1 CSDR and Level 2 measures

32. Taking into consideration CSDs' plans to continue innovating in the offer of their services and in particular with the introduction (or further development) of DLT, ESMA has asked NCAs and CSDs their views on whether the existing legislative and regulatory framework has barriers or undue obstacles to the development of innovative technologies, especially DLT, for CSD services, and whether existing rules leave risks emerging from those new technologies unaddressed. It is worth mentioning that the knowledge of NCAs and CSDs might evolve in the future, especially in the framework of projects which might emerge on the basis of the EU pilot regime once it is adopted and in force.
33. Concerning the existence of barriers to the development and the use of FinTech, slightly less than a third of the NCAs that responded to the ESMA survey think that there are

barriers while on the CSDs' side almost a half think that there are legislative barriers. The other respondents either consider that there are no barriers or do not have an opinion. However, when looking into the responses in more detail, the identified barriers do not necessarily imply that legislative changes to CSDR are needed.



34. When asked about the adequacy of existing rules to address risks emerging from new technologies, only one CSD and a small number of NCAs consider that existing rules leave those risks (or some of them) unaddressed. Other respondents consider that the existing rules do not leave any risk unaddressed, and the majority of respondents have not expressed an opinion.



5.1.1 Barriers to the development/ use of FinTech under the existing framework

Technology neutrality of CSDR: private vs. permissionless DLT

35. A majority of respondents to ESMA's questionnaire (NCAs, CSDs and banks), consider that CSDR is technology-neutral and, as such, it should be able to accommodate the use of new technologies. Some of them, in particular CSDs, do not believe that there is any particular issue in the Level 1 text when using a permissioned DLT platform with a centralised validation model. As indicated previously, one of those CSDs currently authorised under CSDR is actually using DLT, although its use is limited to notary and central maintenance services to keep record of every change resulting from transactions settled through T2S. This CSD however does not provide the full range of CSDR services using DLT (in particular for operating an SSS). This may explain why they have not faced some of the challenges mentioned in this report, while also showing that the use of DLT, while limited, is possible. Adaptations of the national legal framework to allow for the use of DLT have also facilitated this.
36. Most of the comments received from NCAs indicate the same, i.e. there does not seem to be any major impediment to the development of DLT in the CSDR level 1 requirements. One industry association representing banks has explicitly indicated that CSDR does not require any change, except for the exemptions which will be introduced through the EU Pilot Regime. However, many of the respondents who consider CSDR technologically neutral have highlighted a number of topics which would benefit from clarification to ensure legal certainty for CSDs when performing their core activities using DLT.
37. Whether CSDR can be considered as technologically neutral or not might depend on the model of DLT at stake. One NCA has indicated that, although CSDR is not prescriptive regarding the nature of the recording on an account with the CSD and it remains technologically neutral, the use of a CSD remains an obligation for some type of financial instruments. Therefore, a DLT platform listing security tokens should perform settlement and delivery either via another market participant authorised as a CSD or by being itself authorised as a CSD. This would limit the possibilities of using a public DLT. In this regard, ESMA would like to mention that, subject to the outcome of the ongoing negotiations regarding the Regulation on the EU pilot regime for DLT FMIs, the EU pilot regime may allow DLT MTFs to record and settle DLT transferable securities directly, while a CSD operating a DLT SSS may be permitted to admit to trading DLT transferable securities.
38. Several NCAs have indicated that the core requirement of having a legal person, regulated as a CSD, that manages and guarantees the rules imposed by CSDR should be kept. In the current status there are obligations, liabilities and technical requirements imposed by CSDR and delegated texts that must be fulfilled by a concrete entity. In this case, a private or permissioned DLT is better suited. According to one of these NCAs, this should not prohibit the use of smart contracts. A majority of CSDs have also expressed a clear preference for keeping such a model and have indicated that a CSD is by definition a legal entity, this allows the designation of liability for the operation of the DLT platform and compliance with the applicable rules (e.g. capital requirements).

39. In ESMA's Advice on Initial Coin Offerings and Crypto-Assets published in January 2019²⁰, ESMA already expressed doubts about the adequacy of permissionless DLTs due to the specific governance issues that they raise and suggested that this would require additional consideration. One of the issues that ESMA highlighted then was the role of 'miners' (participants validating transactions and including them in the next block of transactions in the chain) and how they would be handled under the CSDR in terms of governance and technical requirements given their novel and fundamental role in the settlement process. These doubts remain. **ESMA** considers that it should be further investigated whether the use of a public DLT would be compatible with the fact of having one legal entity responsible for the application of the relevant CSDR requirements, provided that adequate safeguards are put in place to ensure the proper governance of the DLT platform. Based on anecdotal feedback received by ESMA, it appears that technological arrangements could be put in place to add a layer of controls on top of the public DLT. This however requires further investigation. Therefore, ESMA at this stage does not recommend to the European Commission to introduce any change through the upcoming review of CSDR. The operation of the EU pilot regime might provide useful experience in this regard.

The authorisation process

40. CSDR and RTS 2017/392 establish a series of requirements with regards to the authorisation of a CSD. One NCA has suggested introducing additional proportionality in the authorisation process, primarily at Level 2, that could help in accommodating innovative technologies. According to this NCA, a more modular approach to the licensing requirements could be developed. This should avoid confusion on what requirements apply, depending on the scope of services.
41. ESMA agrees that it is important that authorisation requirements are proportionate to the complexity and the risks represented by the entity seeking authorisation. ESMA would like to mention that the majority of EU CSDs have already been authorised under CSDR. If needed, following the experience from the EU pilot regime, ESMA could consider the need to introduce changes to Level 2 or providing further guidance. Therefore, ESMA at this stage does not recommend to the European Commission to introduce any change through the upcoming review of CSDR with regards to requirements applicable to the authorisation of CSDs.

