



**CHALLENGES AND PERSPECTIVES FOR  
FINANCIAL MARKET INFRASTRUCTURES  
*CONSIDERATIONS FOR ACSDA'S MEMBERS***

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## ACSDA Members

1. Caja de Valores (CVSA) – Argentina
2. Bolsas y Mercados Argentinos S.A. – BYMA (BYMA) – Argentina
3. Bahamas Central Securities Depository (BCSD) – Bahamas
4. Barbados Central Securities Depository Inc. (BCSD) – Barbados
5. Bermuda Securities Depository (BSX) – Bermuda
6. Entidad de Depósito de Valores de Bolivia S.A. (EDV) – Bolivia
7. B3 – Brazil
8. The Canadian Depository for Securities Limited (CDS) – Canada
9. Depósito Central de Valores (DCV) – Chile
10. Depósito Centralizado de Valores de Colombia Deceval S.A. (Deceval) – Colombia
11. Interclear – Costa Rica
12. Depósito Centralizado de Valotres S.A. (Cevaldom) – Dominican Republic
13. Eastern Caribbean Central Securities Depository (ECCSD) – Antigua and Barbados
14. Depósito Centralizado de Valores (Banco Central del Ecuador) – Ecuador
15. Decevale S.A. – Ecuador
16. Central de Depósito de Valores S.A. (Cedeval) – El Salvador
17. Central de Valores Nacional S.A. (CVN) – Guatemala
18. Jamaica Central Securities Depository (JCSD) - Jamaica
19. Bank of Jamaica (JamClear) – Jamaica
20. Indeval Institución para el Depósito de Valores S.A. de C.V. (Indeval) – Mexico
21. Central Nicaraguense de Valores S.A. (Cenival) – Nicaragua
22. Central Latinoamericana de Valores S.A. (Latinclear) – Panama
23. Bolsa de Valores y Productos de Asunción S.A. (BVPASA) – Paraguay
24. Cavali S.A. I.C.L.V. (Cavali) – Peru
25. Strate Ltd. (Strate) – South Africa
26. Trinidad and Tobago Central Depository Limited (Trinidad & Tobago CSD) – Trinidad & Tobago
27. The Depository Trust and Clearing Corporation (DTCC) – United States
28. Banco Central de Uruguay (BCU) – Uruguay
29. Bolsa de Valores de Montevideo (BVM) – Uruguay
30. Caja Venezolana de Valores S.A. (CVV) – Venezuela

## Abbreviations

- AML – Anti-money laundering
- API - Application Programming Interface
- CCP – Central counterparty
- CPMI – Committee on Payments and Market Infrastructures
- CPSS – Committee on Payments and Settlement Systems
- CSD – Central Securities Depository
- DLT – Distributed Ledger Technology
- DNS – Deferred Net Settlement
- DVP – Delivery Versus Payment
- ECB – European Central Bank
- ETF – Exchange Traded Fund
- FMI – Financial Market Infrastructure
- FSAP – Financial Sector Assessment Program
- ICSD – International Central Securities Depository
- MF – International Monetary Fund
- IOSCO – International Organization of Securities Commissions
- IPO – Initial public offering
- KYC – Know your customer
- KYCC - Know your customer's customer
- PFMI – Principles for Financial Market Infrastructures
- PS – Payment System
- OTC – Over the Counter
- RTGS – Real-Time Gross Settlement
- SSS – Securities Settlement System
- TR – Trade Repository
- WFC - World Forum of CSDs

## Executive summary

### **ACSDA members' general business profile**

The majority of ACSDA members act as a CSD and SSS exclusively, but a few markets contain a CCP structure as well. The only FMIs that act as Payment Systems (PS) are the members that act as central banks, and trade repository functions are still rare in ACSDA marketplaces.

It is a dominant feature among ACSDA's members that Exchanges are either under the same legal entity as the FMI, part of the same holding company as the exchange, or have some degree of equity interest in the FMI. As a result, Exchanges play an important role in the life of FMIs<sup>1</sup>, not only because they are involved in the securities transaction lifecycle, but also as decision makers. A vertically integrated structure prevails in markets where there is little or no competition in the trading arena and the post-trade infrastructures can work as an entry barrier for potential competitors. As a result, while capitalizing on existing synergies, Exchanges protect the trading part of the business. In other marketplaces where the Exchange is a minority shareholder of the FMI or an independent entity, the level of influence is expected to be comparable to other stakeholders.

ACSDA's members provide clearing, settlement and depository services for a variety of securities, mainly equities, corporate bonds, government bonds and money market instruments. Mutual funds quotas and mortgage backed securities are eligible for some FMIs, but only a few currently have derivatives products. The relevance of each instrument in each market is quite variable. The equity market is the main segment in the most developed and largest marketplaces. Those are also the ones with a greater diversification of instruments. For medium and small size markets, government and corporate bonds play a preeminent role.

All ACSDA members that act as SSS adopt DVP procedures to settle transactions. The main model adopted by the members is BIS Model 2 and fewer markets work with BIS Model 3. The adoption of a combination of models are often related to different types of securities or different trading venues.

Regarding the account holding system, beneficial owner or hybrid account holding systems are predominant among ACSDA members. Nevertheless, some large marketplaces adopt omnibus account holding systems. In those markets, the high volume of transactions and the number of securities could justify the adoption of this model since the processing of instructions at the level of the beneficial owner would entail greater complexity and operational risk.

Most of ACSDA's members have implemented services and products other than those involved in their core business activities as FMIs. Many admit international securities as eligible and/or maintain international links with

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<sup>1</sup> For this Paper, we consider the FMIs defined by the PFMI: central securities depositories (CSD), securities settlement systems (SSS), central counterparties (CCP), trade repositories (TR) and payment systems (PS).

other FMIs. Services for mutual funds and collateral accounts are also a common diversification pathway. Less common though are services such as securities lending, proxy voting and market data.

### **Clearing, settlement and centralized deposit – considerations and challenges imposed by the PFMI**

The *Principles for Financial Markets Infrastructures* (PFMI), published in 2012, established a new level of international oversight on FMIs with the purpose of developing policies, implementing assistance programs and, most of all, assuring, to the extent possible, the stability of financial market infrastructures worldwide.

In the PFMI, risks originating from clearing and settlement processes are treated in a specific set of principles (credit, collateral, margins and liquidity) with concrete implications for ACSDA's members in the design of their operational models.

Over 80% of ACSDA's members that act as SSSs (and not CCPs) managing non-guaranteed net settlement systems, either through BIS Models 2 or 3. These institutions are fully subjected to the principles on credit and liquidity risks and have to bear the costs involved in maintaining: i) tools and systems for participants to monitor their credit and liquidity exposures to one another; ii) procedures and systems for collecting and managing collateral posted by participants, including marked-to-market capabilities and the application of haircuts, and iii) liquidity arrangements with banks, liquidity providers or the central bank for coping with effects of participants potential defaults.

A valid question is whether the benefits resulting from netting obligations in BIS Models 2 and 3 are negated by the costs adequately of managing the credit and liquidity risks potentialized by the netting.

In FMIs that combine SSS/CSD structures with Exchanges, as is the case with the majority of ACSDA members, the responsibilities related to the treatment of default may be not so well defined. In those cases, one point for ACSDA's members to consider is whether the responsibility for declaring a default belongs to one entity while the actions related to handling the default and assuring the continuity of settlement belongs to another entity. Undocumented procedures for dealing with participant defaults are a source of uncertainty that could worsen an already challenging situation.

For CSDs, the PFMI provide a structured framework for central safekeeping and securities management with requirements in terms of asset segregation, legal rights over securities and reconciliation procedures. Although previous recommendations regarding the safekeeping of securities already focused on the protection of assets and collateral held by CSDs on behalf of participants and/or beneficial owners, the current PFMI framework is more explicit in stating that the CSD must have rules and procedures consistent with its legal framework and robust internal controls to protect assets against custody risk (loss due to negligence, misuse of assets, fraud, poor administration, inadequate recordkeeping, or CSD's insolvency or claims by the CSD's creditors).

One key element for protecting assets and collateral is related to the level of account segregation. The PFMI do not require that CSDs maintain beneficial owner account holding systems but recognize that a higher level of



account segregation helps to provide better protection against the potential claims of creditors of an insolvent participant. Among ACSDA members, the predominance of beneficial owner account holding systems reveals concerns regarding: (i) uncertainty of shareholder rights; (ii) custody risk, especially involving unauthorized use of securities, theft and fraud; (iii) favorable environment for trading internalization at the custodians' level; and (iv) tax evasion. However, in some markets, legal and operational barriers are still difficult to overcome.

### **Products and services diversification and broadening the participant and investor base**

The 2019 edition of the WFC Global CSD conference dedicated part of its agenda to discuss innovation and diversification in the CSD industry. ACSDA members have a product and service portfolio centered around the core businesses of central safekeeping, clearing and settlement. The cases where ACSDA members have ventured into developing services and products beyond the shade of the core business umbrella deserves attention.

#### ***Around and beyond the core business***

One approach to product and services diversification is to consider those that are based on the FMI's core business and have a recognized potential to support market liquidity, price disclosure and risk management in securities settlement such as derivatives, repo and securities lending. Beyond the services that are related to the development of CSD and SSS core businesses, there are opportunities from leveraging the FMI technology and systems in order to develop other business lines such as TR functions, funds services, issuers services, market data and products for individuals.

Spearheaded by the 2008 financial crisis, the development of TRs for OTC transactions, especially derivatives, has been included in the agenda of FMIs, regulators and oversight organisms as a necessity. The ability to oversee risk exposures enables the prevention of disruptive situations for the direct risk taker and also to the entire financial system. The TR role goes beyond oversight – the registration of assets in a centralized manner allows that liens made upon those assets are also recorded and identify the beneficiary of the contract. Thus, the centralized registration prevents fraudulent use of the same asset as collateral for more than one transaction. This assurance is key for developing the securitization of receivables and, consequently, the credit market.

FMIs can leverage their existing systems and communications networks to support a series of processes in investment fund administration. The specific expertise involved in recordkeeping, asset servicing and DVP settlement can be used to automate, standardize and centralize processes, thus enhancing efficiency and reducing costs and risks in fund management administration.

Listed companies with good corporate governance standards attract investor interest and strengthen capital markets. Investors are then encouraged to participate in the company's decisions by voting in general assemblies as much as possible. In order to support a broad participation of investors, remote and/or proxy voting services have developed in many markets. CSDs can play a relevant role where proxy voting providers are not yet dominant players. Leveraging the communication networks already established with both custodians and issuers, CSDs can function as a hub for receiving and consolidating remote/proxy voting instructions. This type of service can be beneficial for both issuers and investors since it reduces the bureaucracy and costs involved in the voting process.



Through greater automation, it also reduces the time involved in the process thus enhancing the conditions for foreign investors to vote. Lastly, it promotes transparency in the voting process since the centralized registration enables the development of automated reconciliation procedures.

Exchanges have been commercializing market data for some time now as investment decisions have become more and more an individual choice, but rather a result of algorithms and robots. However, FMIs should be attentive to opportunities created by some trends in the field such as to market data on OTC transactions.

The development of products and services specifically oriented to individual investors can also be an important business opportunity for FMIs. Although individual investor transactions may correspond to a relatively small volumes, they have a great potential of developing the capital markets culture.

### ***Innovation and new business opportunities***

The discussion about new business opportunities for FMIs is tied closely to the development of new technologies, new assets, and new types of institutions. There are some innovative approaches that CSDs should keep on their radar during the next decade.

The first is related to the role of CSDs/SSSs as a data repository and the possibility that technology enables the monetization of data. The generation of unified identification codes, like ISIN codes, has broken the barrier of standardized assets such as equities and corporate bonds and the challenge is now to be able to identify highly customized assets in order to guarantee their unicity and legitimacy in order to use them for example as collateral. Also, CSDs can become data vendors directly. Another trending topic is the discussion of artificial intelligence and the affect it might have on the automation of FMI functions. Greater straight-through-processing (STP) is expected to develop in areas such as securities issuance, information disclosure by issuers, corporate actions processing, settlement, and collateral management.

### ***Broadening participant and investor base***

The institutional investor base is one of the pillars of a capital market's size and level of development. These investors can be quite effective in providing long-term funds and are less likely to promote market volatility. They also typically, for regulatory reasons in some cases, require higher disclosure standards that reduce information asymmetries. Private pension, insurance, and/or mutual funds are usually relevant sectors in many developing economies with well-established securities markets.

Initiatives for the purpose of attracting retail investors include simplified access to securities transaction services and reporting through mobile applications, for instance. Education systems and programs are also an important line of action. The standardization and simplification of collective investment schemes as well as tax incentives may be effective in enhancing the inclusiveness of capital markets. First-time and less sophisticated investors are typically more risk averse. Products specifically designed for individual investors should be analyzed by FMIs and local regulators as the means to promote the capital markets, the financial sector, and the economy.

## **Challenges and opportunities introduced by Distributed Ledger Technology (DLT)**

### ***Impacts for FMIs related to DLT***

The analysis of the potential impacts of DLT to FMIs encompasses the benefits it may generate in terms of efficiency, resiliency and reliability, but also its disruptive power in terms of altering the current functioning of FMIs or even challenging their very reason of existence.

Although trading venues may be among the less affected institutions, the data recorded at the moment a transaction is executed would be the data required for settlement. Transactions could be automatically matched and locked-in for settlement.

DLT with information on assets holdings in multiple levels through simple accounting structures could weaken custodian and sub-custodian aggregated value to the securities processing chain and hamper their ability to sell packages of services to customers as they do today. In a prevailing near real-time gross settlement environment, an entity to centrally clear the transactions and assume the responsibility of settlement through the novation of the original contracts might be no longer needed. Collateral requirements would also be reduced. The decentralization of information recording on assets, contracts and transactions enabled by DLT could challenge the very reason for creating TRs.

Customer expectations would be to see a reduction of costs related to securities processing and, since counterparty risks have the potential to be reduced, investors may transact more directly among themselves.

### ***Challenges for DLT implementation in capital markets***

Scalability is one feature that must be addressed in order to ensure that enough large datasets are in place if any core part of the capital markets systems is to be replaced by DLT. Moreover, there will be very high standards set for the security, robustness and performance of DLTs and integration with existing non-DLT systems will also be a requirement for implementation purposes. Traceability of the data may be particularly relevant for ensuring compliance with KYC and AML requirements. Traceability requires the preservation of data integrity – data cannot be lost, damaged or tampered with. The integrity of the data is essential to the safety of the arrangement, as well as its immutability.

DLT can increase legal risks if there is ambiguity or lack of certainty about an arrangement's legal basis. Because the application of this technology to FMIs activities is new, the regulatory framework for certain activities may not yet be well established. For a while, DLT has been seen as a means to carry out transactions without the intermediation of financial institutions and/or infrastructures in order to simplify the operations and costs involved. However, financial markets work in an organized, controlled and regulated way, so it is becoming increasingly clear that formal and clear rules, together with accountable governance are a prerequisite for assuring the achievement of this technology's potentialities. Sound governance arrangements are necessary in order to determine the rules regarding functionality, risk management, and access to the network, as well as which entities are responsible for maintaining and modifying the protocol.

Operational risks arise through the adoption of new technologies and, more importantly, by the simultaneous maintenance of old and new technologies that interact. Therefore, migration and integration between technologies are important sources of risk. Specific and well-designed transition plans are needed in order to ensure that operational risks are identified, measured, controlled and minimized.

### ***Perspectives and plans for DLT in financial markets***

Considering the potential benefits generated by DLT as well as its disruptive power, industry participants, regulators and technology firms have been organizing themselves and building their understanding and perspectives on the subject.

A concern for regulators, especially central banks, is how DLT implementation would interact with the existing risk-management frameworks to promote safety and confidence in payments and securities transfer processes. A key consideration that may affect the assessment and adoption of DLT solutions is whether a change to one aspect of the payments, clearing and settlement processes simply redistributes the risks among players or, worse, increases the overall risks in those activities. Central banks, as both overseers and operators of payment systems, cannot afford to ignore its potentially disruptive power and the financial stability consequences.

For the members of other FMI associations such as ECSDA, DLT may make certain services unnecessary and, at the same time, create the need for additional infrastructure services such as private key and smart contract management provided by trusted and regulated institutions like CSDs. Hence, ECSDA's members see the use of DLT not in replacement, but as a supplement to their core CSD systems.

For technology providers, there was speculation that DLT could develop in the sense of providing an equivalent level of risk mitigation as clearinghouses, although it was recognized that it would require regulators to feel "comfortable". In contrast, there was also the belief that clearinghouses would implement some type of blockchain solution to increase efficiency, auditability, and transparency, maintaining the existing infrastructure.

### **Challenges related to cyber-resilience**

Cyber-crimes and technological risks have become the most significant threats to the global financial community. The actors behind cyber threats are of multiple kinds: cyber terrorists, nation states, cyber criminals, hacker activists and insiders; the latter being responsible for 80% of cyberattacks. Insider cyberattacks can be intentional or not, but their preponderance justifies efforts and training with the purpose of increasing the awareness and preparedness of personnel. Publicly disclosed disciplinary actions are also an important prevention mechanism.

Considering that "a chain is no stronger than its weakest link", institutions start with a basic approach and then escalate to more sophisticated tools while planning to respond to attacks. Cyber exercises involve both Intrusion Detection and Prevention Systems (IDS and IPS) and processes for monitoring vulnerabilities. Once an intrusion is identified, the scope and timing of communications should be carefully planned and weighted by senior management. Operational resilience is related to how to keep operations functioning when some part is compromised; the goal being to reduce the impacts for clients, markets, and countries.