Issues related to accounts, credits, debits, reconciliation requirements and segregation

42. According to Article 3(1) of CSDR, an issuer established in the Union that issues or has issued transferable securities which are admitted to trading or traded on trading venues shall arrange for such securities to be represented in book-entry form. This requirement shall apply from 1 January 2023 to transferable securities issued after that date and from 1 January 2025 to all transferable securities.

²⁰ https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf

43. According to Article 3(2) of CSDR, where a transaction in transferable securities takes place on a trading venue the relevant securities shall be recorded in book-entry form in a CSD. Where transferable securities are transferred following a financial collateral arrangement as defined in point (a) of Article 2(1) of Directive 2002/47/EC, those securities shall be recorded in book-entry form in a CSD on or before the intended settlement date, unless they have already been so recorded.
44. Recital 11 of the CSDR provides that the Regulation should not impose one particular method for the initial book-entry form recording which should be able to take the form of immobilisation or of immediate dematerialisation. Immobilisation and dematerialisation should not imply any loss of rights for the holders of the securities and should be achieved in a way that ensures that holders of securities can verify their rights.
45. Two NCAs have indicated that legal requirements related to accounts (be them securities or cash accounts) and to credit and debit, need to be clarified. This is in line with CSDs' views. One of these NCAs goes a bit further and has highlighted that, depending on how the account concept is interpreted, some DLT technologies (based on UTXO²¹ model rather than in account model) may be seen as non-compliant with CSDR. Furthermore, CSDs have suggested the following:
- i. Clarifying in the Recital 11 of CSDR or through a Q&A that for the purpose of the CSDR the performance of recording of securities, crediting and debiting on accounts can be provided through any technical features including data recorded in a DLT platform that can be considered as 'credits' and 'debits' within the meaning of CSDR.
 - ii. Confirming that DLT addresses on a DLT platform are capable of being construed as accounts "provided and maintained by the CSD".
46. As already indicated by ESMA in its Advice on crypto assets, other than the reference to the use of 'securities accounts', CSDR does not prescribe any particular method for the initial book-entry form recording, meaning that any technology, including DLT, could virtually be used, provided that the book-entry form is with an authorised CSD for those financial instruments where this is required by CSDR. However, there may be national rules that could pose restrictions to the use of DLT for that purpose. The legal nature of a securities account (i.e. statutory record, contractual construct, or accounting device) and the legal nature and effects of book entries are still embedded in national law. **ESMA** recommends to the Commission clarifying in a Q&A that could be published by ESMA²², whether data recorded in a DLT platform can be considered as "credits" and "debits" as well as whether digital addresses held in a DLT platform can be considered "securities accounts" within the meaning of CSDR.
47. Reconciliation measures set out by CSDR lean on the existence of securities accounts. One NCA has highlighted that except if the public address of the client are considered to

²¹ Unspent Transaction Output (UTXO) is a model where there are no accounts, only transactions are registered in the blockchain. An unspent transaction output represents e.g. the amount of crypto-currency which is left after executing a transaction. This can be used as input to another transaction.

²² In application of Article 16b of ESMA Regulation.

be the securities account, this text cannot literally be applied in a DLT environment. Furthermore, CSDs have suggested that it is confirmed that reconciliation can be satisfied through real-time data sharing on DLT. According to CSDs, reconciliation implies an obligation of means and results. To the extent real-time data sharing achieves this specific outcome, this requirement should be capable of being satisfied without further steps to be taken.

48. As indicated above, ESMA considers that the Commission could clarify in a Q&A whether digital addresses held in a DLT platform can be considered “securities accounts” within the meaning of CSDR. In addition, **ESMA** believes that this can be complemented by the clarification on whether reconciliation measures under CSDR can be satisfied through real-time data sharing on DLT ensuring that the integrity of the issue is preserved (the number of issued securities is equal to the sum of securities recorded on the DLT). This clarification may also take the form of a Commission Q&A as a first step. Following the further experience from the EU pilot regime, it can be considered whether these clarifications should be included as amendments to CSDR.
49. Following on requirements related to accounts at the CSD, more concretely on segregation requirements in Article 38 of CSDR, CSDs have proposed that the regulator/policy maker confirms that these requirements would be respected when segregated records are maintained on the DLT platform enabling the identification, at any time, of the assets that belong to a particular client, distinct from another client’s assets or from the CSD’s own assets. Furthermore, CSDs have requested guidance on the key characteristics and requirements for an omnibus account in a DLT environment (the need for guidance is illustrated with the following question: “if the DLT platform allows tokens of different clients to be recorded to a single DLT Address, but each Token is also identifiable on the platform (i.e. the CSD’s records) as belonging to a particular client, would this constitute an omnibus account within the meaning of this provision [Article 38 of CSDR]?”).
50. ESMA understand the need to provide clarity with regards to Article 38 of CSDR to CSDs willing to use DLT. At this stage however it does not seem necessary to amend this Article through the targeted review of CSDR. **ESMA** is of the view that this could be clarified by the Commission in a Q&A. Once more experience has been obtained in the use of DLT by CSDs it could be further considered whether any amendment to Article 38 of CSDR is needed.
51. One NCA has highlighted that in its jurisdiction only the recording on an account with a custody account keeper is equivalent to a deed of ownership. Therefore, it would be necessary for security token platforms to go through another intermediary in addition to the central securities depository (the custody account keeper) who would record the security token transfers in its accounts to reflect their transmission on the DLT platform. This would not make it possible to benefit fully from the productivity gains made possible by the DLT due to the disintermediation of the trading and/or post-trading processes. Indeed, the legal nature of a securities account (i.e. statutory record, contractual construct, or accounting device) and the legal nature and effects of book entries are still embedded in national law.

Operational requirements

52. One NCA has indicated that CSDR imposes many operating rules which would imply disproportionate costs for security token platforms, which will have to be adapted to allow for the specific characteristics of innovative technologies such as DLT, for which technology could provide greater security in transactions than routing via a regulated intermediary.
53. Other NCAs have highlighted more specific operational requirement as being potentially problematic in a nascent DLT environment, more concretely:
1. Article 35 of CSDR, further developed in Level 2, to use (solely) international communication standards seems to be reasonable taking into account the important role of CSDs. Nevertheless, such limitation could restrict the use of new or innovative technologies such as DLT which do not have a proven track record (similar to international standards). Therefore, some NCAs suggest that a clarification or extension might be helpful to allow for the use of common standards with regard to a specific innovative technology. The difficulties in complying with Article 35 of CSDR when using DLT are also recognised by CSDs. They suggested that the DLT-based real-time data-sharing with nodes could satisfy the requirement of this article. **ESMA** agrees that the upfront requirement to use international open communication procedures and standards might work as a barrier to the development of projects using innovative technologies such as DLT, however some level of standardisation is required to avoid the risks that systems using new technologies such as DLT would be developed in an isolated manner from other systems, legacy ones or other new ones. In the past, ESMA has indicated through a CSDR Q&A²³ that in cases where internationally accepted standards are not “available on a fair, open and non-discriminatory basis to any interested party” or do not exist, the competent authority of the CSD may allow that CSD to use other messaging standards, until international standards become available; or in cases where the use of internationally accepted standards that are “available on a fair, open and non-discriminatory basis to any interested party” does not “facilitate efficient recording, payment and settlement” for a CSD, specific participants or market infrastructures, its competent authority may allow that CSD to use other messaging standards, as long as such lack of efficiency can be evidenced. Considering this background, **ESMA** recommends the Commission to amend Article 35 of CSDR.
 2. Article 2 of the RTS 2018/1229 imposes an obligation on professional clients to send to the relevant investment firm written allocations specifying notably “the names and numbers of the securities or cash accounts to be credited or debited.” Such specification might be to some extent inconvenient to apply in a DLT environment which does not reflect the features of traditional cash and securities

²³ Part II: Central Securities Depositories, Q&A 4(a), https://www.esma.europa.eu/sites/default/files/library/esma70-708036281-2_csd_r_qas_2.pdf

accounts. These NCAs consider that Article 2 of the RTS 2018/1229 should be broadened to encompass the specificities of DLT.

3. The practical implementation of the bilateral cancellation facility in Article 7 of RTS 2018/1229 and the hold and release mechanism in Article 8 of that same RTS in a DLT environment would merit some clarification. The NCA having raised this point indicated that these two requirements would need to be adapted in a DLT environment due to the fact that DLT technologies are immutable.
54. Also, with regards to operational requirements, CSDs have suggested the need for some further clarifications, in particular with regards to resilience requirements under Article 45(2) of CSDR further developed in RTS 2017/392. According to CSDs, it would seem important to clarify whether the operator of the settlement functionality of a DLT platform would have to ensure that the smart contract overlaid onto the DLT is bug-free and sufficiently precise to achieve the purposes of that smart contract in order to comply with operational reliability and resilience requirements under CSDR Article 45(2).
55. **ESMA** considers that there is not enough experience with the use of DLT by CSDs to propose at this stage changing requirements in Articles 2, 7 and 8 of RTS 2018/1229 nor in those related to the operational risks set out in article 45(2) of CSDR and further elaborated in RTS 2017/392. ESMA will give further consideration to whether requirements in RTS 2018/392 and in RTS 2017/392 might require any amendment or clarification in the context of DLT and would propose targeted amendments if required also taking into consideration further experience on the use of DLT from CSDs including from the EU pilot regime.

Interoperability

56. As indicated above, the lack of international standards can act as a barrier to the deployment of DLT-based solutions. This is not only the case for communication protocols and standards but also, as indicated in the AMI-SeCo report on the use of DLT in post-trade processes, for standardisation and common rules on a broader set of features and technical aspects. According to AMI-SeCo²⁴, legacy and DLT-based systems need connection and communication standards that are robust. This will help to avoid a situation where each system becomes a different ecosystem isolated from the others. It will also help to ensure a level playing field among market participants, irrespective of the underlying technology. Furthermore, interoperability should therefore be seen as a crucial feature when developing any post-trade solution based on DLT. It should also be a key consideration when addressing preliminary issues, such as the business design – and in some instances even the technical design – of a solution and how to link the entire chain of stakeholders and mechanisms, including end users and existing engines/tools that need to remain accessible.

²⁴ https://www.ecb.europa.eu/pub/pdf/other/ecb.20210412_useofdltposttradeprocesses-958e3af1c8.en.pdf

57. **ESMA** agrees that legacy and DLT-based systems need connectivity and communication standards that are robust. This should help avoiding that different solutions develop in isolation and create a fragmented market. In this respect, ESMA believes that it is important to assess, following the implementation of the EU pilot regime, whether regulatory or supervisory convergence clarifications might be needed covering the interoperability aspects and addressing potential risks emerging from this. This assessment should look not only at interoperability between legacy systems and DLT-based systems, but also at interoperability between DLT-based systems themselves.