The impacts of cyberattacks to FMIs are essentially of the same nature as to other financial institutions. Nevertheless, FMIs are risk consolidators and their networks usually link a great number and variety of institutions. Moreover, the operations involved are considered systemically important and, as a result, critical to the financial system stability. Therefore, considering its central role and potential ramifications, a cyberattack involving FMIs is very likely to generate impacts at multiple levels - investors, institutions and governments.

### **Internationalization experiences and their contribution to FMI development**

Acting in a global arena and participating in international capital flows is an unequivocal sign of success for financial institutions in general. Cross border links have developed over the last three decades as a result of the diagnosis that the internationalization of infrastructures would result in: i) broader and better services to local market stakeholders, investors, intermediaries and issuers, and ii) the consolidation of the local capital markets through the strengthening of their infrastructures.

There are some types of cross-border links that are relatively easy to implement and allow for local investors to access a foreign market. The extent of the participation of CSDs in those links may vary, and usually a chain of intermediaries and custodians play a relevant role in the arrangement. Other links involve the coordinated connection between different parts of the transaction chain such as Exchanges, CSDs, SSSs and CCPs. In some markets, CSDs and other infrastructures have certainly experienced a visible development as a result of their “internationalization” initiatives, in terms of markets attended, number of participants and customers, as well as products and services offered.

There is consensus that opening access to international investors and issuers and allowing domestic firms and investors to issue and invest abroad can generate positive effects in securities markets. However, opening the market requires a certain level of development and maturity. If the level of internal securities liquidity is rather low, the economic conditions are not sufficiently attractive for foreign issuers and investors are not sophisticated enough to demand international products, the existing market can be exported to other more attractive venues.

Although internationalization has the capability of promoting capital markets’ development, as well as economic growth and stability, the experience shows that some concrete circumstances and specificities will determine whether those outcomes will materialize or if the results will be rather neutral or even negative in terms of local market progress.

Cross-border links involving FMIs are key to operationalize the integration of markets. The willingness of issuers, intermediaries and investors is a crucial driving force, but the implementation of cross-border links involves the FMIs and the regulators of linked markets. The design and features of cross-border arrangements among CSDs/SSSs presupposes a certain level of regulatory harmonization, standardization and, sometimes, technology integration. Impediments such as corporate actions processing, and taxation procedures may hold back the potential of internationalization as a factor of development.

## Issues for consideration and recommendations

According to McKinsey&Company (2017), FMIs have been growing steadily in recent years and above the average in the financial services industry. However, in a time of disruptive technological change and evolving regulation, FMIs are required to permanently evaluate their strategies in order to leverage the existing capabilities and to perform new roles. In a scenario where potentially, disruptive technologies are imminent and financial systems everywhere are being challenged to provide products and services in a more efficient way and at lower costs, ACSDA members should step forward as leaders in this changing environment.

### ***Reevaluation of the core business model***

Considering the requirements imposed by the PFMI, the CSD/SSS that adopt a deferred netting schemes for clearing and settlement (DVP models 2 or 3) should calculate the netting efficiency of such arrangements. The PFMI requirements for the CSD/SSS in terms of risk management tools and systems are significant. The investments and controls that need to be developed can only be compensated if the efficiency achieved by the netting is also relevant. From the perspective of participants, there is the risk that market participants enjoy a small reduction in terms of settlement obligations that does not offset the collateral required by the CSD/SSS. In this case, CSD/SSS should consider adopting gross settlement model – DVP model 1.

A similar reasoning applies to the development of central counterparties. These are fairly sophisticated structures that demand a certain level of market development in order to justify their implementation. Markets where netting is not advantageous in terms of reduction of settlement obligations should not engage in building central counterparty functions.

Netting and central counterparty arrangements and structures are a natural result of market development and maturity and not a goal *per se*. By means of imposing sophisticated risk management requirements, the adoption of such features can weaken the FMIs' core business instead of strengthening it.

In the CSD business, one important feature that should be reevaluated by ACSDA members is the account holding structure. Although the PFMI does not require the adoption of beneficial owner account structure, the preference for this model is relatively unambiguous, considering aspects such as rights over securities, segregation of assets and reconciliation procedures. Complexity and lack of adequate legal basis are reasons for not implementing a beneficial owner account structure. For the sake of greater investors' protection, it is recommended that ACSDA members consider the adoption of beneficial owner accounts for assets where ownership is typically more pulverized.

### ***Diversification of products and services***

The diversification to other classes of assets is a major driver of expansion for CSD/SSS. According to McKinsey&Company (2017), FMIs have been expanding services to the buy side, where revenues have grown strongly in the last decade. A key buy side trend has been a shift towards passive investment such as ETFs. Corporate and debt bond trading has also been an area of interest.

The expansion through the development of derivatives markets is a rather obvious recommendation. ACSDA members are very focused on exchange traded derivatives. However, OTC derivatives are a fast-growing market. It is recommended that ACSDA members, which do not operate with a CCP, consider supporting the development of OTC derivatives either through the associated development of collateral management services, or through the establishment of centralized registration functions in a TR. The effort involved in the creation of a TR is significantly lower than in creating a CCP. Besides, a TR can render services to a vast array of financial instruments.

The introduction of securities lending services and repo transactions is very beneficial to the development of capital markets since it promotes liquidity, an additional source of revenue for investors, holders of securities and a mechanism for reducing settlement failures in the delivery process. A relevant obstacle for the consolidation of those markets is the presence regulatory barriers for institutional investors to access them. It is recommended that CSDs work with regulatory authorities in order to reduce regulatory barriers. Also, in countries where naked short selling is allowed, CSDs should adopt a high level of settlement enforcement through buy-in processes.

Trade Repositories have gained relevance in the global financial marketplace especially for OTC derivatives. The OTC can be a sizable and growing market for different types of instruments. The value of central registration has been recognized for other types of assets and contracts and can be key for the development of credit transactions based on the income inflow provided by a receivable, for example. It is recommended that CSDs consider the expansion of activities through the implementation of TR functions. The main risk involved in TR activities is of operational nature and managing operational risk is a CSD expertise as well as the record keeping of positions and transactions.

The expertise involved in recordkeeping, asset servicing and DVP settlement can be used in order to automate, standardize and centralize processes related to funds management with gains in terms of efficiency and cost reduction. Elements such as automation and standardization are powerful tools in the investment funds sector. ACSDA members should also expand service offerings for issuers. This source of diversification can be particularly relevant for CSDs with a strong primary markets business. Some categories of service that deserve consideration are pre-IPO advisory, communications solutions, management services and remote/proxy voting.

The development of products and services specifically oriented towards retail investors are also an important business opportunity for CSDs. Potentially even more relevant where the institutional investors base is in earlier stages of development and individuals are looking for new investment opportunities. Although retail investor transactions may correspond to a relatively small volume, they have a great potential of developing the investment culture in the marketplace.

For expanding the relationship base, educational initiatives are paramount and CSDs should dedicate time, financial and human resources in order to improve the level of financial knowledge of participants, issuers and investors. CSDs should also support participant educational initiatives or even create requirements related to educational programs that must be implemented by participants.

### ***Adoption of new technologies***

The recommendation for ACSDA members is to elect one product or service that is not a core business to introduce DLT technology. This could function as a sand box for further developments and a learning environment for the people involved, without affecting the core of the CSD. It could then be progressively expanded to other existing businesses from more satellite processes to ones that are closer to the core. Meanwhile, the expectation is that DLT implementation cases would multiply and the current challenges would have matured if not been solved.

### ***Cybersecurity***

It is recommended that ACSDA members work together, possibly in a dedicated specific task force, in order to discuss and eventually adopt a shared solution for dealing with cyberattacks. However, this is a rather medium or long-term project and the approaches to cybersecurity should differ significantly depending on the size and amplitude of the market. A first step could be to implement an information sharing agreement and protocol through which cyberattack events or attempts could be communicated without compromising the safety and reliability of the CSDs.

### ***Internationalization and regional integration***

CSDs should evaluate carefully the benefits of partnerships against the required investment. If the tie-up is limited to order-routing and cross-trading, or perhaps a form of cross-membership, it is not likely to lead to a step change in volumes or revenues. Other challenges include diverse tax regimes and unmatched clearing and settlement processes. Moreover, regional diversification should in most cases not be the focus of expansion strategies, given the difficulty of achieving a significant increase in revenues.



## I. Introduction

The Americas' Central Securities Depository Association (ACSDA) has recently celebrated its 20<sup>th</sup> anniversary. From the initial 8 (eight) founding members, ACSDA counts now with 30 (thirty) members from South, Central and North America and South Africa, and the diversity of membership is significant in terms of financial markets' maturity, depth, coverage, and size.

During the last two decades, ACSDA has worked as a catalyst for its members for the exchange of knowledge and experience about industry perspectives, trends, best practices and about each other. Through General Assemblies, seminars, leadership forum events, working groups and task forces, members influenced one another on how to proceed with their businesses, considering the specificities of their local realities. Alliances and links were formed in the period. Also, since its creation, ACSDA has been representing its members in the most relevant international events, allowing their views and experiences to take part and contribute to the global debate.

ACSDA's members have lived through critical changes in the financial industry worldwide: a high-speed evolution in the available technology, the rise of a range of alternative trading platforms to be served by financial market infrastructures, an ever-growing diversification and sophistication in product development, the emergence of new types of infrastructures, such as trade repositories, an increase of the awareness of the relevance of financial infrastructures for the welfare of financial stability both locally and globally, and a financial crisis that necessitated all players in industry to review concepts, practices and drivers.

Now, while a leap-forward technology is on the rise, with all potentialities and doubts a paradigm change generates, new standards in terms of recommendations for financial markets infrastructures apply and competition is more than ever the order of the day. This scenario demands ACSDA's members to re-think their businesses strategies, operational models as well as to envisage future perspectives in terms of the products and services they provide, the clients they serve as well as existing and potential alliances.

The objectives of this paper are principally to:

- Explore various aspects of the members' current business models, such as the settlement models, default procedures and the depository account structures, considering the framework provided by the CPMI-IOSCO *Principles for Financial Market Infrastructures* (PFMI);
- Identify opportunities and trends in terms of product and client base diversification;
- Present the main characteristics of blockchain/distributed ledger technology (DLT) and discuss its likely implications for financial market infrastructures (FMI);
- Identify challenges and initiatives in terms cyber-resilience; and
- Discuss "internationalization" as a factor of development both for the individual markets and for the region.

As a result, this paper also aims to raise issues for consideration by ACSDA members in developing their future strategies and, whenever possible, make specific recommendations.

This paper is organized as follows.

Chapter 1 provides a general overview of members' profiles in order to have a view on the different features that may raise different sets of issues and recommendations. Chapter 2 discusses aspects of the members' current business models, considering the PFMI framework while chapter 3 seeks to identify opportunities and trends in terms of product and client base diversification. In chapter 4, there is a presentation of the main characteristics of blockchain/DLT, as well as a discussion of possible implications for FMIs. Chapter 5 in brief identifies challenges and initiatives in terms cyber-resilience while chapter 6 discusses the potential of internationalization as a factor of business expansion. Chapter 7 raises some issues for consideration as well as recommendations. The final chapter is dedicated to the conclusions that may be drawn regarding the current environment.

## II. General profile of ACSDA members

As a pre-requisite for the forthcoming analysis, it is important to undertake an overview of ACSDA members' profiles with respect to aspects such as the type of infrastructure, the securities covered, the settlement model (or delivery-versus-payment model), the account holding model and the complementary services provided.

The reason why such an overview is relevant is that it provides the context for formulating considerations and recommendations. An Exchange owned FMI that acts exclusively as a CSD, principally for corporate and government securities, can hardly have a similar agenda as an FMI that accumulates the functions of a CSD, SSS, CCP and TR for a broader range of securities. Similarly, markets where government securities predominate over private issuances may well face different challenges in terms of product diversification.

Therefore, the ensuing sections are dedicated to presenting an aggregate view on ACSDA's members regarding:

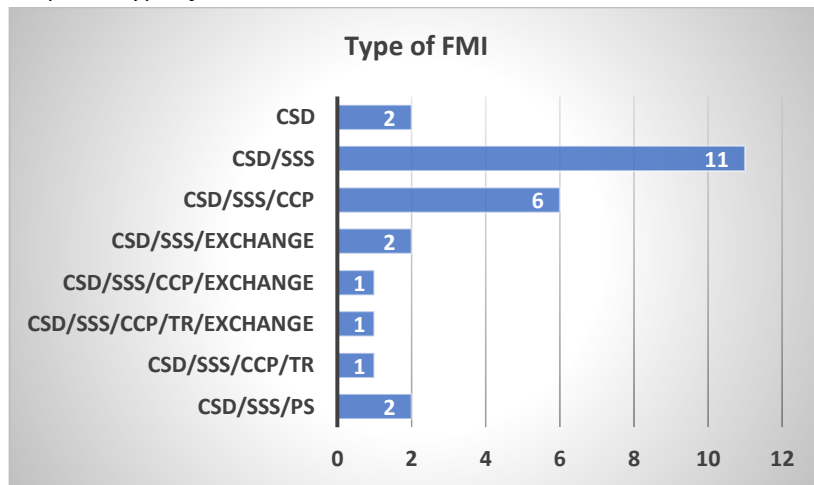
- The type of FMI (CSD, SSS, CCP, TR and PS) and the relationship with Exchanges;
- The securities eligible for the different services provided;
- The settlement model adopted (DVP1, DVP2, DVP3 or any combination of those);
- The account holding system adopted (omnibus, beneficial owner or hybrid); and
- The products and services provided beyond the core business (securities lending, market data, proxy voting and collateral management among others).

The analysis presented below is based on the information available in ACSDA members' profiles, their respective *websites* and specific requests of information submitted in the course of this work.

## 1. Type of Financial Market Infrastructure<sup>2</sup> and the relationship with exchanges

ACSDA, as with other CSD associations, congregates members whose role as FMIs go, usually, well beyond the provision of depository services. Most commonly, they also act as securities settlement systems and, less often, as central counterparties. *Graph 1* below shows how ACSDA’s members are distributed in different categories of combined FMIs.

*Graph 1 – Type of FMI*



Source: ACSDA members profiles and respective websites

The majority of ACSDA members act as a CSD and SSS exclusively, but a number of markets contain a CCP structure as well.

The only FMIs that act as Payment Systems (PS) are central banks so, although payment arrangements are crucial for post-trade activities as well as CSD and SSS links to PS, the management of large value transfer systems are not a core function for ACSDA’s members.

An interesting feature that can be observed is that the development of trade repository functions is still very rare in ACSDA marketplaces. Although many CSDs are involved in the settlement of OTC transactions, those usually involve corporate debt instruments, and sometimes the FMI is only involved in the settlement of the securities leg, and the cash leg is settled privately between the parties. OTC derivatives, which are the main motivation for the creation of TRs, are only present in 2 (two) of ACSDA’s members (B3 and DTCC).

It is a dominant feature among ACSDA’s members that Exchanges are either part of the same legal entity under which FMI’s functions are performed, part of the same holding company as the exchange or, at a minimum, have some degree of equity interest in the FMI. *Table 1* and *Graph 2* show the distribution considering ownership categories and the relationship to Exchanges:

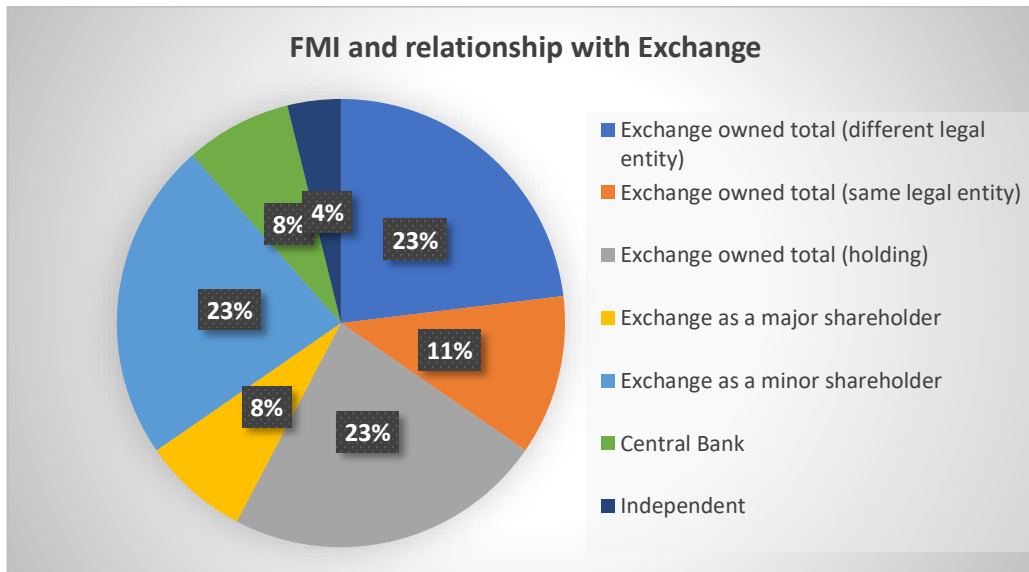
<sup>2</sup> For this Paper, we consider the following FMIs: central securities depositories (CSD), securities settlement systems (SSS), central counterparties (CCP), trade repositories (TR) and payment systems (PS).