Settlement of securities and of cash in a DLT environment

58. Concerning the definition of “settlement”, CSDs have suggested that regulators confirm that, provided the underlying terms and conditions of the tokens and the contractual arrangement between the members on the DLT platform set out clearly that their obligations to each other would be discharged by the method of transfer of the DLT platform (e.g. when a transaction is ‘validated’ on a DLT platform, data is recorded to the transferor’s and the transferee’s DLT Addresses; that results in the ‘transfer’ of the token), the token transfer mechanism should be capable of resulting in ‘settlement’ within the meaning of CSDR. **ESMA** understands the need for providing clarity on this issue, and believes that, as a first step this clarity could be provided through a Q&A. Following the experience from the EU pilot regime, it can then be assessed if this should also be reflected as an amendment to CSDR.

59. When talking about the settlement of the cash leg of the transactions, things seem to be slightly more complicated. Two NCAs have indicated that Article 40 of CSDR on cash settlement represents a barrier to the development of DLT. Indeed, in the current state of the legislation, it would seem that the complete tokenisation of the settlement and delivery of security tokens is impossible. Although the delivery of security tokens could be performed on a DLT platform operated by a CSD authorised for this purpose (potentially confirming CSDs’ suggestion in the previous paragraph), cash settlement would have to take place in fiduciary money and not in cryptocurrency. This would therefore require the CSD to effect movements in its cash accounts at the same time as the DLT platform, which to some extent limits the productivity gains that can be expected from the tokenisation of post-trade infrastructures. According to those NCAs, a legislative adaptation of the CSDR would seem necessary to allow settlement of the cash leg of a transaction in cryptocurrency. Another NCA has indicated that the asset used in the case of settlement in cryptocurrency should carry little or no credit risk. One of those NCAs highlights however that this legislative adaptation would not be necessary if the European Central Bank decided to issue central bank money on a DLT platform.

60. CSDs have also raised some issues with regards to DvP on a DLT network. According to CSDs, DvP could be achieved on a single DLT network by making the cash transfers directly on the DLT ledger (through central bank digital currencies or asset referenced tokens or e-money). Alternatively, according to CSDs, cash can be processed outside the DLT network (‘off-ledger’) through mechanisms of interfaced settlement between the DLT

network and the cash payment system. New technologies would allow interfaced settlements to occur in a 'simultaneous and irrevocable' manner if both the DLT network and the cash payment network are governed by regulated market infrastructures or central banks.

61. CSDs and some NCAs have further indicated that in the absence of a central bank digital currency, it would be unclear how the current CSDR requirements for the provision of banking-type ancillary services and settlement in commercial bank money would apply to asset-referenced tokens or e-money tokens which are used as settlement asset.
62. The settlement of the cash leg of a security transaction should be possible in central bank money and in commercial bank money respecting principle 9 of the CPMI-IOSCO PFMI²⁵ as it is currently the case, independently of the technology used for the settlement of the security transaction. ESMA understands however the need to achieve DvP on a single DLT network by making the cash transfers directly on the DLT ledger. In this respect, the Commission together with members of the ESCB may wish to consider further whether the current drafting of Article 40 of CSDR allows for the settlement of the cash leg of a securities transaction in a central bank digital currency (CBDC). Any potential amendment needed should respect in any case CSDR's technology neutrality, as well as the neutrality of the technology the central banks may employ for issuing and settling CBDCs. At the same time, ESMA is aware that some time will be needed for a potential implementation of the respective CBDCs in all EU jurisdictions, which adds a further element of complexity. ESMA would like to point out that various initiatives might be developed in this field, in order to cope with that issue. For example, Deutsche Bundesbank and several other public and private institutions have recently announced²⁶ the successful development and testing of a solution that allowed establishing a technological bridge between DLT (i.e. DLT-based securities settlement of transactions) and TARGET2 which enabled the settlement in central bank money (CeBM) without using a CBDC. This shows that technological solutions enabling the interface and interaction of DLT securities settlement platforms and (legacy) payment systems have started to be developed. Other central banks are also looking into the use of CBDC for clearing and settlement²⁷. Last but not least, taking into consideration the systemic importance of CSDs and the implications that the use of crypto-currencies could have in terms of counterparty risk and financial stability, ESMA does not propose to the Commission to introduce through the targeted review of CSDR any change to Article 40 that would allow the use of crypto currencies or stablecoins²⁸.

Outsourcing

63. CSDs have suggested that the circumstances under which entities involved in the validation function are to be covered by outsourcing requirements under Article 30 of CSDR

²⁵ <https://www.bis.org/cpmi/publ/d101a.pdf>

²⁶ Please see the following link: [DLT-based securities settlement in central bank money successfully tested | Deutsche Bundesbank](#)

²⁷ <https://www.banque-france.fr/en/financial-stability/market-infrastructure-and-payment-systems/call-applications-central-bank-digital-currency-experimentations>

²⁸ More information about the difference between a central bank digital currency, crypto-assets and stablecoins can be found in Annex 2 of the [ECB's Report on a digital euro](#).

should be clarified. According to them, a CSD should not be considered to be outsourcing its obligations in respect of the platform it operates assuming the validation and recording of transactions on the platform remains exclusively within the power of the CSD.

64. **ESMA** considers that the very limited experience with the use of DLT by CSDs does not allow to make any concrete recommendation to amend Article 30 of CSDR. Indeed, with the use of a private or permissioned DLT, the manager of the network can assign participants different functions or roles, including the validation and recording of transactions. Therefore, without further experience with the use of DLT and the subsequent attribution of roles and functions to participants (or clients), any recommendation at this stage would risk being incomplete. This should be further assessed following the experience from the EU pilot regime. Furthermore, with the use of DLT there might be also other new functions or roles that ESMA recommend assessing following the experience of the EU pilot regime. Depending on the outcome of that assessment, ESMA might recommend further safeguards to ensure the adequate mitigation of those risks.