**Table 1: FMIs and exchange relationship**

Exchange owned (different legal entity)	6
Exchange owned (same legal entity)	3
Part of the same holding company as an Exchange	6
Exchange is a major shareholder	2
Exchange is a minor shareholder	6
Central Bank	2
Independent	1

Source: ACSDA members profiles and respective websites

**Graph 2 – FMI and relationship with Exchange**



Source: ACSDA members profiles and respective websites

As a result, Exchanges do play an important role in the life of FMIs<sup>3</sup>, not only because they are involved in the securities transaction lifecycle, but also as decision makers.

Historically, in many markets, clearing, settlement and depository services were provided internally by the Exchanges and, at some point, the Exchange decided to segregate those functions in a separate entity, although keeping some level of control either through a holding arrangement or simply as a shareholder.

In some cases, the Exchange remains together with the FMIs in a vertically integrated structure based on the understanding that such a structure is advantageous from a competitive perspective. The vertical arrangement prevails in markets where there is little or no competition yet in the trading arena and the post-trade infrastructures can work as an entry barrier for potential competitors. As a result, while capitalizing on existing synergies, Exchanges protect the trading part of the business. In vertically integrated models, governance policies and specific committees may prove to be important measures in order to prevent conflicts of interest.

<sup>3</sup> Although an important part of the financial system, Exchanges are not categorized as FMIs in the PFMI.

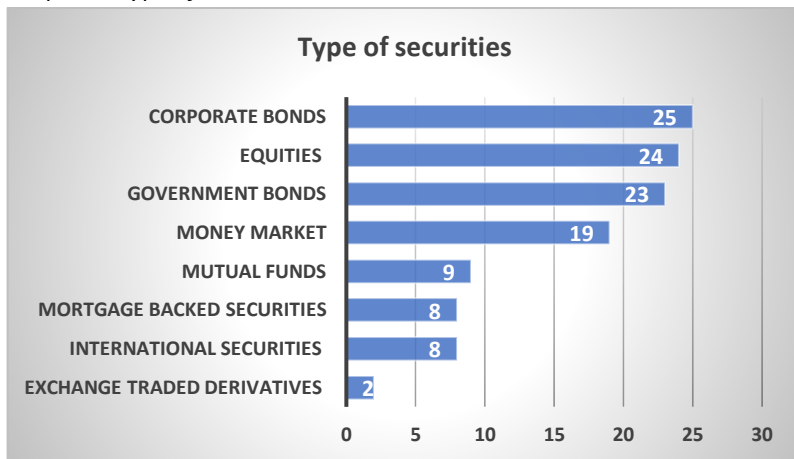
In cases where Exchanges are a major shareholder of the FMIs, their level of influence on the FMIs strategies and decisions may be relevant. Governance arrangements such as the composition of the board of directors, the presence of a minimum number of independent board members, and the existence of risk and audit committees are important mechanisms to ensure an adequate balance of power among the different stakeholders.

In other marketplaces where the Exchange is either a minority shareholder of the FMI or the FMIs is an independent entity, the level of influence is expected to be comparable to other stakeholders.

## 2. Eligible securities

Most of ACSDA’s members provide clearing, settlement and depository services to a variety of securities, mainly equities, corporate bonds, government bonds and money market instruments. Mutual funds quotas and mortgage backed securities are eligible for a fair number of FMIs, but only a few currently have derivatives products as shown in *Graph 3*:

*Graph 3 – Type of Securities*



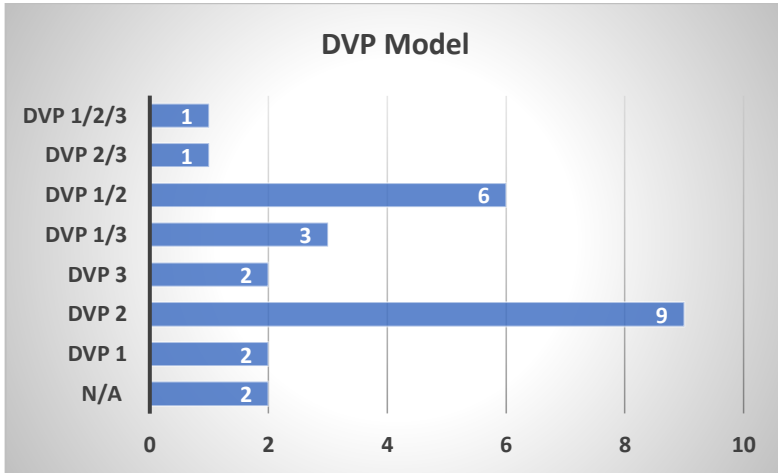
Source: ACSDA members profiles and respective websites

The relevance of those instruments in each market is quite variable. The equity market is the main segment in the most developed and largest marketplaces. Those are also the ones with a greater diversification of instruments. For medium and small size markets, government and corporate bonds play a preponderant role.

### 3. Delivery versus Payment model

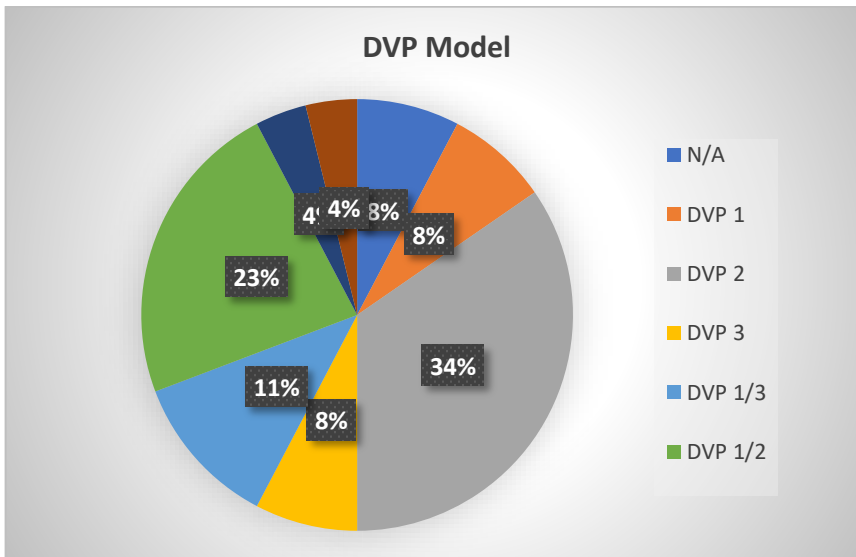
All ACSDA members that act as SSS adopt DVP procedures to settle transactions. *Graphs 4 and 5* below show the distribution of the application of DVP Models 1, 2 and 3<sup>4</sup>.

Graph 4 – DVP Model



Source: ACSDA members profiles and respective websites

Graph 5 – DVP Model (%)



<sup>4</sup> In 1992, the CPSS published a document entitled *Delivery versus Payment in Securities Settlement Systems* where three models are presented:

DVP Model 1 - transfer of securities and funds done on a trade-by-trade basis, with final transfer of securities occurring at the same time as the final transfer of funds;

DVP Model 2 - transfer of securities on a gross basis, with final transfer of securities occurring throughout the day, but funds transfer on a net basis at the end of the day; and

DVP Model 3 - Transfer of both securities and funds on a net basis, with final transfers occurring at the end of the day.

The main model adopted by the members is DVP Model 2 – gross settlement for securities and net settlement for payments. Fewer markets work with DVP Model 3 with net settlement for both securities and payments.

The adoption of a combination of models, as shown in the graphs, are related to different types of securities or different trading venues. For the 23% that settle using DVP 1 and 2, some markets use DVP 1 for settling government securities transactions, and DVP 2 for equities settlements. Other markets settle exchange traded securities in DVP Model 2, but OTC trades in DVP Model 1.

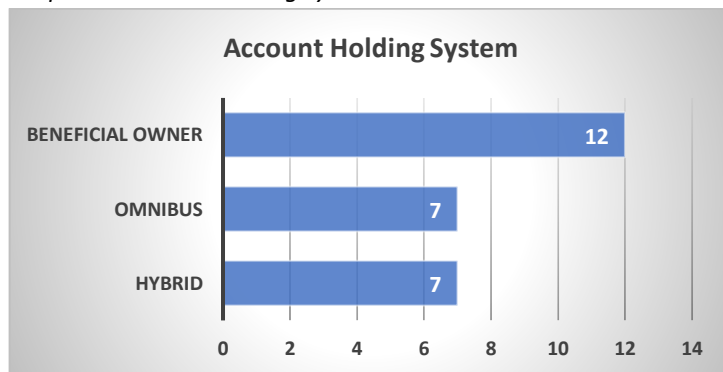
The simultaneous adoption of DVP 1 and 3 (11%) is also often related to the type of securities - DVP 3 for equities and DVP 1 for corporate and government bonds; or, alternatively, to the type of transaction – DVP 3 for secondary market transactions and DVP 1 for primary market operations such as IPOs and follow-ons.

One important issue to be discussed in the following chapters is related to the use of netting settlement schemes by FMIs and the implications for risk management and control. As per the PFMI, netting has significant implications for credit and liquidity risks and policies, procedures, tools and systems are required to cope with default situations even when no central counterparty is in place.

#### 4. Account holding system

Regarding the account holding system used by ACSDA’s members, *Graphs 6 and 7* show the distribution in the use of omnibus, beneficial owner and hybrid systems.

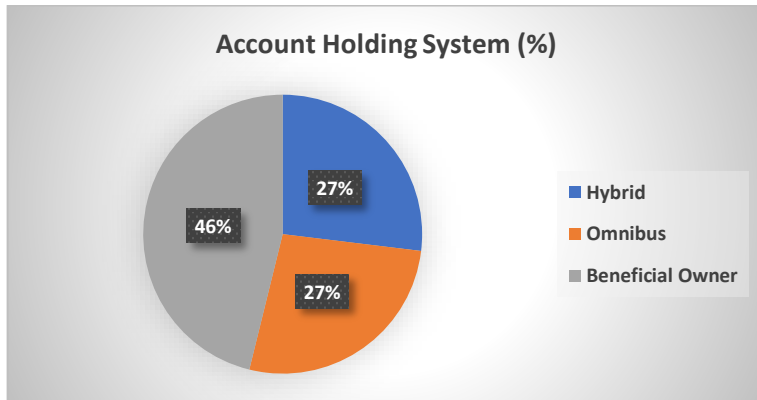
*Graph 6 – Account Holding System*



Source: ACSDA members profiles and respective websites



Graph 7 – Account Holding System (%)



Source: ACSDA members profiles and respective websites

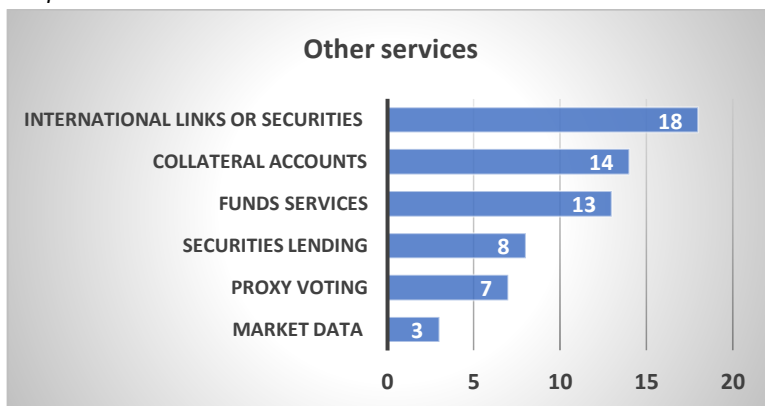
Although beneficial owner account holding systems are predominant since it is used by almost half of the CSDs (46%) in ACSDA, it is noteworthy that in most large marketplaces such as USA, Canada and Mexico, the CSDs adopt omnibus accounts holding systems. In those markets, the high volume of transactions as well as the number of securities could justify the adoption of this model since the processing of instructions at the level of the beneficial owner would entail greater complexity and operational risk.

Also, the same number of markets that have omnibus account holding systems (27%) combine both models in a hybrid solution. In a hybrid account holding system, regulatory requirements may differ according to the type of securities – equities and bonds, the type of investor involved (retail or banks) and the trading modality – exchange or OTC.

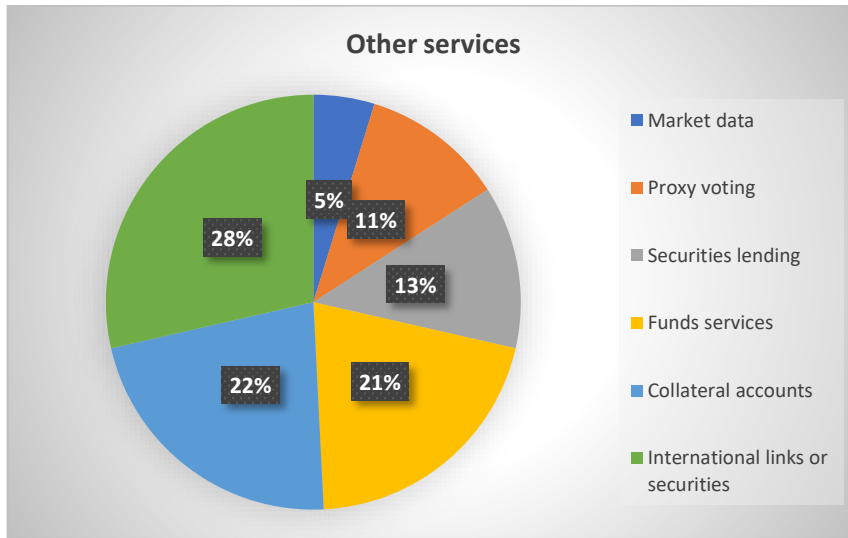
## 5. Complementary products and services

Most of ACSDA’s members have implemented services and products other than those involved in their core business activities as FMIs. These services can be seen as complementary in the sense that they are usually related to the core business. *Graphs 8 and 9* below show a sample of those services:

Graph 8 – Other Services



Graph 9 – Other services (%)



Source: ACSDA members profiles and respective websites

Many of ACSDA’s members either admit international securities as eligible and/or maintain international links with other FMIs. The links mentioned correspond mainly to accounts held in ICSDs, such as Euroclear and Clearstream, either for accepting collateral or for settling local investors’ transactions in foreign markets or local transactions with foreign securities, such as in Mexico and Uruguay. Other important link in the region is the Latin American Integrated Market (MILA) formed by Deceval, DCV, Cavali and Indeval to set up a regional market to trade equities.

Services for mutual funds and collateral accounts are also a common diversification pathway. Less common though are services such as securities lending, proxy voting and market data. Exploring market data has a correlation with the size, depth and liquidity of markets. Proxy voting is a service that depends on the size of equity markets as well as the investor base and the demand for liquidity.

Securities lending, however, has been identified as a prospective market for a long time now. Securities lending generates recognized benefits in reducing settlement failures and can represent an additional source of income for securities holders. However, securities lending still seems to be behind its potential for either regulatory, operational, or cultural reasons that vary from country to country.

### III. Clearing, settlement and centralized deposit – considerations and challenges imposed by the PFMI

#### 1. The evolution of international recommendations for FMIs and the assessment and disclosure framework introduced by the PFMI

The financial markets infrastructure landscape has changed materially since the first recommendations were published by the BIS and The Group of 30 in late 80's<sup>5</sup>. These documents launched the discussions on what could be done in order to improve the functioning of securities markets and payments systems.

In the 90's, the risks involved in post-trade activities were examined in detail and concepts such as delivery versus payment, same day funds and central bank money were shaped and established as best practices for the settlement of financial transactions<sup>6</sup>. The importance of large-value funds transfer systems used to settle financial market transactions<sup>7</sup> was also broadly recognized.

In 2001, the CPSS produced the *Core Principles for Systemically Important Payment Systems* and, jointly with the Technical Committee of IOSCO, the *Recommendations for Securities Settlement Systems*. In 2004, CPSS-IOSCO published the *Recommendations for Central Counterparties* in order to set out comprehensive standards for risk management of a CCP.

Until that moment, the recommendations for promoting financial stability were more focused on the adequate management of credit, liquidity and principal risks. Custody risk had not yet been considered a major source of systemic risk and no specific recommendations had been issued for CSDs, although some aspects were addressed in the recommendations for SSSs. Also, OTC markets were mostly off the radar of regulators and policymakers, although in some markets, OTC derivatives trades were already required to be registered and the first TRs were being launched around mid-2000's.

The 2008 financial crisis placed new light on international recommendations which were reviewed with respect to the already covered FMIs (SSS, CCP and PS) and had its scope expanded in order to incorporate CSDs and TRs. In 2012, CPMI-IOSCO published compiled recommendations for financial markets infrastructures as well as an assessment methodology so that FMIs around the globe could and should self-evaluate, rate themselves against each applicable principle, identify the gaps and elaborate action plans and implementation timeframes. More specifically, the assessment methodology demands FMIs to grade themselves in relation to their level of observance to each principle (observed, broadly observed, partially observed and not observed).

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<sup>5</sup> G-30: *Clearance and Settlement Systems on the World's Securities Markets* (1989)

BIS: *Report of the Committee on Interbank Netting Schemes of the central banks of the Group of Ten countries (Lamfalussy Report)* (1989).

<sup>6</sup> CPSS/BIS: *Delivery versus Payment in Securities Settlement Systems* (1992).

<sup>7</sup> CPSS/BIS: *Real Time Gross Settlement Systems* (1997)

In the current FMI environment, local authorities such as central banks and securities commissions are committed to the oversight that the self-assessment is completed by all FMIs in their jurisdiction, the gaps are identified, and plans are made to overcome them. External assessors, including the international financial institutions, use the assessment methodology to determine observance of the principles and responsibilities by FMIs and authorities. The International Monetary Fund (IMF) and the World Bank, in particular, are using the assessment methodology as part of their Financial Sector Assessment Program (FSAP) and their technical assistance programs. In conducting their assessments, external assessors have as an objective the identification of risks to global financial stability and potential areas for improvement.

In other words, the PFMI established a new level of international oversight on local FMIs with the purpose of developing policies, implementing assistance programs and, most of all, assuring, to the extent possible, the financial stability worldwide. As a result, most FMIs in the world have now completed their self-assessment and many FSAP reports have already been issued.

One clear example of such international oversight was the ACSDA project for supporting members' self-assessment, sponsored and financed by the IADB, and implemented during 2017/2018. A total of 13 FMIs in 12 jurisdictions successfully completed their self-assessments<sup>8</sup>. Most of ACSDA's members that did not participate in this initiative had already completed and published their self-assessments as established in the disclosure framework guidelines.

## 2. Current requirements in risk management and some implications for clearing and settlement

In the PFMI, the assessment of risks in general is very comprehensive and detailed. Regarding risks originating from **clearing and settlement processes**, the PFMI addresses specifically:

- Credit risk (Principle 4);
- Collateral (Principle 5);
- Margins (Principle 6); and
- Liquidity risk (Principle 7).

The objective of this section is not to review those principles, but rather to discuss some aspects that have concrete implications for ACSDA's members on the design of their operational models and the conducting of their business. Therefore, we will focus on the implications of **credit and liquidity risk principles to non-guaranteed DNS SSSs**, since over 80% of ACSDA's members that act as SSSs (and not CCPs) managing non-guaranteed net settlement systems, either through DVP models 2 or 3.

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<sup>8</sup> In order to support the project, ACSDA – IADB hired the consultancy firm *Grupo de Consultores Internacionais (GCI)*, composed by experts from Brazil, Chile, Mexico and United States. The project comprised four phases: a workshop in Panama, held in May 2017, the one-one support for answering the self-assessment questionnaire, according to the disclosure Framework, on-site visits to each market with the involvement of regulators and the final assistance for the production of the final reports.

For SSSs employing DNS settlement models, a SSS may settle securities on a gross basis and funds on a net basis (DVP model 2) or settle both securities and funds on a net basis (DVP model 3). The PFMI states that, in an SSS “that does not provide an explicit settlement guarantee, participants may face **settlement risk** vis-à-vis each other if a participant defaults on its obligations. Whether this settlement risk involves credit exposures, liquidity exposures, or a combination of both will depend on the type and scope of the obligations, including any contingent obligations, the participants bear. The type of obligations will, in turn, depend on factors such as the SSS’s design, rules, and legal framework.”

A SSS faces counterparty **credit risk** when it extends intraday or overnight credit to participants which is not the case for ACSDA’s members. However, it remains that their participants are subject to credit exposures to each other.

PFMI’s principle 4 on **credit risk** determines that, even when no credit is extended by the SSS itself, “if credit risk exists between participants, the SSS should provide the capacity to participants to measure and monitor their current exposures to each other in the system or adopt rules that require participants to provide relevant exposure information”. Additionally, in order to manage the credit risk arising from a participant default, the SSS should establish exposure limits and require collateral from its participants in order to avoid unwinding transactions or to mitigate the effect of an unwind should a participant default on its obligations. Moreover, collateral maintained by the SSS should be “at a minimum, sufficient to cover the exposures of the two participants and their affiliates that would create the largest aggregate credit exposure in the system”<sup>9</sup>.

It is important to clarify that those requirements were somehow present in the Recommendations for SSSs, *recommendation 9 on CSD risk controls to address participants’ failures to settle*. However, the PFMI are more detailed in segregating the risks incurred directly by the SSS through credit extension and the risks incurred by the participants through their respective exposures to each other, as well as in defining SSSs direct responsibilities to prevent spillover effects of poorly managed credit risk in terms of financial stability.

**Liquidity risk**, for its part, arises in a FMI when it, its participants, or other entities cannot settle their payment obligations when due as part of the clearing or settlement process. In SSSs that use a DVP model 2 or 3 and do not guarantee settlement, participants may face liquidity exposures to each other if one of the participants fails to meet its obligations. These types of systems may address a potential settlement failure by unwinding transfers involving the defaulting participant, thus imposing liquidity pressures on the non-defaulting participants. Besides, the settlement finality is not assured as preconized by the PFMI,

PFMI’s principle 7 on **liquidity risk** establishes that “an SSS, including one employing a DNS mechanism, should maintain sufficient liquid resources in all relevant currencies to effect same-day settlement (...) of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions”.

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<sup>9</sup> This corresponds to key consideration 3 of Principle 4 of the PFMI *Disclosure Framework and Assessment Methodology*.

Principle 7 also recognizes that a FMI that employs a DNS mechanism may be able to reduce its or its participants' liquidity risk by providing participants with sufficient information or control systems to help them manage their liquidity needs and risks. Furthermore, a FMI should have the operational capacity to reroute payments, where feasible, on a timely basis in case of problems with a correspondent bank. To mitigate and manage liquidity risk stemming from a participant default, a FMI could use exposure limits, collateral requirements, and prefunded default arrangements.

Thus, SSSs that use DVP models 2 and 3, are fully subject to principles 4 and 7 even if settlement is not guaranteed. The SSS has to bear the costs involved in maintaining: i) tools and systems for participants to monitor their credit and liquidity exposures to one another; ii) procedures and systems for collecting and managing collateral posted by participants, including marked-to-market capabilities and the application of haircuts, and iii) liquidity arrangements with banks, providers and/or the central bank for coping with effects of participants potential defaults. The participants, on their turn, have to bear the costs of collateral requirements made by the SSS.

At this point, one could ask if the benefits resulting from netting obligations in DVP models 2 and 3 are not offset by the costs of managing adequately the credit and liquidity risks potentialized by the netting. Alternatively, FMIs could employ DVP model 1 and settle transaction by transaction.

In markets where the number and the volume of transactions are substantial, it is likely the netting efficiency<sup>10</sup> is sufficiently powerful to justify the maintenance by the SSS of monitoring functionalities, the collateral management systems, the liquidity arrangements and the posting of collateral by participants. In other words, in those cases, settling transaction by transaction could represent greater credit and liquidity pressures for both the SSS and the participants.

By contrast, whereas the number and the volume of transactions are low so that the netting efficiency is also low, the savings in terms of liquidity may not be enough to support the costs involved in maintaining the risk management infrastructure as well as for the collateral posting.

In the same way that the implementation of a central counterparty is not justifiable in all markets, depending on its features, the adoption of netting schemes for settling transactions needs to be weighed against the risk management implications. The PFMI made this debate more explicit as can be seen in the specific key considerations and questions of its assessment methodology. Simulations might be made in order to assess the impacts of different DVP models, and bilateral netting can also be considered as possibility.

### 3. Considerations on participant default rules and procedures

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<sup>10</sup> Netting efficiency measures how much (in percentage terms) the total quantity of resources for settlement is reduced by the use of netting in comparison to the resources needed when transactions are settled on a gross basis. The higher the netting efficiency the lesser is the need for resources and greater the savings in terms of liquidity.

Although participant default has been discussed in the previous section, the perspective there was related to the impacts of a default in credit and liquidity exposures. The purpose here is to make some considerations in terms of the responsibilities of FMIs in participant default situations.

Principle 13 of the PFMI establishes that an “FMI should have default rules and procedures that enable the FMI to continue to meet its obligations to non-defaulting participants in the event of a participant default”. The fundamental aspects of this framework are the definition of what circumstances constitute a participant default and whether the declaration of default is automatic or discretionary, and if discretionary, which person or group shall exercise that discretion. Once the default is identified and declared, there should be rules and procedures comprising: i) the actions that an FMI can take when a default is declared; ii) the potential changes to the normal settlement practices to ensure timely settlement; iii) the management of transactions at different stages of processing; iv) the probable sequencing of actions; and v) the roles, obligations, and responsibilities of the various parties.

One important clarification when discussing default rules and procedures is that we refer specifically to the inability of a FMI's participant to settle transactions that have already been accepted by the FMI, meaning that the failure is related to the settlement and not to the trade. The trade has been executed, registered and accepted by the FMI, thus generating delivery and payment obligations. Participants may fail to fulfill those obligations, but the trade is not cancelled. In cases where failed settlements void the transactions that originated the obligations, this could represent a mechanism for manipulating the market through intentional settlement failures.

Considering the fundamental aspects of the definition of the default event and those responsible for declaring the default, it is pertinent to assess if the FMI managing the settlement, including coordinating the DVP, is the one that has the power and the capability to declare a participant's default.

In FMIs that combine SSS/CSD structures with Exchanges, as it is the case for 88% of ACSDA members, the roles and responsibilities related to the treatment of default may be not so well defined. In those cases, one point for ACSDA's members to consider is whether the responsibility for declaring a default belongs to one entity while the actions related to handling the default and assuring the continuity of settlement belongs to another entity.

Regarding the procedures involved in default management; although they are usually well established in practical terms, it is of utmost importance to have a documented description of the sequenced actions as well as of the obligations and responsibilities of the various parties involved.

A participant default event, as mentioned in the previous item, might trigger circumstances of credit and liquidity risk materialization where the FMI is untested in its ability to contain contamination effects. Undocumented procedures for dealing with participant defaults are a source of uncertainty that could worsen an already challenging situation.

#### 4. Current requirements for central securities depositories



For CSDs, the PFMI provides a structured framework for central safekeeping and securities management with requirements in terms of asset segregation, legal rights over securities and reconciliation procedures.

The level of dematerialization is a concern, and specific safety requirements apply to CSDs that maintain physical securities. However, CSDs should have plans for eliminating, as much as possible, physical certificates or documents of title that represent ownership of securities so that securities exist only as accounting records. Immobilized securities allowing for book-entry records and transfers are a minimum standard that should be pursued.

The PFMI recognize more explicitly the role of CSDs in ensuring the integrity of securities issues. As per principle 11, in order to preserve the rights of issuers and holders of securities, CSDs should “employ appropriate rules, procedures, and controls to safeguard the rights of securities issuers and holders and prevent the unauthorized creation or deletion of securities” as well as “maintain robust accounting practices and perform end-to-end auditing to verify that its records are accurate and provide a complete accounting of its securities issues.”

To further safeguard the integrity of the securities issues, CSDs should conduct an at least daily reconciliation in order to ensure that the total number of securities recorded in the CSD for a particular issue is equal to the amount of securities registered to the CSD in the issuers’ books. If the CSD is not the official securities registrar for the securities issuer, reconciliation with the official securities registrar is required.

A CSD should prohibit overdrafts and debit balances in securities accounts to avoid credit risk and reduce the potential for the erroneous creation of securities. If a CSD were to allow overdrafts or a debit balance in a participant’s securities account in order to credit another participant’s securities account, a CSD would effectively be creating securities and would affect the integrity of the securities issue.

Although previous recommendations regarding the safekeeping of securities already focused on the protection of assets and collateral held by CSDs on behalf of participants and/or beneficial owners, the current PFMI framework is more explicit in stating that the CSD must have rules and procedures consistent with its legal framework and robust internal controls to “protect assets against custody risk, including the risk of loss because of the CSD’s negligence, misuse of assets, fraud, poor administration, inadequate recordkeeping, or failure to protect a participant’s interests in securities or because of the CSD’s insolvency or claims by the CSD’s creditors”. In this regard, CSDs should even consider maintaining insurance policies or establishing compensation schemes to protect asset holders.

One key element for protecting assets and collateral is related to the level of segregation of the account holding system. The PFMI requires that CSDs maintain an account holding system that enables, through the provision of separate accounts, the segregation of participants’ securities from those of the CSD and from other participants. Furthermore, whenever legally possible, CSDs should support operationally the segregation of securities belonging to a participant’s customers on the participant’s books and facilitate the transfer of customer holdings to another participant.

The PFMI do not require that CSDs maintain beneficial owner account holding systems. Nevertheless, they recognize that a higher level of account segregation helps to provide better protection against the potential claims of creditors of a participant in the event of its insolvency. Some CSDs maintain systems that allow for the segregation of participants' proprietary positions from those of customers, but not among the customers themselves. Other CSDs allow full segregation through an individualized account holding system.

Among ACSDA members, as noted before, beneficial owner account holding systems are predominant but large marketplaces have adopted omnibus accounts holding systems. Some of the latter are weighting the legal and operational barriers for developing a beneficial owner structure. The risks identified are mainly related to (i) uncertainty of shareholders rights; (ii) custody risk, especially involving unauthorized use of securities, theft, and fraud; (iii) favorable environment for trading internalization at the custodians' level; and (iv) tax evasion.

Another relevant aspect of this discussion for ACSDA members is related to the complications created by different types of account holding systems for the development of operational agreements, such as of MILA, or other internationalization/cross border initiatives.

## IV. Products and services diversification and broadening the participant and investor base

The 2019 edition of the WFC Global CSD conference dedicated part of its agenda to the discussion of innovation and diversification in the CSD industry. The development of non-core services has also become a hot issue for CSDs around the globe. CSDs have been trying to develop their businesses in new ways and are looking closely at products and services that could generate new sources of revenue from the traditional participants and customers, but that also have the potential of attracting new customers.

ACSDA members for the most part have a product and service portfolio centered around the core businesses of central safekeeping, clearing and settlement. Some markets have developed derivatives, repo, securities lending and mutual fund services, but the liquidity of those markets is still, with a few exceptions rather low. The cases where ACSDA members ventured into developing services and products beyond the shade of the core business parasol are noteworthy but rare.

In all cases, it should be considered that the maturity curve of product development encompasses many aspects. The first one is the maturity and liquidity of the cash market that underlies those derived products. Also, the cultural barrier that should be overcome through an intense educational process both of industry intermediaries and investors.

### 1. Product and services diversification and innovation

#### ***Around the Core Business***

The first approach to product and services diversification is to consider those that are based on the FMI's core business and have a recognized potential to support market liquidity, price disclosure and risk management in securities settlement. Such is the case of derivatives, repo and securities lending markets that help intermediaries to fund their positions and prevent failures. Although those products and services do not strictly belong to the core business of CSDs and SSSs, their implementation is related to the improvement of the core functions.

### *Derivatives*

The demand for risk management tools and hedging capabilities grows as financial instruments and investment strategies became more sophisticated and, consequently, the derivatives market developed as an indicator of financial and economic development in many countries. As macroeconomic policies become more credible and inflation gives signs that will remain low, the demand for financial services grows. As financial markets develop and get more sophisticated, risk management becomes increasingly relevant and derivative instruments play a fundamental role in this positive movement.

Derivative markets can be exchange traded or traded over the counter (OTC). For historical and structural reasons, most ACSDA members have developed or envisage the development of exchange-traded derivatives markets, cleared and settled by a central counterparty. For some of those with active derivatives markets, some factors that contributed for developing this market are a favorable regulatory environment, economic and fiscal incentives and the initiative of market participants and/or foreign investors, besides direct action taken by the exchange and the CCP<sup>11</sup>. The role of a CCP has been key for the development of an exchange-traded standardized derivatives market since risks need to be centrally managed and settlement should be guaranteed. Risk management involves the control of open positions, the measurement of credit exposures and the management of collateral posted.

However, for the last decade, many international organisms have focused their attention on the OTC derivatives markets both for their size and because exchange-traded derivatives tend to be considered sufficiently safe and regulated. One of the main issues around OTC derivative markets is the lack of transparency in trading and the lack of information on the overall level of exposures. The recommendation prevailing since 2007, and reinforced in 2012, is the centralized registration of OTC transactions in *trade repositories* (TR)<sup>12</sup> as a mitigating mechanism to system risk. Note that this creates a favorable condition for existing CSDs and SSSs to provide TR services not only for OTC derivatives transactions, but for all OTC transactions in bonds, for instance.

### *Repo and securities lending*

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<sup>11</sup> FIAB - *Diagnóstico y recomendaciones para remover inhibidores micro que restringen el desarrollo de los mercados de capitales y la inversión transfronteriza en la región*, September 2015

<sup>12</sup> CPMI – IOSCO - *Principles for financial markets infrastructures*, April 2012

Repo and securities lending markets play a key role in enabling the flow of cash and securities around capital markets<sup>13</sup>. First, repos are used by market participants seeking to finance trading activities that support market liquidity and narrow pricing discrepancies through arbitrage. Leveraged financial institutions may also use repos to fund purchases or cover short sales. For dealers, repos support their market-making activities thus enhancing market liquidity. By enabling the reuse of securities in the market and short selling, securities lending facilitates greater liquidity and price disclosure.

Second, by improving the ability of investors to settle trades and meet margin requirements, repos and securities lending support market stability and resilience. Market participants indicated that deeper repo markets with longer maturities would facilitate funding of positions in emerging markets, thus reducing their need to exit positions in periods of market stress.

Finally, in some countries, repo markets facilitate the asset and liability management of long-term investors such as pension funds. Such investors can borrow cash against government bonds and use the resources to reinvest in bonds of longer duration. However, sometimes regulations prohibit insurance companies and pension funds to access these markets because of the potential leverage risks involved.

### ***Beyond the Core Business***

Beyond those services that are related to the development of CSDs and SSSs core businesses, there are opportunities of leveraging the FMI technology and systems in order to develop other business lines.

#### *Trade Repositories (TRs) – Derivatives, Bonds and Receivables*

As discussed previously, TRs are a relatively new type of FMI, but one that has rapidly gained relevance in the global financial marketplace.

Spearheaded by the 2008 financial crisis, the development of centralized repositories of trade information for OTC transactions, especially derivatives, has been included in the agenda of FMIs, regulators and oversight organisms as a necessity. In the last decade, centralized registry is a concept that has evolved to other OTC transaction types as well as to other financial assets and contracts.