CSDR and the Settlement Finality Directive

65. Finally, respondents to ESMA's questionnaire have also raised concerns with regards to the interplay between CSDR and the Settlement Finality Directive (SFD). One NCA has highlighted that it should be examined to what extent a public DLT network could be recognised as a securities settlement system. The issue of designation of a system operator, and the obligation of intermediation deriving from the participation in such systems cannot be accommodated by public DLT networks. Other NCAs have also highlighted the need to adapt SFD in a way that it is technology-neutral and future proof. These NCAs believe that current definitions or concepts in SFD might be interpreted in a way that a DLT system could be SFD compliant. However, according to these NCAs, it would seem preferable to further clarify and fine-tune some definitions and concepts in a DLT context, including a principle based legal definition of a "DLT based SFD system" and to clarify the term "participant" in a DLT based SFD system. One of those NCA notes as well that ideally those clarifications should be drafted in a way that they are fit for the future if and when a new technological solution outshines and replaces DLT. According to them, such principle-based concepts would then be further developed by the rules of the system itself.
66. As mentioned before, ESMA considers that it should be further investigated whether the use of public DLT would be compatible with the fact of having one legal entity responsible for the application of the relevant CSDR requirements. However, **ESMA** considers it is important that the Commission addresses through the SFD review²⁹ questions related to the definition of a "DLT based SFD system" as well as the term "participant".

²⁹ Please see the targeted consultation launched by the Commission on the review of SFD which includes specific questions on this topic https://ec.europa.eu/info/consultations/finance-2021-settlement-finality-review_en

5.1.2 Addressing risks raised by FinTech

67. As shown in the introduction to this section, the number of respondents having indicated that the current rules leave risks emerging from new technologies unaddressed is relatively low. Further feedback received with regards to the unaddressed risks and the way to address them is equally limited.
68. One NCA considers that the requirements of RTS 2017/392 on authorisation, supervision, and operational requirements for CSD should be enhanced to take into consideration the specific features of the DLT. This NCA suggests including a list of qualitative criteria that would need to be satisfied by the DLT to be eligible as a securities settlement system.
69. **ESMA** agrees that the use of DLT may bring additional operational risks which might not be currently covered by the requirements in RTS 2017/392. However, at this stage the experience with the use of this type of technology and its level of deployment are not sufficient for ESMA to put forward any more concrete proposals. Furthermore, it is to be noted that the majority of EU CSDs have already been authorised under CSDR. Following the experience from the EU pilot regime, ESMA could consider the need to introduce changes to Level 2 or providing further guidance.
70. One NCA has pointed to the lack of harmonised rules allowing for the registration of financial securities in a DLT in Member States as hampering competition among CSDs in the Union. This divergence of approaches can create situations where CSDs established in an EU jurisdiction where the national law allows the registration of financial securities in a DLT would not be able to perform DLT-based activities in countries which do not recognise DLT as a means of registration of financial securities. However, the CSDs established in those countries which do not recognise DLT as a means of registration of financial securities would be legally allowed to perform DLT-based activities in countries where the registration of financial securities in a DLT is recognised. In addition, there can be different approaches at national level regarding whether a DLT-based system may characterise as a system within the meaning of Article 2(1)(10) of CSDR (and therefore within the meaning of SFD).
71. As indicated before, ESMA considers it is important that the Commission addresses through the SFD review³⁰ questions related to the definition of a “DLT based SFD system” as well as the term “participant”. The risk of unlevel playing field highlighted in the previous paragraph reinforces ESMA’s argument. Furthermore, clarifications regarding whether digital addresses held in a DLT platform can be considered “securities accounts” and data recorded in a DLT platform can be considered as “credits” and “debits” within the meaning of CSDR would be helpful in this regard.
72. Finally, that same NCA has pointed to risks unaddressed concerning legal requirements in SFD. This NCA has indicated that the validity of a transfer order in a DLT system could be

³⁰ Please see the targeted consultation launched by the Commission on the review of SFD which includes specific questions on this topic https://ec.europa.eu/info/consultations/finance-2021-settlement-finality-review_en

deemed to take place at various mining stages. The exact moment where the entry and irrevocability of a transfer order effectively takes place within a DLT system could then be different in different systems. This could lead to different practices between the systems, which is not desirable, and would impact among others the interoperability of systems³¹. According to this NCA, CSDR, Level 2 or other CSDR guidance could provide some guidance regarding the moment of entry and of irrevocability of transfer orders specifically in a DLT based securities settlement system, in order to promote a more harmonised approach between European CSDs. This would avoid discrepancies in the practices of DLT based European CSDs.

73. **ESMA** considers it is important to address this concern. This should be assessed as part of the SFD review³². The EU pilot regime should also provide useful experience on how the SFD moments are applied in a DLT context.