Although many markets have not yet reached the level of sophistication and complexity that led to the overall lack of control of risk exposures, OTC transactions might be sizable and growing for different types of instruments such as government and corporate bonds. In some markets, centralized registration might be legally required. The advantages in terms of post-trade transparency and price disclosure are clear. The ability to oversee and, consequently, measure aggregate risk exposures enables the prevention of extreme situations that can be disruptive not only for the direct risk taker, but to the entire financial system due to the intricate existing correlations and relationships.

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<sup>13</sup> BIS - *Establishing viable capital markets*, CGFS Papers, No 62, January 2019

The role of TRs can go beyond promoting post-trade transparency and proper risk assessment, management and mitigation. The registration of assets in a centralized manner allows that liens made upon those assets are also recorded and identify the beneficiary of the contract. As assets can be used as collateral for a variety of transactions, the mandatory and centralized registration assures the unicity of the lien, hence preventing fraudulent use of one same asset as collateral for more than one transaction. This assurance is key for developing certain markets and products such as receivables investment funds or other credit transactions based on the income inflow provided by the underlying receivable.

All markets have the potential of securitizing receivables, independently if they are commercial receivables such as forward purchase instalments or financial receivables such as credit or debit cards bills. The securitization of receivables is beneficial for the development of the credit market. An essential condition for this to happen is the assurance of the unicity of the lien established upon the underlying asset, and TRs can play this important role. Obviously, registration obligations, responsibilities and controls must have a sound legal basis and an adequate level of enforcement.

#### *Fund services*

FMI can leverage their existing systems and communications network to support a series of processes in the area of investment fund administration. CSDs and SSSs usually have a proprietary network to communicate with a broad range of players such as investment managers, brokers, dealers, banks and other financial services firms that provide fund services to the market.

The specific expertise involved in recordkeeping, asset servicing and DVP settlement can be used in order to automate, standardize and centralize processes thus enhancing efficiency and reducing costs and risks in fund management administration. Features such as automation and standardization are powerful tools in the investment funds sector where many companies still rely on phone calls.

Information services can also make an important contribution to this market by means of consolidating data, promoting transparency and developing price references.

#### *Remote and proxy voting*

Companies with good corporate governance standards attract investor interest and strengthen capital markets. Investors are then encouraged to participate in the company's decisions by voting in general assemblies as much as possible. In order to support a broad participation of investors, remote and/or proxy voting services have developed in many markets and providers are well established businesses.

Remote and proxy voting services allow for consolidation of voting intentions, usually at the level of the local custodians and, although the process might still be somewhat bureaucratic, voting intentions can be instructed

remotely from different parts of the country or from abroad. Ultimately a combination of proxy voting providers and the local custodian networks is what enables foreign investors to participate in general assemblies around the globe.

Nevertheless, in many markets, the shareholder base is still not sufficiently large or diversified to justify the development of such services and/or the legal and regulatory framework does not recognize votes that are not cast personally during the assembly or shareholders' meetings. The trend is that legal and regulatory barriers are removed and that all efforts are made in order to promote a higher level of participation.

Should this be the case, CSDs might have the opportunity to play a relevant role where proxy voting providers are not yet a dominant player. Leveraging the communication network already established with both custodians and issuers, CSDs can function as a hub for receiving and consolidating remote/proxy voting instructions. The potential gains of such services are enhanced in a beneficial owner environment where individuals can cast their votes directly to a centralized system and the CSD can consolidate information in different ways.

This type of service can be beneficial for both issuers and investors. First, it helps to achieve the goal of expanding investor participation in company decisions. Second, it reduces the bureaucracy and costs involved in the voting process. Through greater automation, it also reduces the time involved in the process thus enhancing the conditions for foreign investors to vote. Lastly, it promotes transparency in the voting process since the centralized registration enables the development of automated reconciliation procedures.

#### *Data services and analytics*

Exchanges have been commercializing market data for a while as investment decisions have become less and less an individual choice, but rather a result of algorithms and robots. Abundant and accurate information provided in a timely fashion adds a lot of value to the entire intermediation industry, exchanges and of course investors.

The provision of market data services within the ACSDA member landscape is a reality for many markets since, as mentioned before, their connection with Exchanges is strong. However, FMIs should be attentive to opportunities created by some trends in the field.

First, as data produced by exchanges are quite widespread, the intermediation industry has progressively turned its attention to market data on OTC transactions. This follows the movement of improving transparency in markets that traditionally have been opaquer. It derives that TRs function in storing transaction data has not only a risk management perspective but also an investment strategy value.

On a more futuristic level, market data is becoming part of a broader and more dynamic concept - market intelligence where users are moving from generic, historical information to real-time data with easy access and multiple possibilities for analytical approaches.

### *Products oriented to individuals*

The development of products and services specifically oriented to individual investors can also be seen as an important business opportunity for FMIs. This might be even more relevant where the institutional investor base is in the earlier stages of development. Although individual investor transactions may correspond to a relatively small volumes, they have a great potential of developing the investment and capital markets culture.

### ***Innovation and new business opportunities***

The discussion about new business opportunities for CSDs, and FMIs in general, is currently very tied to the development of new technologies, new assets and new types of institutions. In a financial landscape marked by the rise of Fintechs, crypto-assets and blockchain processing, what is the role of CSDs in this arriving future?

To this point we have discussed business opportunities associated with the core business and beyond the core but leveraging on the existing technology, know-how and expertise. There is a recognized concern about how CSDs can protect their core business from erosion. However, we might be experiencing a paradigm change that will require a change of mindset in order to identify and create new services, new subjects for the services provided and new ways to provide the same services or, most likely, a combination of those.

We will discuss in more detail the impacts of DLT for FMIs in the next chapter. Nevertheless, there are other innovative approaches that CSDs should keep on their radar during the next decade.

The first is related to the role of CSDs/SSSs as a data repository and the possibility that advanced analytics might enable the monetization of data. The generation of unified identification codes, like ISIN codes, has broken the barrier of standardized assets such as shares and corporate bonds and the challenge is now to be able to identify highly customized assets in order to guarantee their unicity and legitimacy in order to use them as collateral for example. Also, CSDs could become a data vendor or take participation in one by means of providing inputs. One consideration about the leveraging of data services is related to restrictions imposed by secrecy laws and regulations.

Another trending topic is the discussion of artificial intelligence and the effects it might have on the automation of FMI functions. Greater straight-through-processing (STP) is expected to develop in areas such as securities issuance, information disclosure by issuers, corporate actions processing, settlement and collateral management, among others. Regarding KYC, much can be improved through the automated use of available and public databases in order to validate investor information. Basically, artificial intelligence can improve efficiency and accuracy by means of mining data from large databases and analyze them in a faster and more predictive way.

With respect to the provision and management of technology, one area to be examined is the usage of cloud solutions since it represents a great opportunity to reduce costs<sup>14</sup> and become more efficient and flexible. The

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<sup>14</sup> In the first moment, cloud solutions may increase the costs due to the its coexistence with traditional systems. However, costs are expected to be reduced along time.

main issue regarding the use of cloud solutions might be regulator resistance due to safety concerns so that FMIs need to ensure that the cloud solution developed is safe and compliant to regulations.

## 2. Broadening participant and investor base

The development of new products and services, such as discussed in the previous section, can also be achieved by means of broadening the participants' base beyond traditional. Other type of institutions might be interest in assessing the market for a variety of reasons. Such is the case, for example, of pension funds and other institutional investors with buy-and-hold behavior that can see securities lending services as an opportunity to augment their revenues without materially increasing their risk exposures.

Market data services is another promising area for attracting new customers and users. Trade automatization has been growing steadily for many years now and immediate access to accurate trade information is key to the development of tools and strategies. Institutions have been willing to pay in order to have their computers placed closer to the data center in order to gain seconds, or even smaller amounts of time, based on the financial advantages it might generate. More recently, the raise of new technologies such as DLT and the impact of artificial intelligence and parallel computer processing can further enhance the relevance of efficient access to information.

Greater transparency and broader participation in issuer decision making are global trends. It derives that issuer related services such as information disclosure and proxy voting may enhance the relationship with issuers and investors. Also, information disclosure can also be a regulatory condition for investment in case of institutional investors. Although this reasoning seems more applicable to equity markets, there is evidence that bond markets have been growing at a faster pace in the recent years<sup>15</sup> and demanding for greater transparency levels both as a consequence of growth and the basis for further development.

Regarding the final customers' perspective, a broad and diversified investor base is important to support market liquidity, economic stability and the financialization of savings.

### ***Institutional investors***

The institutional investor base is one of the pillars of capital markets' size and level of development. Those institutional investors can be quite effective in providing long-term funds and are less likely to promote market volatility since their investment horizon is larger. They also typically, for regulatory reasons in some cases, require higher disclosure standards that reduce information asymmetries."<sup>16</sup> Private pension, insurance, and/or mutual fund are usually relevant sectors in many developing economies with well-established securities markets. While the overall size of capital markets is strongly correlated with the institutional investor base, there are significant differences among the countries in how these funds are allocated across equities, corporate financial bonds and non-financial bonds.

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<sup>15</sup> CGFS - *Establishing viable capital markets*, CGFS Papers, No 62, January 2019.

<sup>16</sup> CGFS - *Establishing viable capital markets*, CGFS Papers, No 62, January 2019.



The relationship between institutional investors and capital markets is mutually beneficial. The development of capital markets helps increase economies of scale for collective investment funds thus contributing to reduce fees. This dynamic interaction has a positive effect in attracting savings into capital markets therefore increasing the financialization of economies.

### ***Retail investors***

Initiatives in the sense of attracting retail investors include simplified access to securities transaction services and reporting through mobile applications, for instance. Education systems and programs are also an important line of action. The standardization and simplification of collective investment schemes, such as mutual funds, as well as directed tax incentives may be effective in enhancing the inclusiveness of capital markets.

First-time and less sophisticated investors are naturally more risk averse. In this sense, it is quite natural that they will first draw their attention to government bonds or mutual funds where the level of security and/or diversification is high enough to prevent against unforeseen losses. Those products are also less demanding in terms of management skills from the investors. In this sense, as mentioned in the previous session, products specifically design for individual investors should be analyzed by FMIs and local regulators as the means to promote the capital markets, the financial sector and the economy.

## **3. Case Studies**

The case studies presented below are examples of products and services developed beyond the core business of CSDs, since those related to adjacent areas have already been largely discussed among ACSDA members.

### ***TR for receivables***

Factrack (Cavali, Peru) and CERC (Brazil) are interesting examples of the development of TRs for central registration of receivables.

In 2015, Cavali launched **Factrack**, a proprietary system that enables the registration of commercial receivables (invoices) to facilitate companies and individual investors to contract financing faster and at lower costs. The service encompasses the verification, registration and electronic transfer of receivables thus avoiding bureaucratic procedures and, more important, reducing risks related to loss, cloning or falsification of the receivables.

The verification of the legitimacy and validity of each receivable is done through a dedicated connection to the Peruvian fiscal authority (Sunat). The service is recognized as the legally authorized method to register receivables electronically. The payment of obligations defined in the invoice is also centrally processed by Cavali acting as SSS for this market. In September 2019, approximately 52,000 receivables had been registered in Factrack.

Similarly, in 2018, **CERC**<sup>17</sup> received from the Brazilian Central Bank the authorization to register a more extended class of financial assets, starting with commercial and financial receivables. CERC also manages an Internet based proprietary system that uses API interfaces to communicate and a cloud solution to store information.

The service also contemplates the verification of validity of the receivables prior to registration through online consultation to the fiscal authority databases. CERC engaged in a project led by the Brazilian Central Bank to implement an interoperability agreement for the registration of credit and debit cards receivables in order to ensure the unicity of such registries. Until the end of January 2020, more than 1 million receivables had been registered in CERC with an aggregate value of approximately USD 1.2 billion.

### ***Issuer services***

With the purpose of supporting better corporate governance for listed companies, the Brazilian Securities Commission (CVM) in 2015 issued a new regulation to promote remote voting. In 2018, the CVM launched a remote voting service called CI.CORP with the IT and operational support of B3. The service is based on the existing communication network between the B3 CSD and both issuers and local custodian. Although the service has a broad reach, one of the main concerns was to facilitate the voting process for non-resident investors who represent a relevant share of the Brazilian capital market<sup>18</sup>.

Prior to the launching of CI.CORP, remote voting depended on a series of power of attorney – the process was bureaucratic, expensive and took a significant amount of time. In the new remote voting system, issuers upload voting bulletins with the topics to be voted in the general assembly and investors, or custodians on behalf of investors, can download those bulletins, fill them according to their voting intentions and cast the votes electronically. The information is consolidated at the CSD level and made available to the company through “voting maps”.

It is noteworthy that, as B3’s CSD has the identification of the shareholders (beneficial owner account holding system), it is possible to ensure that only the shareholders can download the voting bulletin and also to reconcile the number of votes with the number of shareholders. Besides supporting greater participation in the companies' decision making, the system is an important tool to prevent fraud in the voting process.

### **Innovation and new business opportunities**

In 2012, the Brazilian Central Bank regulation required the centralized registration of liens constituted over automotive vehicles as collateral for credit transactions, as well as of the ownership of the vehicles object of leasing transactions. Leveraging over the existing expertise, the **B3**<sup>19</sup> launched a new service called Financing Unity (Unidade de Financiamento, or UFIN). The UFIN manages systems that enable financial institutions to register

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<sup>17</sup> CERC is a new FMI in Brazil and is not linked to B3 or any other institution. Its operations started in August 2018.

<sup>18</sup> One aspect identified by the Brazilian Securities Commission and B3 was that, in some countries, regulation requires that investors participate in general assemblies. As a result, operational barriers for shareholders to exercise their voting rights could be one factor preventing foreign investment in the local market.

<sup>19</sup> CETIP at that moment.

information regarding the liens constituted over automotive vehicles related to the leasing contracts under their responsibility. The information is consolidated by B3 and reported to the Central Bank. On average, the revenues originated at the UFIN correspond to 10% of total B3 revenue.

DCV in Chile has plans to implement a service of record keeping of professional titles in a centralized manner also as an example of using the existing expertise in an innovative manner.

### ***Broadening retail investors base***

In 2002, an operational partnership between the Brazilian National Treasury and the Brazilian **B3** enabled the development of an internet-based system, operated by B3, for retail investors to buy government bonds directly from the Treasury inventory<sup>20</sup>. The product called *Tesouro Direto* (Treasury direct in English) also allows investors to sell the bonds back to the Treasury thus ensuring their liquidity. It is a primary market and no secondary trades take place in this environment. In order to invest in *Tesouro Direto*, investors need to have a deposit account with an intermediary that is a participant of B3 CSD therefore promoting the sell side business as a spillover effect. The product presents a steady growth since its launching specially among younger investors. In December 2019, the number of investors attained 5.6 million and the volume of assets in the programs reached approximately USD 1.5 billion.

In 2014, the **Indonesian Stock Exchange (IDX)** initiated a series of programs aiming at boosting retail investment – educational initiatives, information centers and IDX galleries at universities. Discounted fees for students was also part of the program. Since 2012, the number of retail investors more than triple reaching more than 1 million by the end of 2019.

## V. Challenges and opportunities introduced by distributed ledgers

Distributed ledgers offer a new approach to data management and sharing. Based on a new architecture, capital market participants work with common, shared but decentralized databases, in near real-time, through which operations is streamlined.

The applications and impacts on the way the financial industry works are estimated to be many and rather positive such as greater efficiency, resilience, reliability, and lower costs. Nevertheless, the disruptive potential is recognized as significant, worrying FMIs and regulators, and distributed ledger technology has been advancing in the financial systems mainly in areas that are not considered core to the FMIs and the financial market.

In this section, we make an introduction explaining the concepts of **distributed ledger** (also called distributed ledger technology or **DLT**), their innovative features compared to the current paradigm, the efficiencies it generates and other general benefits. In the sequence, we discuss the potential impacts and challenges this new architecture brings to the FMIs landscape and businesses, as well as the perspectives of different stakeholders,

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<sup>20</sup> The product was part of a comprehensive program of initiatives to extending Brazilian public debt maturities.

from regulators to technology providers. We conclude with a brief description of case studies where such technology was (or is being) implemented within the scope of CSDs products and services.

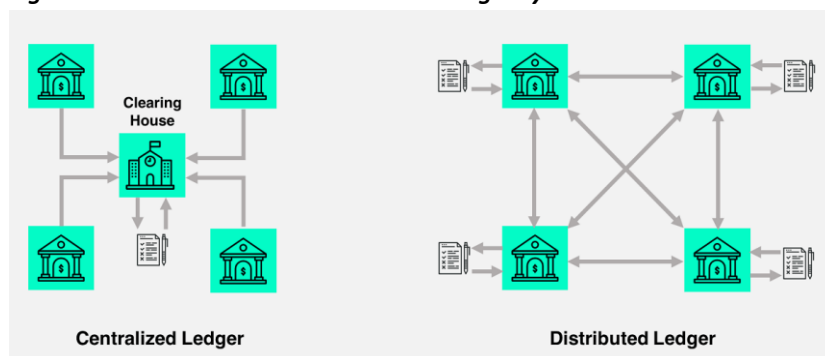
## 1. DLT and blockchain – definition and innovative characteristics

Traditional data storage systems consist in a centralized database accessed by authorized participants. If we look at the system as a book or a ledger of data, we would be talking about a centralized ledger. A DLT is a replicated, shared, and synchronized digital data set geographically spread across multiple sites, countries, or institutions with no central administrator or centralized data storage. The distributed ledger database is then spread across several *nodes* on a peer-to-peer network, where each node replicates and saves an identical copy of the ledger and updates itself independently. Consensus algorithms must be adopted to ensure accurate replication across the nodes.

The primary advantage is the lack of central authority. When a ledger update happens, each node constructs the new transaction, and then the nodes vote by consensus algorithm on which copy is correct. Once a consensus has been determined, all the other nodes update themselves with the new, correct copy of the ledger. Security is accomplished through cryptographic keys and signatures.

The *Figure 1* below illustrates centralized and decentralized ledger systems.

**Figure 1: Centralized and decentralized ledger systems**

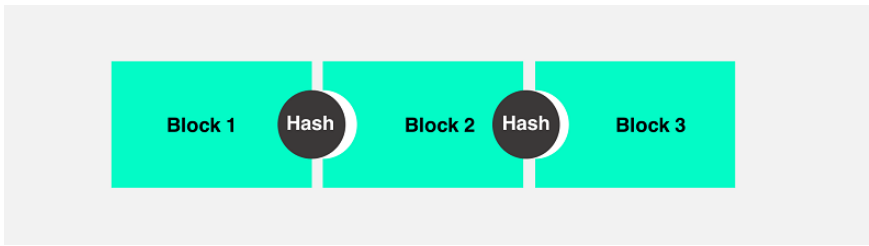


Source: *tradeix.com*

One form of distributed ledger design is the **blockchain system**. Blockchain is essentially a shared database filled with entries that must be confirmed and encrypted. Each database entry is dependent on a logical relationship to all its predecessors. The name blockchain refers to the “blocks” that get added to the chain of transaction records.

To facilitate this, the technology uses cryptographic signatures called hashes. *Figure 2* illustrates a blockchain.

**Figure 2: Blockchain**



Source: *tradeix.com*

Blockchains or DLTs are the building blocks that enable recording of interactions and transfer “value” peer-to-peer, without a need for a centrally coordinating entity. “Value” refers to any record of ownership of asset, such as money, securities, or contracts, and also ownership of specific information like identity and other personal data. The objective is to create a single version of the truth, used by all participants, containing a much richer database than the existing ones. This will enable new financial processes to be developed and encoded into the ledger, based on the use of real-time data, the immediate settlement and the expansion of ‘smart’ contracts.

### **Technologically innovative characteristics**

Distributed ledgers use *encryption* technologies that enable sensitive data to be shared selectively, as needed, with security and anonymity. DLTs also require *consensus verification protocols* that allow participants to collectively update the shared database in a previously agreed manner, assuring that it remains accurate along time without the need for a centralized management. *Smart contracts* are programs that generate automatic uploads to the distributed ledger, such as payment instructions, for example, once a pre-specified condition is met. Those features concur to improve efficiency, security and reliability of data processing and management although in a decentralized way.

### **Data efficiencies**

Distributed ledgers enable independent parties to work with *universal data sources*, automatically reconciled among all participants. In principle, any stored data record could be represented on a blockchain such as ownership of securities, credit exposures or settlement obligations.

A multitude of data types can be encrypted and uploaded to the distributed ledger to create more comprehensive and complete databases. For example, securities holding systems could register ownership data in a way to show multiple levels of beneficial ownership. *Distributed records* are stored locally by participants as their reliable source of information bringing obsolescence to some systems that are currently used keep their records and reconcile them to centralized databases, such as reconciliation procedures for asset holdings between CSDs and custodians.

### **General benefits**

There are benefits brought by DLTs that might not be fully achievable with existing technology. *Transparent real-time data* can remove the need for data enrichment in the securities processing such as aligning trade data with settlement data or including beneficial owner accounts for delivery purposes. Participants can selectively disclose trusted data to others ahead of trade time thus reducing risk exposures. Also, as commented in the previous chapter, once placed on a DLT, assets with greater level of customization and not typically traded, such as receivables and invoices, could be considered reliable to be used as collateral.

Furthermore, since all participants share the same underlying database, the DLT reduces the scope for operational errors, disputes, and reconciliation lags, increasing the level of STP.

## 2. Potential impacts for FMIs and other parties

The analysis of the potential impacts of DLT to FMIs encompasses the benefits it may generate in terms of efficiency, resiliency and reliability but also its disruptive power in terms of altering the current architecture of FMIs or even challenging their very reason of existence, depending on how implementation is carried out. In some cases, DLT can be seen as an incremental upgrade over current functionalities, and one that does not change significantly current business practices. In other cases, DLT may lead to disintermediation of certain functions. Such a change in business practices may affect the competitive balance in financial markets and have implications for financial market infrastructure architecture.

In many markets, FMIs are entities assigned by their participants (and their respective customers) to assure the integrity of a centralized information ledger by means of keeping it updated. In some cases, the risk management function is also delegated to the FMI. DLT has the potential to reduce the traditional reliance on a central entity for managing the ledger.

While DLT is essentially a decentralized way of storing and processing information in financial systems and capital markets, FMIs are centralized arrangements that, from the moment of their creation until now, are believed to be the better and safest way to conduct the business.

Conceptually, the expectation is that the DLT technology<sup>21</sup> can change financial markets in order to:

- Improve transactions processing speed and, consequently, the availability of assets and funds;
- Decrease or eliminate the need for reconciliation across multiple infrastructures;
- Increase transparency in transaction record keeping;
- Enhance network resilience through distributed data management; and
- Reduce operational and financial risks.

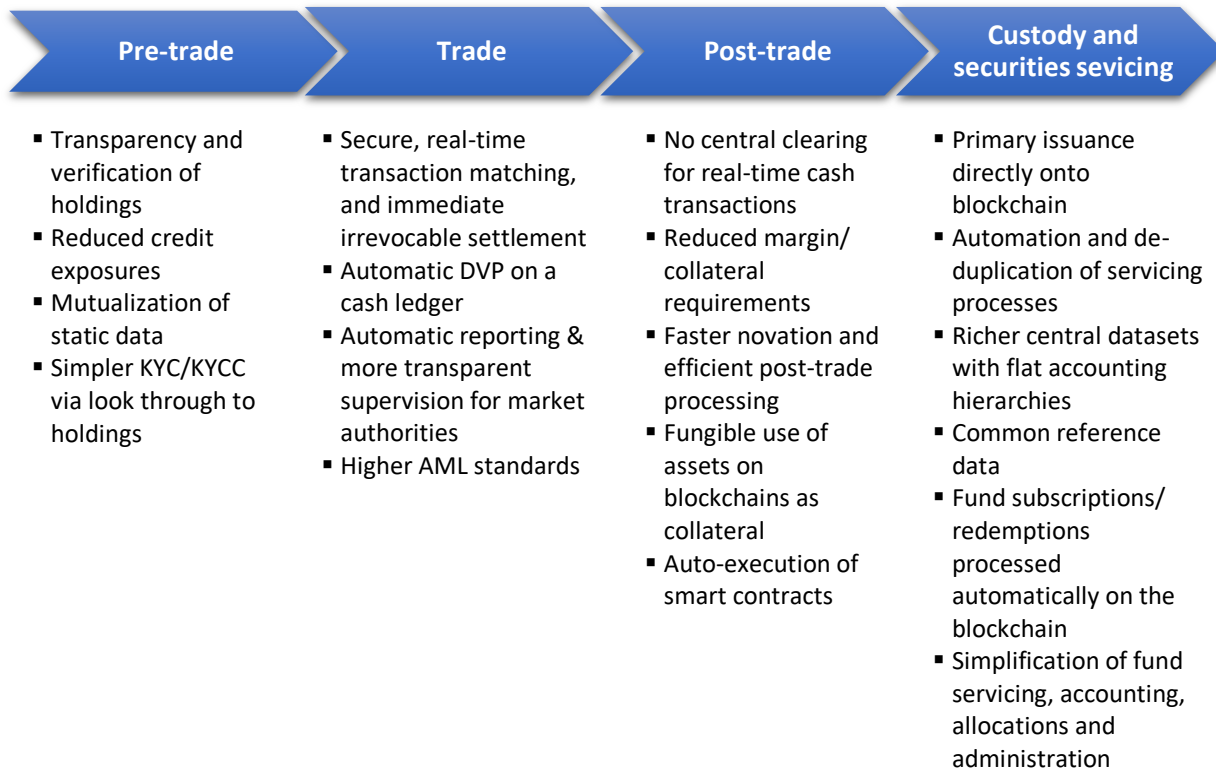
In practical terms, the achievement of all those benefits may lead to a profound transformation in financial services and markets and in how assets are kept and recorded, obligations are fulfilled, and risks are managed.

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<sup>21</sup> BIS/CPMI - *Distributed ledger technology in payment, clearing and settlement: An analytical framework*, February 2017.

Since DLT can represent a massive change to the structure of capital markets, a legitimate question is related to the motivation the industry would have to embrace it. There are undeniable potential impacts across pre-trade, trade, post-trade, and securities servicing, as shown in *Figure 3* below.

*Figure 3: Impacts of DLT*



Source: Euroclear & Oliver Wyman - *Blockchain in capital markets*, February 2016

Considering this potential impact in the securities transactions streamline, the FMIs' business models would also change as well as the behavior and expectation of most players in the industry.

### Trading venues

Trading venues may be among the less affected institutions. However, the data recorded at the moment a transaction is executed would be the data required for settlement. Transactions could be automatically matched and locked-in for settlement without any need for information enrichment at the pre-settlement level. Part of the value-added business conducted in CSDs and/or SSSs such as trade confirmation and affirmation would be transferred to the trading systems. Furthermore, in markets where HFT accounts for a large share of trading volumes, this impact could be even more significant.

### SSSs

Centralized clearing and settlement are considered the most efficient way to settle transactions: the consolidated concept of “hub and spokes model” is a better configuration in comparison to the “spaghetti model” involved in bilateral settlements. Similarly, the adoption of netting schemes is considered more efficient in terms of liquidity management. DLT challenges the efficiency of centralized clearing and settlement and offers the possibility of greater efficiency by the adoption of a decentralized arrangement, as the “spaghetti” could be a better design after all.

DLT may have the ability to shorten the end-to-end processing of settlements. By means of affecting the efficiency of clearing and settlement, DLT also has the capacity to affect safety. BIS (2017) analyses what they identify as key components of settlement: the settlement asset, how settlement is achieved operationally and how settlement finality is achieved for legal purposes. Focusing on the last two, it is interesting to understand the dynamic aspect imprinted to settlement with DLT arrangements:

- **Operational settlement.** In some DLT arrangements, it can take some time to update and synchronize state changes to a ledger. The first instance of an update, for example, may not represent operational settlement because it may take time for consensus to be achieved across the nodes in the synchronization of ledgers. Operational settlement becomes more complex if it involves the delivery of one asset against another.
- **Legal settlement finality.** Settlement finality is the legally defined moment at which the transfer of an asset is irrevocable and unconditional. In traditional systems, settlement finality is a clear and well-defined point in time. For DLT arrangements, settlement finality may not be as clear. In arrangements that rely on a consensus algorithm to effect settlement finality, there may not necessarily be a single point of settlement finality. Further, the current legal framework may not support finality in such cases.

Nevertheless, in DLT arrangements cash transactions would settle in (near<sup>22</sup>) real-time since the trade is locked-in for settlement thus eliminating the need for post-trade affirmation or confirmation and central clearing during the settlement cycle. Also, as parallel processing is easier to achieve, the migration to gross settlement models may become a trend. Also, since all participants would share the same database of trades, it would be expected that DLT reduces errors, claims and reconciliation lags, speeding up and enhancing the security of settlement processing.

## CSDs

Considering the extent of the custody chain, including CSDs, custodians and sub-custodians as well as some intermediary layers until the final beneficial owner, the expectation is that DLT would facilitate the record of ownership in multiple levels and the processing of instructions up and down the chain.

New issuances, corporate actions and proxy voting processing should also become more agile and autonomous since all the parties involved could benefit from a common shared database and instruct upon information available to all at the same time.

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<sup>22</sup> DLT arrangements may take longer to achieve settlement when compared with RTGS systems because the process for validating a transaction and reaching consensus in DLT is potentially more complex than with an SSS.



Reconciliation procedures along the chain would be facilitated through DLT arrangements. This is typically time-consuming and labor-intensive since it involves the reconciliation of information on different databases and the recording of that information in different formats across different institutions. By allowing information that is in a common format to be shared across participants to a transaction, the use of DLT may reduce data discrepancy, facilitate quicker reconciliation and eliminate or reduce burdensome back office activities. All or part of the reconciled data may also be shared across other market participants to enhance market transparency or with the relevant authorities to facilitate reporting. However, information sharing that improves the speed and cost of reconciliation should be balanced against data protection and privacy.

## **CCPs**

In a prevalent near real-time gross settlement environment, an entity to centrally clear the transactions and assume the responsibility of settlement through the novation of the original contracts might be no longer needed. Therefore, collateral requirements would also be reduced since most cash transactions would migrate to gross settlement and would not require a CCP to absorb credit risks during settlement. This perspective is especially important for those markets that are now considering the development of a CCP.

However, as near real-time transfers allow for a reduction in credit exposures, they place higher demand on liquidity. Faster transfers suggest that participants will also receive funds and securities more quickly, freeing up liquidity that could be tied up in collateral as is the case in today's FMIs. While evaluating the impacts of DLT arrangements, it is necessary to balance how close to real-time transactions are processed and the impact on credit- and liquidity-saving features. Transactions with a longer lifecycle, such as derivatives and futures, may still take advantage of a CCP novation in order to achieve the benefits of netting and reduce credit risk along time.

## **TRs**

The decentralization of information recording on assets, contracts and transactions enabled by DLT could challenge the very reason for creating TRs as the means to promote transparency in transactions occurring in the OTC market. Disclosure information policies and procedures could be aspects to be debated.

## **Custodians, sub-custodians and intermediaries**

Distributed asset ledgers with information on assets holdings in multiple levels through simple accounting structures could remove some of the functions currently performed by custodians and sub-custodians.

Custodians and sub-custodians may become the managers of the information, handling holdings information and ensuring that automated asset servicing processes are performed adequately. The unbundling of account holdings recording may weaken custodians and sub-custodians' aggregated value to the securities processing chain and hamper their ability to sell packages of services to customers as today.

Intermediaries, such as brokers and dealers, could be challenged to develop value-added services that go beyond providing market access, such as advising on transactions and execution management.

## **Customers**

Customers' expectation would be to see a reduction of costs related to securities processing in general – trading, clearing and settlement, safekeeping, and asset servicing. Also, since counterparty risks along settlement have the potential to be reduced, investors may transact more directly among themselves without necessarily relying on intermediaries as long as local regulations allow them to do so.

## **A note on interoperability**

One relevant aspect to highlight while discussing the impacts of DLT to FMIs and its entourage is that it created a favorable scenario for FMIs interoperability. The concept of interoperability among FMIs is closely related to their capability of sharing information and instructing upon the information shared in a safe and efficient environment. DLT, as an intrinsic decentralized mechanism allowing all participants (or nodes) to access an updated and correct copy of the ledger at all times, has the potential to ease interoperability arrangements which have been in FMIs agenda for, at least, the last decade. Yet, the cost efficiency of this approach remains to be tested against the current solutions.

## **3. Challenges for DLT implementation in capital markets**

DLT remains nascent, even if it is developing quickly. It has not yet been proven sufficiently robust for wide scale implementation. Such being the current status, although DLT has the potential to reduce some of the traditional risks involved in securities transactions processing by FMIs, it may introduce new or different risks such as:

- The novelty character of the technology and the consequent potential uncertainty about its scalability and data integrity;
- Questions regarding the soundness of the legal and regulatory basis;
- The absence of a clear and robust governance framework;
- Operational risks involved in migration; and
- Issues related to anonymity management.

The challenges posed by those issues may represent important implementation barriers.

### **Scalability, traceability, and data integrity**

How an arrangement records, maintains and shares data has implications for the safety of the core processes in FMIs.

Questions over the scalability and throughout capacity of DLTs are starting to be successfully answered, although the current standard of technology might be considered insufficient to support broader adoption in capital

markets. Scalability is one feature that must be addressed in order to ensure that enough large datasets are in place if any core part of the capital markets systems is to be replaced by DLT.

Moreover, there will be very high standards set for the security, robustness and performance of DLTs and integration with existing non-DLT systems will also be a requirement for implementation purposes.

Another fundamental requirement for any record-keeping system is to have records maintained in such a way that the relevant history of the record can be verified at any moment, meaning that the traceability of the data should be guaranteed. Traceability may be particularly relevant for ensuring compliance with KYC and AML requirements.

Traceability, however, should be weighed against privacy requirements. Depending on the DLT architecture, all nodes have access to a copy of the ledger and may see all transactional history. However, in applying DLT in financial markets, participants may not want or be permitted to provide full visibility of the data. In such cases, access to information may be restricted either through the encryption of data so nodes only see the elements of the ledger that they are allowed or through limiting the nodes to hold only the data that are relevant to them.

Furthermore, traceability requires the preservation of data integrity – data cannot be lost, damaged or tampered with. The integrity of the data is essential to the safety of the arrangement, as well as its immutability. The immutability of data means that data cannot be unilaterally changed once recorded.

## **Regulation and legislation**

*“Disrupters in other industries (such as Airbnb and Uber) have adopted an ‘act first, seek forgiveness later’ approach to regulation”<sup>23</sup>.*

This might not be the case in the financial industry. Having a well-founded, clear, transparent, and enforceable legal basis is a core element of FMIs which are well protected by the existing regulatory framework. Embracing disrupting technology, however, might require the explicit blessing of regulators beforehand.