6 Conclusions

74. Generally speaking, the current level of deployment of FinTech by CSDs in the Union is rather low. Certain innovative technologies such as AI or cloud computing seem to be already used. No specific barrier within the framework of CSDR has been brought to the attention of ESMA with regards to technologies such as Cloud computing, AI/ Machine Learning, Internet of Things (IoT) or Quantum computing. Concerning DLT, while CSDs generally recognise its disruptive potential in the field of CSD services, its deployment is extremely limited at this stage. Indeed, other than the use of DLT by ID2S, presently CSDs are not using DLT but rather investigating its use and planning to use it in the coming years. The feedback received by ESMA shows that many CSDs are planning to deploy DLT in the next 3 to 5 years, although at this stage it is not clear whether this deployment will be done through the upcoming EU Pilot Regime (benefiting from the special permissions and derogations foreseen therein) or within the CSDR framework or through both.
75. While the Commission's proposal for an EU pilot regime for DLT FMIs should promote the uptake of this technology, respondents to ESMA's questionnaire have identified a number of areas where targeted amendments to CSDR or further guidance (from ESMA or from the Commission) could help CSDs in the deployment of DLT regardless of the EU Pilot Regime. ESMA considers that some of these targeted amendments, or further guidance, should be introduced before the results of experimentations in the framework of the EU Pilot Regime are obtained in order to avoid that financial innovation in the Union lags behind as compared to other international players. Indeed, ESMA agrees that some clarifications may be provided already at this stage (either through the CSDR review or

³¹ As per Article 48(8) of CSDR: "Interoperable securities settlement systems and CSDs, which use a common settlement infrastructure shall establish identical moments of: (a) entry of transfer orders into the system; (b) irrevocability of transfer orders. The securities settlement systems and CSDs referred to in the first subparagraph shall use equivalent rules concerning the moment of finality of transfers of securities and cash".

³² Please see the targeted consultation launched by the Commission on the review of SFD which includes specific questions on this topic https://ec.europa.eu/info/consultations/finance-2021-settlement-finality-review_en

through Commission Q&As), however, in other cases ESMA considers that it would be beneficial to first obtain further experience with the use of DLT by CSDs before rules are durably amended.

76. ESMA is conscious of the limited experience with DLT in relation to CSDs' core services and, as such, the recommendations in this report should not, in ESMA's view, alter any of the principles enshrined in CSDR. They should rather help promote innovation among CSDs in a safe environment while respecting CSDR and internationally agreed standards such as the CPMI-IOSCO Principles for market infrastructures.

77. ESMA's main recommendations to the Commission are highlighted below:

a) **Issues related to securities accounts, credits, debits, segregation requirements and reconciliation requirements:** As already indicated by ESMA in its Advice on crypto assets, other than the reference to the use of 'securities accounts', CSDR does not prescribe any particular method for the initial book-entry form recording, meaning that any technology, including DLT, could virtually be used, provided that the book-entry form is with an authorised CSD for those financial instruments where this is required by CSDR. However, there may be national rules that could pose restrictions to the use of DLT for that purpose. The legal nature of a securities account (i.e. statutory record, contractual construct, or accounting device) and the legal nature and effects of book entries are still embedded in national law. These national considerations aside, taking into consideration further input received to the ESMA's questionnaire for the preparation of this report, **ESMA** recommends to the Commission clarifying the following aspects in a Q&A that could be published by ESMA³³:

- Whether digital addresses held in a DLT platform can be considered "securities accounts";
- Whether data recorded to a DLT platform can be considered as "credits" and "debits" within the meaning of CSDR;
- Whether segregation requirements under Article 38 of CSDR would be respected when segregated records are maintained on the DLT platform enabling the identification, at any time, of the assets that belong to a particular client, distinct from another client's assets or from the CSD's own assets.
- Whether reconciliation measures under CSDR can be satisfied through real-time data sharing on DLT ensuring that the integrity of the issue is preserved (the number of issued securities is equal to the sum of securities recorded on the DLT).

Following experience gained with the EU pilot regime, the above-mentioned clarifications may then be included as amendments to CSDR.

b) **Operational requirements:** several operational requirements have been highlighted as problematic, or at least requiring some clarification, to allow the use

³³ In application of Article 16b of ESMA Regulation.

of DLT. In particular Article 35 of CSDR on communication procedures. With regards to Article 35 of CSDR, ESMA has indicated through a CSDR Q&A³⁴ that in cases where internationally accepted standards are not “available on a fair, open and non-discriminatory basis to any interested party” or do not exist, the competent authority of the CSD may allow that CSD to use other messaging standards, until international standards become available; or in cases where the use of internationally accepted standards that are “available on a fair, open and non-discriminatory basis to any interested party” does not “facilitate efficient recording, payment and settlement” for a CSD, specific participants or market infrastructures, its competent authority may allow that CSD to use other messaging standards, as long as such lack of efficiency can be evidenced. Considering this background, **ESMA** recommends to the Commission to amend this Article through the targeted review of CSDR to allow CSDs to deploy DLT solutions using other communication standards or protocols if international open communication procedures and standards are not available for this specific type of technology. ESMA could monitor the implementation of communication standards to ensure convergence towards international open communication procedures and standards as DLT takes up and once this becomes feasible.

- c) **Settlement of securities and of cash in a DLT environment:** Several issues have been raised with regards to the definition of settlement in Article 2(1)(7) of CSDR as well as requirements on cash settlement in Article 40 of CSDR. In the case of the definition of settlement, CSDs would like to have some reassurance on the fact that, provided that the underlying terms and conditions of the tokens and the contractual arrangement between the members on the DLT platform set out clearly that their obligations to each other would be discharged by the method of transfer of the DLT platform, the token transfer mechanism should be capable of resulting in ‘settlement’ within the meaning of CSDR. **ESMA** does not recommend to the Commission to modify the definition of settlement in Article 2(1)(7) of CSDR. This could potentially be initially clarified through a Commission Q&A that could be published by ESMA³⁵. Following experience gained with the EU pilot regime, it can then be assessed if this should also be reflected as an amendment to CSDR.
- d) **Settlement finality:** Several concerns have been raised with regards to the application of SFD in a DLT context. Several respondents have also asked for the clarification of the SFD terminology in a DLT context. Furthermore, one respondent has highlighted that the validity of a transfer order in a DLT system could be deemed to take place at various mining stages, therefore the exact moment where the entry and irrevocability of a transfer order effectively takes place within a DLT system could then be different in different systems. This could lead to different practices between the systems, which is not desirable, and would impact among others the interoperability of systems. ESMA considers it is important to address this concern and ensure that SFD is technologically neutral (i.e. it does not create undue barriers

³⁴ Part II: Central Securities Depositories, Q&A 4(a), https://www.esma.europa.eu/sites/default/files/library/esma70-708036281-2_csd_r_qas_2.pdf

³⁵ In application of Article 16b of ESMA Regulation.

to the deployment of DLT). This should be assessed as part of the SFD review³⁶. The EU pilot regime should also provide useful experience on how the SFD moments are applied in a DLT context.