DLT can increase legal risks if there is ambiguity or lack of certainty about an arrangement’s legal basis<sup>24</sup>. Because the application of this technology to FMIs activities is new, the regulatory framework for certain activities may not be well established yet. When DLT becomes part of the market infrastructure and consensus protocols are exchanged through a network of nodes, a considerable number of aspects of the law might need to be reinterpreted or changed and new regulations may also be needed.

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<sup>23</sup> Euroclear & Oliver Wyman: *Blockchain in capital markets*, February 2016.

<sup>24</sup>The legal basis includes general laws, regulations governing property, contracts, and liability, as well as DLT’s rules and procedures.

These needs include, for example, the legal definition of the finality of settlement which presupposes existing market processes and central data sources held at the CSD. Likewise, ownership rights should be regulated by the DLT arrangement and supported by applicable law.

Finally, as the mechanisms currently stand, records are irrevocable once entered a DLT, an inherent security feature of the DLT concept. However, this might prevent judicial interventions as outcomes of legal proceedings. Regulators might not be willing to accept a mechanism that inhibits in any way the implementation of their lawful decisions. Therefore, the design of the system has to cope with the challenge of incorporating features that allow for a change in ownership to be enforced in case it is legally determined.

## Governance

Although still a nascent technology, DLT has experienced over the past years relevant development and implementation cases reflecting the belief that this technology can transform the operations of global financial markets.

For a while, DLT has been seen as a means to carry out transactions without the intermediation of financial institutions and/or infrastructures which would, as a natural consequence, simplify the operations and costs involved. However, financial markets work in an organized, controlled and regulated way, so it is becoming increasingly clear that formal and clear policies and rules, along with accountable governance are a prerequisite for assuring the development of this technology and the achievement of its potentialities discussed before.

*“The oversight and governance among the institutions that participate in the regulated financial industry is necessary if DLT is to continue to grow and be successfully adopted.”<sup>25</sup>*

Effective, accountable, and transparent governance arrangements are critical to the risk management of FMIs. Sound governance arrangements would continue to be necessary for DLT arrangements to determine the rules regarding functionality, risk management, and access to the network, as well as which entities are responsible for maintaining and modifying the protocol. The methods by which governance arrangements take effect may differ depending on the architecture of the DLT arrangement.

- **Open permissionless systems:** may require distributed governance arrangements, in which consensus could be used to determine any changes to the network’s protocol or functions. The potential lack of clear, transparent, and predictable governance could have a negative effect on the stability of the network and broader financial system, especially if at any point the network interacts significantly with regulated entities in the traditional financial system.
- **Closed permissioned systems:** may involve one or more institutions that have ownership rights over the arrangement. To that end, this type of arrangement could create a more-centralized governance structure for granting access to the system arrangement, making significant decisions such as rules or technology upgrades on behalf of the arrangement, as well as determining permissions to write changes to the ledger.

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<sup>25</sup> DTCC/Accenture - *Governing DLT networks – Distributed Ledger Technology Governance for Private Permissioned Networks*, September 2019.

Such arrangements are likely to be more recognizable as FMI governance arrangements thus reducing uncertainty around responsibility, accountability, and liability for decisions related to the system.

Considering those two models, the alignment of stakeholders is required on certain architecture decisions, such as: if systems are completely open or adopt access requirements based on permissions; the principles of legitimacy and authorization for interacting with the ledger; and the interoperability between different DLTs, which may potentially run different consensus protocols.

DTCC, together with Accenture, published a White Paper where it presented a governance model to manage the risks and consequences of a distributed ledger landscape for closed permissioned systems. The model presented aims at addressing the responsibilities and critical functions in a DLT arrangement, as well as creating an orderly system for addressing adoption, security and regulatory compliance.

### **Operational risks of migration**

Operational risks come into play through the adoption of new technologies and, more importantly, by the simultaneous maintenance of old and new technologies that interact. Therefore, migration and integration between technologies are important sources of risk. Specific and well-designed transition plans would need to be built to ensure that these operational risks are identified, measured, controlled and minimized.

### **Managing access and identity**

Cryptography protects anonymity in a DLT arrangement. However, it requires meticulous management skills to ensure that only authorized participants have access to a given subset of information and no other. Therefore, the ability to disclose selective information to counterparties is key to prevent errors that result in major data breaches that could compromise the safety and reliability of the DLT arrangement.

Another issue is how to link cryptographic identities to real world identities. KYC assessment could be a responsibility of the validation nodes in a permissioned network but could also be seen as a more autonomous function and identity management could be provided as an independent service.

All aspects considered, however, waiting for “perfect” DLT solutions could mean missing an opportunity to help shape it. To understand how DLT can address challenges in the financial sector requires both research and real-life applications and pilots. In this sense, DLT applications will most likely be incremental, and adopted initially in non-core functions.

## **4. Perspectives and plans for DLT in financial markets**

Considering the potential benefits generated by DLT as well as its disruptive power, industry participants, regulators and technology firms have been organizing themselves and building up their views about the subject.

This section aims at presenting different perspectives and concerns about the adoption of DLT in financial and capital markets.

## Central banks

The *Federal Reserve*<sup>26</sup> manifested its concern on how DLT implementation would converse with the existing risk-management frameworks to promote safety and confidence in payments and securities transfer processes.

Although recognizing that legal, settlement, operational, and financial risks are inherent in payments, clearing and settlement, those risks are currently concentrated in FMI which establish rules and procedures to mitigate credit and liquidity risks or eliminate other risks through the provision of legally defined settlement finality and delivery versus payment. A key consideration that may affect the assessment and adoption of any DLT solution is whether a change to one aspect of the payments, clearing and settlement processes simply shifts the risks among players or, worse, increases the overall risks in those activities. For example, a solution may reduce the cost of clearing, but does so by shifting financial and operational risk to end-users of a system.

The Federal Reserve sees DLT's benefits as: *"new ways to transfer and record the ownership of digital assets; immutably and securely store information; provide for identity management; and other evolving operations through peer-to-peer networking, access to a distributed but common ledger among participants, and cryptography"*. Nonetheless, given the technology's early stage, *"a number of challenges to development and adoption remain, including in how issues around business cases, technological hurdles, legal considerations, and risk management considerations are addressed"*. According to the Fed, industry use cases tend to provide clearness over time on how those challenges can be addressed.

Although affirming enthusiasm regarding DLT, the *European Central Bank*<sup>27</sup> takes a cautious position by defending that central banks, as both overseers and operators of payment systems, cannot afford to ignore its potentially disruptive power and the financial stability consequences.

While considering the theme of digital currency issued by central banks, the ECB points out that although it would allow people to hold a central bank liability comparable to cash, without the risks associated with commercial money, the possible adverse financial stability implications of introducing central bank digital currencies *"call for the greatest caution, while the underlying DLT that would enable these digital tokens to be introduced are still immature, costly to maintain and possibly prone to vulnerabilities"*.

The current crypto assets, for example, fail to ensure legal certainty on settlement finality, which is a necessary condition for a safe and efficient payment system. Given this type of flaw, the ECB believes central banks should pursue a two-track strategy:

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<sup>26</sup> Federal Reserve - *Distributed ledger technology in payments, clearing, and settlement*, Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board, Washington, D.C., 2016 – 095

<sup>27</sup> ECB: *The future of financial market infrastructures - spearheading progress without renouncing safety*, Speech Mr Benoît Cœuré, Central Bank Payments Conference, Singapore, June 2018.

- Continue to study new technologies closely and experiment and engage with the industry as a learning tool;
- Pursue drawing on less-disruptive existing technologies to make the current payment systems, which are convenient and have earned public trust, more efficient and safer, which entails making retail payment systems instant and available 24/7; and
- Modernize RTGS systems and enhance cyber resilience.

The *BIS* also focused on the theme of central bank digital currency taking a similar position to the ECB by saying that central bankers prefer to tread cautiously into new territory since the monetary system is the backbone of the financial system – “*we recognize that adopting untried technology that ultimately proves unreliable could seriously endanger public trust in the currency and in the central bank*”.

In May 2019, the Bundesbank reflected on the underwhelming outcome of a joint experiment with Deutsche Bourse on the use of blockchain technology for the settlement of cash and securities. While the prototype developed to test the technology fulfilled the objectives and recorded some positive outcomes in terms of higher resiliency and lower cost of reconciliation, Bundesbank president showed skepticism about its potential as a replacement mechanism for current processes.

#### **FMI association (ECSDA)**

According to ECSDA<sup>28</sup>, “*the impact of DLT in redefining the role of financial market infrastructures will be mixed and subject to a case-by-case analysis, depending on whether it replaces the core of the post-trade infrastructure technology or is used as a supporting technology in the areas where it is most appropriate*”. In some cases, it may make certain services unnecessary and, in others, the use of DLT will create the need for additional infrastructure services such as private key and smart contract management provided by regulated institutions like CSDs.

ECSDA also expresses a view that DLT is only one of many technologies that could be used in post-trade. Also, the strategic developments of an industry should not be driven by the technology, but rather the needs of the industry stakeholders should guide the choice of the most appropriate technology. Therefore, European policies should aim at being technology neutral. Moreover, it is too soon for legislative action in this field, given its early stage of development.

ECSDA expects that the DLT could result in some cost savings in areas like reconciliation, reporting, corporate actions or tax processing, as well as some services to issuers and shareholders such as proxy voting and KYC. ECSDA agrees, for example, that DLT could potentially help in obtaining faster information on the end investor through indirect holding systems. CSDs however also see a few matters requiring careful reflection such as the impossibility to change the ledger.

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<sup>28</sup> ECSDA: *Response to the European Commission public consultation on post-trade in a Capital Market Union: dismantling barriers and strategy for the future*, 2017.

Hence, ECSDA sees the use of DLT not in replacement, but as a supplement to the core CSD systems.

ECSDA believes that Fintech companies should not be treated differently than established businesses, and that a tailored regulatory framework for those companies would mean that they are not viable in a real-world setting. Thus, Fintech companies and new technologies should abide by the same existing rules to ensure investor protection as well as the integrity and stability of the financial system.

Lastly, ECSDA sees that the replacement of the technology and its testing, the establishment of interoperability between the systems and with other services may require a significant investment.

### **Technology providers**

In 2014, organizations from across the global financial system pooled resources to create **Digital Asset Holdings (DAH)**<sup>29</sup> with the goal of developing blockchain-enabled distributed ledgers for the financial industry, more specifically for post-trade processing. The views at the time were that blockchain technology would primarily work within the existing infrastructure to help restructure existing processes, enhance reconciliation procedures, optimizing execution and settlement, and increase transparency.

There was speculation that DLT and smart contracts could develop in the sense of providing equivalent level of risk mitigation as clearinghouses, although it was recognized that it would require regulators to feel “comfortable”. In contrast, DAH was confident that clearinghouses would implement some type of blockchain solution to increase efficiency, auditability, and transparency; that arrangement would preserve the existing infrastructure.

DAH saw blockchain solutions not as a replacement to the current ecosystem, but as an opportunity to “*re-architect processes—driving blockchain from experimentation to mainstream adoption across multiple business applications*” such as settlement optimization, client onboarding KYC/AML, standard settlement instructions, collateral management and regulatory reporting.

It is noteworthy that, in 2017, DAH engaged in a project for developing a blockchain-based clearing and settlement system for the Australian Securities Exchange (ASX), which will be detailed in the next section.

Mid-2019, DAH views and strategies have changed. Distancing from the promise to revolutionize finance by applying DLT to activities such as trade clearing and settlement, instead, DAH is ramping up its focus on smart contracts with the perspective that any blockchain-enabled financial settlement system is likely to be highly dependent on smart contract technology. There is also recognition that customers were fearful of being locked into any specific platform.

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<sup>29</sup> The following entities have contributed to DAH: ABN Amro, Accenture, Australian Securities Exchange, BNP Paribas, Broadridge, Citi, CME Group, Deutsche Börse Group, Depository Trust & Clearing Corporation, Goldman Sachs, IBM, JPMorgan Chase, NEX, PNC Financial Services, and Banco Santander.



Almost in parallel, in 2015, Finality<sup>30</sup> launched the “utility settlement coin” (USC) project with the perspective that the introduction of DLT technology would not only enhance efficiency and simplification but would “*enable a big disruptive shift in the shape of financial market structure, a vision that goes beyond the narrow, technology-centric goals of operational efficiency improvements that are found in many DLT initiatives*”.

Currently, the firms that are partners in Finality<sup>31</sup> plan to use a “bitcoin-like” token, or USC, for the settlement of cross-border transactions. The token will function as a payment tool and will be a blockchain-based digital cash equivalent to currencies. Finality will open accounts at participating central banks and issue the coins, backed by cash assets held at the central bank. In this way, USCs will remove the need to buy the destination currency, enabling clients to reduce their exposure to foreign exchange risks.

## 5. Case studies

### Australian Securities Exchange (ASX)

ASX is in the process of replacing CHES<sup>32</sup> with DLT with the purpose of providing a broader range of benefits to a wider cross section of the market.

ASX commenced a process of evaluating replacement options for CHES in 2015. In January 2016, ASX selected US-based software firm Digital Asset (DA) as a technology partner to develop, test and demonstrate to ASX a working prototype of a post-trade platform for the cash equity market using DLT. ASX is an investor in DA. This initial phase of work was completed in mid-2016. In December 2017, ASX completed its own analysis and assessment of the technology.

The new DLT-based CHES is targeting to go live in April 2021 and is being built using the Digital Asset Modelling Language (DAML). Additionally, CHES will use the ISO 20022 protocol, the messaging standard being adopted by the Reserve Bank of Australia (RBA) and other exchanges around the world.

ASX said that the new system will provide “upgraded security, resilience and performance” and enable a market participant to access the platform by taking a DLT node which will be “secure, privately permissioned and operate behind ASX’s perimeter firewalls”. Another benefit of blockchain in post-trade services is the synchronization of the user to “source-of-truth data” without the need for messaging and a costly reconciliation process. Any user who does not wish to take a DLT node can access the ledger using messaging standards. Only ASX can make changes to the ledger, with users aligning with regulatory prerequisites having read-only access.

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<sup>31</sup> Finality was originally proposed by UBS in collaboration with fintech startup Clearmatics. Currently, Finality is also composed by Banco Santander, Bank of New York Mellon Corp., Barclays, Canadian Imperial Bank of Commerce, Commerzbank AG, Credit Suisse Group, ING, KBC Group NV, Lloyds Banking Group, Mitsubishi UFG Financial Group Inc., Nasdaq, State Street Bank & Trust Co., and Sumitomo Mitsui Banking Corp.

<sup>32</sup> CHES is the core system that performs the processes of clearing, settlement, asset registration, and some other post trade services which are critical to the orderly functioning of the market.

Although the project is on track, in the recent past, the CHES replacement has hit some hurdles. For example, some share registry firms complained about the invasion of their territory. ASX responded by working with regulators and customers and inviting stakeholders to join the Business Committee, the body overlooking the exchange's clearing and settlement services.

## **DTCC**

In early 2017, DTCC announced a project with the purpose of analyzing how DLT and cloud services could improve its credit derivatives Trade Information Warehouse (TIW) system<sup>33</sup>. The standardized nature of the process flows and data models made credit derivatives an ideal test case for DLT. Strengthened by common data standards and governance, a DLT-based TIW service would enable the industry to process and report to regulators from the same data record.

Initially, DTCC selected only three partners, IBM, Axioni and R3 with IBM providing program management, DLT know-how, and integration services, and R3 serving as an advisor of the project. The DLT initiative uses the blockchain technology of Axoni.

In November 2018, DTCC announced the beginning of a test phase with MarkitSERV and 15 (fifteen) leading global banks. DTCC plans were to move TIW to blockchain and cloud infrastructure after the first quarter of 2020. However, in October 2019, DTCC pushed back the release of its blockchain-based post-trade system for derivatives by several months in order to allow for additional testing of the revamped TIW. It is speculated that the postponement was also related to complications created by Brexit. There are also other timing issues to do with market implementation, including new regulations from the Commodity Futures Trading Commission (CFTC), for example. DTCC did not yet provide a new date for the re-scheduled release.

## **DCV**

The DCV together with the Chilean Central Bank decided to explore DLT for advancing in the development of digital assets, considering the processes of issuance, administration and repurchase of those instruments. Both DCV and the Chilean Central Bank were interested in analyzing how DLT could effectively contribute to reduce risks and improve the issuance of instruments.

The project began to take shape in the beginning of 2019, since when both DCV and the Chilean Central Bank have been carrying out a survey of the flows and a study of the business model. This work is expected to produce a proof of concept and a formal conceptual document allowing for the design of a theoretical solution to identify a possible model that could replace the current one and provide a basis to evaluate the viability and convenience

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<sup>33</sup> The TIW serves as the golden record for bilateral credit derivatives, performing lifecycle events, payment calculations and settlement through CLS. Additionally, it includes cleared derivative positions from ICE, the Japan Securities Clearing Corporation (JSCC) and LCH SA's CDS Clear, providing market transparency through its public reporting across both cleared and uncleared transactions.



of advancing to a next stage as determined by both institutions. The plans were to conclude this phase in mid-2020.

In August 2019, DCV, the Santiago Stock Exchange (STE) and the Global Trade Directory (GTD) announced the formation of the so-called Technology Consortium in order to examine use cases for blockchain in the financial sector, specifically create a Blockchain as a Service (BaaS) to any potential Independent Software Vendors (ISV) for domestic and international institutions. This alliance is the first of its kind in Latin America.