78. Further to the above-mentioned issues, taking into consideration the feedback it has received to its questionnaire and in light of the further experience to be gained including through the EU Pilot Regime, ESMA will give further consideration to instances where Level 2 requirements might be incompatible with the use of DLT and would require some targeted amendments. This might include, among others, further reconciliation requirements foreseen in RTS 2017/392, the bilateral cancellation facility and the hold and release mechanism foreseen in Articles 7 and 8 of RTS 2018/1229. Any suggested changes will take into consideration the level of deployment of DLT.

³⁶ Please see the targeted consultation launched by the Commission on the review of SFD which includes specific questions on this topic https://ec.europa.eu/info/consultations/finance-2021-settlement-finality-review_en

7 Annexes

7.1 Annex I – ESMA survey on Fintech/ use of new technologies by CSDs (ref. ESMA70-156-2761/ 28 May 2020)

Survey

1. Do CSDs already use or plan to use new/ innovative technologies³⁷?

a) Yes

b) No

[Q dependent on 1(a)] If yes, please provide details:

CSD Name and Country of Incorporation	Type of New/ Innovative technologies used by CSDs	Scope: activities or services using this technology	Implementation timeframe	Benefits brought by the technology	Potential challenges and/or Risks arising from the use of the technology	Other comments (incl. figures and qualitative evidence)
	Distributed Ledger Technology (DLT) ³⁸ Smart contracts Cloud computing	[Traditional CSD services (please specify, e.g. notary, central maintenance, settlement, collateral management, corporate actions processing, regulatory reporting, IT services, etc.)/	[Already in use/ Planned to be used in the next 1-3 years/ Planned to be used in the next 3-5 years]			

³⁷ For background information please see: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2020-digital-finance-strategy-consultation-document_en.pdf

³⁸ **Distributed ledger technology (DLT):** a means of saving information through a distributed ledger, i.e., a repeated digital copy of data available at multiple locations. DLT is built upon public-key cryptography, a cryptographic system that uses pairs of keys: public keys, which are publicly known and essential for identification, and private keys, which are kept secret and are used for authentication and encryption. (Source: https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf)

Artificial Intelligence/ Machine Learning,	Providing CSD services (please specify) for new asset class /					
Internet of Things (IoT)	Providing new services (wallet provision, etc. please specify)/					
Biometrics	For compliance/supervision purposes (RegTech/SupTech)]					
Quantum computing						
Other						
[blank space]	[blank space]	[blank space]	[blank space]	[blank space]	[blank space]	[blank space]

2. Do CSDs provide services in relation to crypto-assets³⁹?

a) Yes

b) No

[Q dependent on 2(a)] If yes, please provide details:

CSD Name and Country of Incorporation	New asset classes (crypto assets) ⁴⁰	Services provided by CSDs in relation to crypto assets	Implementation timeframe	Benefits	Risks	Other comments (incl. figures and qualitative evidence)
	Crypto assets that qualify as MiFID financial instruments Crypto assets that qualify as e-money	[Traditional CSD services (please specify, e.g. notary, central maintenance, settlement, collateral management, corporate actions processing, regulatory reporting, IT	[Already in use/ Planned to be used in the next 1-3 years/ Planned to be used in the next 3-5 years]			

³⁹ **Crypto-asset:** a type of private asset that depends primarily on cryptography and Distributed Ledger Technology (DLT) or similar technology as part of their perceived or inherent value. Unless otherwise stated, ESMA uses the term to refer to both so-called 'virtual currencies' and 'digital tokens'. Crypto-asset additionally means an asset that is not issued by a central bank. (Source: https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf)

⁴⁰ Crypto-assets may be digital native or represent assets that exist outside of a DLT framework.

	Others (please specify)	services, etc.)/ Providing new services (wallet provision, etc. please specify)/ For compliance/supervision purposes (RegTech/SupTech ⁴¹)				
	[blank space]	[blank space]	[blank space]	[blank space]	[blank space]	[blank space]

3. Please rate (from 1-5) how much you think CSDs are prone/reluctant to use new/ innovative technologies:
 - 1 – CSDs are very reluctant to use new/ innovative technologies
 - 2 – CSDs are reluctant to use new/ innovative technologies
 - 3 – CSDs are neutral in relation to using new/ innovative technologies
 - 4 – CSDs are prone to use new/ innovative technologies
 - 5 – CSDs are very prone to use new/ innovative technologies

4. Please provide insights on how much you think CSDs are prone/reluctant to use new/ innovative technologies, compared to other market participants, e.g. credit institutions or investment firms. *[insert text box]*

5. Do CSDs have partnerships with innovative start-ups?
 - a) Yes

 - b) No

[Q dependent on 5(a)] If yes, please provide details: [insert text box]

6. In your view, is CSD innovation growing or slowing?
 - a) Growing. Please explain, including figures and qualitative evidence *[insert text box]*

 - b) Slowing. Please explain, including figures and qualitative evidence *[insert text box]*

⁴¹ Technology-enabled regulatory and supervisory processes that have the potential to create efficiencies in compliance, regulatory reporting, and risk analysis.

7. Do some technologies attract more interest than others from CSDs and, if so, why? *[insert text box]*

8. Do you have any indication regarding the amount of money and/or resources invested in these new/innovative technologies? Please provide any figures, as well as qualitative insights collected from CSDs. *[insert text box]*

9. Have some CSD projects involving new/ innovative technologies been stopped or shelved?
 - a) Yes

 - b) No

[Q dependent on Q9(a)] If yes, please explain why. [insert text box]

10. How do you see the CSD developing in the next 3-5 years? Please list the key opportunities and challenges. *[insert text box]*

11. Please give examples of uses of new/ innovative technologies that may affect the CSD's interactions with its users (e.g. participants, issuers, investors) from the perspective of the new/ innovative technologies at the level of the CSD users.

CSD Name and Country of Incorporation	New/ Innovative technology used by CSD participants or other parties when interacting with the CSD	Type of interaction (relevance for the CSD activity)	Applying to new asset classes (crypto assets)	Comments
	Distributed Ledger Technology (DLT) Smart contracts Cloud computing Artificial Intelligence/ Machine Learning, Internet of Things (IoT)	[blank space]	[No/Yes] [If Yes: Crypto assets that qualify as MiFID financial instruments Crypto assets that qualify as e-money Others (please specify)]	[blank space]

	Biometrics			
	Quantum computing			
	Other			

12. As an authority, have you had to deal with requests from CSDs in your innovation hub⁴²? Or, as a CSD have you used an innovation hub?

- a) Yes
- b) No

[Q dependent on Q12(a)] If yes, please provide details (e.g., the type of inquiries, including the type of activities/services and assets involved, the reason for using the hub, and the outcomes): *[insert text box]*

13. As an authority, have you had to deal with requests from CSDs in your regulatory sandbox⁴³? Or, as a CSD have you used a regulatory sandbox?

- a) Yes
- b) No

[Q dependent on Q13(a)] If yes, please provide details (e.g., the type of inquiries, including the type of activities/services and assets involved, the reason for using the sandbox, and the outcomes): *[insert text box]*

14. In your opinion (and where applicable, based on your experience), what is the main benefit of a supervisor implementing (a) an innovation hub or (b) a regulatory sandbox:

[insert text box]

15. In your view, do CSDR and the related Level 2 measures create undue obstacles to new/innovative technologies?

- a) Yes
- b) No

[Q dependent on Q15(a)] If yes, please specify which clarification or changes would be needed to remove these undue obstacles:

⁴² Innovation hubs provide a dedicated point of contact for firms to ask questions to competent authorities on FinTech related issues and to seek non-binding guidance on regulatory and supervisory expectations, including licensing requirements. (Source: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/2020-digital-finance-strategy-consultation-document_en.pdf)

⁴³ Regulatory sandboxes are most often schemes to enable firms to test, pursuant to a specific testing plan agreed and monitored by a dedicated function of the competent authority, innovative financial products, financial services or business models. (Source:

Areas/provisions which would need to be clarified/amended to remove undue obstacles to new/ innovative technologies	Justification	If relevant, concrete proposals
[blank space]	[blank space]	[blank space]

16. In your view, do CSDR and the related Level 2 measures leave certain new/enhanced risks introduced by new/ innovative technologies unaddressed? *[insert text box]*

[Q dependent on Q16 (a)] If yes, please specify which clarification or changes would be needed to address these new/enhanced risks:

Areas/provisions which would need to be clarified/amended to address the new/enhanced risks raised by new/ innovative technologies	Justification	If relevant, concrete proposals
[blank space]	[blank space]	[blank space]

7.2 Annex II – List of respondents to the ESMA survey on the use of FinTech by CSDs, and contributors to this Report

NCA's

1. BE National Bank of Belgium and FSMA
2. BG Financial Supervision Commission
3. CZ Czech National Bank
4. DE Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin, Federal Financial Supervisory Authority)
5. DK Finanstilsynet
6. EE Finantsinspektsioon
7. ES Comisión Nacional del Mercado de Valores (CNMV)
8. FI Financial Supervisory Authority (FIN-FSA)
9. FR Autorité des Marchés Financiers (AMF)
10. GR Hellenic Capital Market Commission (HCMC)
11. HR Croatian Financial Services Supervisory Agency
12. LT Lietuvos bankas
13. LU Commission de Surveillance du Secteur Financier (CSSF)
14. LV Financial and Capital Market Commission
15. MT Malta Financial Services Authority
16. PL Polish Financial Supervision Authority (KNF)

17. PT Comissão do Mercado de Valores Mobiliários
18. RO Autoritatea de Supraveghere Financiara
19. SE Finansinspektionen
20. SI Securities Market Agency (ATVP)
21. SK National Bank of Slovakia

CSDs

1. Clearstream Banking AG
2. Clearstream Banking SA
3. Središnje Klirinško Depozitarno Društvo D.D.
4. CSD Prague
5. Euroclear Bank
6. Euroclear France
7. Euroclear Belgium
8. Euroclear Nederland
9. Keler LTD/CSD
10. Iberclear
11. ID2S
12. Monte Titoli S.p.A.
13. Nasdaq CSD and all branches (Estonia, Lithuania, Iceland)
14. LuxCSD
15. Depozitarul Central SA

Trade Associations

1. Association of German Banks (BdB)
2. European Banking Federation (EBF)