Within 18 months, the association looks to institute the Blockchain as a Services (BaaS) that will operate a collection of nodes. Reportedly this interconnectivity will reduce applications, times, and costs of administrative processes. Over the next six months, the Consortium will define the project's details with input from affected institutions. Production releases are expected at 6 (six) month intervals thereafter.

The agreement contemplates the development of a Business Blockchain Network, a new infrastructure that will allow the connection of local and international clients of the stock market through nodes provided by the Technological Consortium itself or installed in customer systems. In both cases, the network would be accessed through APIs that would provide access to the different applications in the platform.

### **SIX (Swiss Stock Exchange)**

In 2019, SIX has launched a pilot version of its exchange and CSD for digital assets. The prototype platform was launched under its digital assets subsidiary SIX Digital Exchange (SDX). SDX intends to show that a DLT-based CSD can be integrated with a central order-book stock exchange model to ensure fair market conditions for all.

Early functionality of the platform for “test cases” covers issuance of digital security tokens, live trading and instant settlement, which includes the cash-leg of the transaction within the concept of a payment token as well as access to a distributed portal where it would be possible to monitor transactions across specific DLT member nodes.

SDX's trading facility is intended to be similar to the SIX infrastructure, while token issuance will utilize SIX's Connexor reporting service and functionality. Ultimately, SDX aims to enable instant settlement with no counterparty risk or requirement for default fund collateral at a central counterparty; the transactions being settled directly between the buy and sell-sides if they have the necessary cash and assets to fulfil the settlement obligations.

Phase two of the prototype is expected to be ready in 2020. It will also add the first digital custody functionality. Exchange users will be able to hold their assets on the SDX in a “distributed way,” with access through the use of a private key.

## VI. Challenges related to cyber-resilience

Cybersecurity threats are evolving almost at the same pace as digital technologies, exploring the increased complexity and connectivity of critical infrastructure systems. Cyber-crimes and technological risks have become the most significant threats to the global financial community.

### 1. The NIST Framework and the CPMI-IOSCO Guidance on cyber resilience

In 2014, the US **National Institute of Standards and Technology (NIST)** developed and published the Framework version 1.0<sup>34</sup> for improving critical infrastructure cybersecurity<sup>35</sup>. Since then, the NIST Framework has become the main reference for approaching cyberthreats and managing the related risks.

The Framework is a risk-based approach to managing cybersecurity risk and is composed of three parts: the **Framework Core**, the **Framework Implementation Tiers**, and the **Framework Profiles**.

- The **Framework Core** allows for communication of cybersecurity activities and outcomes across the organization from the executive level to the implementation/operations level. The Framework Core consists of five Functions—**Identify, Protect, Detect, Respond, Recover**. These Functions provide a high-level, strategic view of the lifecycle of an organization’s management of cybersecurity risk.
- The **Framework Implementation Tiers** provide context on how an organization views cybersecurity risk and the processes in place to manage that risk. The Tiers characterize an organization’s practices over a range, from Partial (Tier 1) to Adaptive (Tier 4), reflecting a progression from informal, reactive responses to approaches that are agile and informed. An organization should consider its risk management practices, threat environment, legal and regulatory requirements, business objectives, and organizational constraints.
- The **Framework Profile** can be characterized as the alignment of standards, guidelines, and practices to the Framework Core in a particular implementation scenario. Profiles can be used to identify opportunities for improving cybersecurity posture by comparing a “Current” Profile (the “as is” state) with a “Target” Profile (the “to be” state).

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<sup>34</sup> The Cybersecurity Enhancement Act 20142 (CEA) updated the role of the NIST to “facilitate and support the development of” frameworks. NIST should identify “a prioritized, flexible, repeatable, performance-based, and cost-effective approach, including information security measures and controls that may be voluntarily adopted by owners and operators of critical infrastructure to help them identify, assess, and manage cyber risks.”

<sup>35</sup> Critical infrastructure<sup>4</sup> is defined in the U.S. Patriot Act 20015 as “systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters.”

The five Framework Core Functions are defined in the box below.

- Identify – Develop an organizational understanding to manage cybersecurity risk to systems, people, assets, data, and capabilities. Understanding the business context, the resources that support critical functions, and the related cybersecurity risks enables an organization to prioritize its efforts, consistent with its risk management strategy and business needs.
- Protect – Develop and implement appropriate safeguards to ensure delivery of critical services. Examples of outcome Categories within this Function include: Identity Management and Access Control; Awareness and Training; Data Security; Information Protection Processes and Procedures; Maintenance; and Protective Technology.
- Detect – Develop and implement appropriate activities to identify the occurrence of a cybersecurity event. The Detect Function enables timely discovery of cybersecurity events. Examples of outcome Categories within this Function include: Anomalies and Events; Security Continuous Monitoring; and Detection Processes.
- Respond – Develop and implement appropriate activities to take action regarding a detected cybersecurity incident. Examples of outcome Categories within this Function include: Response Planning; Communications; Analysis; Mitigation; and Improvements.
- Recover – Develop and implement appropriate activities to maintain plans for resilience and to restore any capabilities or services that were impaired due to a cybersecurity incident. The Recover Function supports timely recovery to normal operations to reduce the impact from a cybersecurity incident. Examples of outcome Categories within this Function include: Recovery Planning; Improvements; and Communications.

Source: NIST - *Framework for improving critical infrastructure cybersecurity – version 1.1*, April 2018

In 2016, **CPMI – IOSCO** published the document *Guidance on cyber resilience for financial market infrastructures* aiming at a more specific reference for FMIs. Without imposing any additional standards on FMIs, the *Guidance* provides details related to the measures that FMIs should undertake to enhance their cyber resilience capabilities with the objective of limiting the escalating risks that cyber threats pose to financial stability. In this context, cyber resilience is an “FMI’s ability to anticipate, withstand, contain and rapidly recover from a cyberattack”.

Although cyber risk is included in the PFMI, mainly through principle 17, the uniqueness of this type of risk is considered to present challenges to FMIs’ traditional operational risk management frameworks:

- Cyberattacks have a persistent nature. The presence of an active, persistent and sometimes sophisticated adversary in cyberattacks means that, unlike most other sources of risk, malicious cyberattacks are often difficult to identify or fully eradicate and the breadth of damage difficult to determine.
- There is a broad range of entry points through which an FMI could be compromised. As a result of their interconnectedness, cyberattacks could come through an FMI’s participants, linked FMIs, service providers, and vendors. Also, from a cyber perspective, a small participant or a vendor may be as risky as a major participant or a critical service provider. The risk of insider threat is yet another avenue for possible compromises.

- Cyberattacks can render some risk management and business continuity arrangements ineffective and can propagate rapidly within a network of systems. For example, automated system and data replication arrangements might fuel the propagation of malware and corrupted data to backup systems.

The *Guidance* outlines five primary risk management categories that should be addressed across an FMI's cyber resilience framework. The categories broadly replicate the NIST Framework functions with some prominence given to governance<sup>36</sup>.

## 2. The current challenges and impacts on FMIs

Cyber-crime is a growing risk in the Americas. According to the OAS (Organization of American States), Cyber Security Program of the Inter-American Committee against Terrorism<sup>37</sup>, 92% of the banking entities report that they identified some kind of digital security event (successful attacks and unsuccessful attacks) against the financial entity. The most identified events were: "i) malicious code or malware (80% of all banking entities), ii) violation of clear desk policies (63% of total banking entities) and iii) targeted phishing to access the bank's systems (57% of the total of banking entities). Moreover, the events of phishing, social engineering, and spyware (malware or Trojans) were the most frequently used against their financial service users"<sup>38</sup>.

The cyber security risks that warrant the most attention from banking entities are the theft of a critical database, the compromise of privileged user credentials and/or data loss.

The actors behind cyber threats are of multiple kinds: cyber terrorists, nation states (hackers working for governments), cyber criminals, hacker activists and insiders; the latter being responsible for 80% of cyberattacks. Insider cyberattacks can be intentional or not, but their preponderance justifies efforts and training with the purpose of increasing the awareness and preparedness of personnel. Publicly disclosed disciplinary actions are also an important prevention mechanism.

Cybercrimes are currently very well-funded and based on highly organized structures with a clear hierarchy. According to the OAS, on average, banks take 200 days to detect a security event and approximately two thirds of them do not detect the breaches by themselves, but rather through users or other parties.

Considering the "a chain is no stronger than its weakest link"<sup>39</sup>, institutions start with a basic approach and then escalate to more sophisticated tools while planning to respond to attacks. It is worth mentioning that almost half of banking entities are still not implementing controls involving digital technologies, such as big data, machine learning or artificial intelligence which can be very useful for prevention and identifying suspect patterns associated with cyberattacks.

Cyber exercises involve both Intrusion Detection and Prevention Systems (IDS and IPS) and processes for monitoring vulnerabilities.

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<sup>36</sup> CPMI/IOSCO - *Guidance on cyber resilience for financial market infrastructures*, June 2016.

<sup>37</sup> OAS - *State of cybersecurity in the banking sector in Latin America and the Caribbean*, 2018.

<sup>38</sup> Although the data is related to the banking system, it could be considered a fairly good proxy for the financial system as a whole. No similar data is available for FMIs.

<sup>39</sup> Thomas Reid in *Essays on the Intellectual Powers of Man*.

Once an intrusion is identified, the actions that follow should be carefully planned and weighted by senior management, in particular to the scope and timing of communications and to the prioritization of removing measures. Operational resilience is related to how to keep operations going on when some part is compromised; the goal being to reduce the impacts for clients, markets and country.

One important concern related to information sharing is the reluctance of institutions to expose themselves and add reputational risk to the already compromised operations. Knowing that everyone is under potential attack on a continuous basis and that the odds are better if the information is timely shared should stimulate institutions to develop cooperative communication protocols.

In this sense, the Financial Services Information Sharing and Analysis Center (FS-ISAC) is dedicated to reducing cyber-risk in the global financial system through a trusted peer-to-peer network of experts focused on anticipating, mitigating, and responding to cyberthreats.

The impacts of cyberattacks to FMIs are essentially of the same nature as to other financial institutions.

Nevertheless, FMIs are risk consolidators and their networks usually link a great number and variety of institutions – from settlement banks to custodians and issuers. Moreover, the operations involved are considered systemically important and, as a result, critical to the financial system stability. Therefore, considering its central role and its ramified trait, a cyberattack involving securities and depository systems is likely to generate losses at multiple levels - individuals, institutions, and governments.

Another level of concern arises from the cross-border links existing among FMIs. A cyberattack can rapidly go beyond national boundaries and compromise operations in different marketplaces. As said before, since the weakest link is the actual measure of the system's cyber resilience, coordination is another key aspect along the adoption of the reference framework mentioned before.

Individually, FMIs are increasingly dedicating human and financial resources to develop tools and processes to detect, prevent and remove cyber risks. Continuity and recovery plans have been/are being reviewed to incorporate this new level of risk. Nevertheless, cooperation remains a challenge.

In this sense, the WFC created a new working group to co-ordinate regional CSD associations' efforts to keep cyber-resilience at an agreed level.

## VII. Internationalization experiences and their contribution to FMIs' development

Acting in a global arena and participating in the international capital flows is an unequivocal sign of success for financial institutions in general. Although FMIs have different drivers of development, cross border links have developed for the last 3 (three) decades as a result of the diagnosis that the internationalization of infrastructures would result in: i) broader and better services to local markets' stakeholders, investors, intermediaries and issuers, and ii) the consolidation of the local capital markets through the strengthening of their infrastructures.

There are some types of cross-border links that are relatively easy to implement and allow for local investors to access a foreign market. The extent of participation of CSDs in those links may vary and usually a chain of intermediaries and custodians play a relevant role in the arrangement. Other links involve the coordinated connection between exchanges, CSDs, SSSs and CCPs. In some other cases yet, links take form of direct participation in the other infrastructure either through the acquisition of part of the foreign infrastructure or through the provision of technological solutions.

Whatever the cross-border link model, one valid question is related to its efficiency in terms of the development of the market, its participants and FMIs. In some markets, CSDs and other infrastructures have certainly experienced a visible development as a result of their internationalization initiatives, in terms of markets attended, number of participants and customers, as well as products and services offered. However, those markets usually have already reached a certain level of maturity and liquidity and were able to make relevant investments to promote their growing internationalization. This is not the reality of most ACSDA members..

In this chapter, we briefly present the existing cross-border links within ACSDA environment, as well as the experiences of Target-2 Securities (T2S) and, more recently, Asian Settlement Depository (ASD) as examples of regional integration initiatives. In the sequence we will discuss how internationalization can be a factor of development for FMIs.

### 1. ACSDA's existing cross-border links and arrangements

Most ACSDA members maintains some type of cross-border link or integration arrangement. In this section, the regional experience will be organized in 3 (three) models – cross-participation (unilateral or bilateral), operational agreement and ownership<sup>40</sup>.

#### **Cross participation**

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<sup>40</sup> Although not categorized as one type of link or integration agreement, it is worth mentioning the experience of AMERCA, the *Asociación de Mercados de Capitales de las Américas* including the stock exchanges of Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Dominican Republic. This alliance among exchanges that also act as CSDs and/or SSS for their market was created in 1994 with the purpose of promoting the cross-border links among the members as the basis for cross-border investments.



This model corresponds to the cases where a CSD maintain a securities account in an ICSD, more specifically Euroclear and/or Clearstream, or in another CSD<sup>41</sup>. The CSD that has an account in another CSD usually has the status of a regular participant of the host CSD and adheres to their rules and procedures.

Through the mechanism of maintaining an account in a foreign CSD, the local participants / investors can access the corresponding foreign market, buy the securities available in that market and have them deposited in the foreign CSD when settled. The local CSD would then reflect the positions in a mirror account in their own systems and provide information and balances to the local participants / investors.

If the local market operates with a beneficial owner account holding structure, there is the additional obligation of breaking down into individual positions the aggregate position held in the foreign CSD. In this case, although the local CSD would keep record of beneficial owner positions in their local mirror account, in the local CSD account held in the foreign CSD the positions will be held in an omnibus account without individualization.

The link can be unilateral or bilateral and the design reflects the interests of investors and issuers and/or the willingness of the markets, their trading and post-trading infrastructures, to engage in promoting capital flows among them.

One common link of this type maintained by ACSDA members is through accounts they hold in the ICSDs – Euroclear and/or Clearstream, as shown in the table below. Those unilateral links allow local investors to access the foreign markets served by the ICSD.

**Table 2: ACSDA members with accounts in the ICSDs Euroclear and Clearstream**

ACSDA Member	Euroclear	Clearstream
BCU		✓
BVM		✓
Cavali	✓	
CDS	✓	
Cedeval	✓	✓
Cevaldom	✓	✓
CVSA	✓	✓
DCV	✓	
Deceval		✓
Indeval	✓	✓
Interclear	✓	✓
Latinclear	✓	✓

Source: ACSDA members profiles and respective websites

<sup>41</sup> In the PFMI (Principle 20 on FMI Links), the CSD that establish a link to another CSD is referred to as the investor CSD and the CSD where securities are issued or immobilized is referred to as the issuer CSD.

ACSDA members also maintain accounts in other CSDs and the drive seems to be related to geographical proximity and affinity. As shown below, most links are bilateral and many among countries in Central America. Many CSDs hold in DTC which are related to the size and relevance of the US market for investors in the region.

**Table 3: ACSDA members with accounts in other CSDs**

ACSDA Member	Other CSD	Type of link
BarCSD	T&TCSD	Bilateral
	JCSD	Bilateral
BVM	BVPASA	Unilateral
Cavali	DTC	Unilateral
	CDS	Bilateral
CDS	DTCC	Bilateral
	SEB <sup>42</sup>	Unilateral
	Cavali	Bilateral
Cedeval	Interclear	Bilateral
	Latinclear	Bilateral
	Cenival	Bilateral
Cenival	Cedeval	Bilateral
	Latinclear	Bilateral
CVSA	DTC	Unilateral
Indeval	DTC	Unilateral
Interclear	Cedeval	Bilateral
	Cenival	Unilateral
	Latinclear	Bilateral
JCSD	BarCSD	Bilateral
Latinclear	Cedeval	Bilateral
	Interclear	Bilateral
	Cenival	Bilateral
	CVV	Unilateral

Source: ACSDA members profiles and respective websites

Another relevant link maintained by ACSDA members is with DTCC mainly for receiving collaterals in the US market either through a mechanism of pledge accounts or custodian banks. The following ACSDA members have this type of arrangement: B3, CDS, DCV, Indeval and Cavali.

### Operational agreements

This model corresponds to the cases where one or more CSDs establish an operational agreement with specific rules and procedures, besides the individual markets' rules and procedures that usually prevail for the processes that take place within the local market. The specific rules and procedures are mostly related to the exchange of information among the agreement participants such as instructions, reports and statements and reconciliation procedures.

The most relevant example among ACSDA members currently is the **Mercado Integrado Latinoamericano**, known as **MILA**. Aiming at the development of the members' capital markets through the integration of their

<sup>42</sup> Skandinaviska Enskilda Banken AB



infrastructures, MILA integrates the markets of Chile, Colombia, Mexico, and Peru. MILA was launched in 2011 by its three founding members - the Lima Stock Exchange, the Santiago Stock Exchange, and the Colombia Stock Exchange and the respective CSDs, Cavali, DCV and Deceval. The Bolsa Mexicana de Valores and Indeval joined MILA in 2014.

The integration takes form of an operational agreement among the exchanges' and CSDs' members in order to consolidate the trading environment through an order routing scheme. Investors are able to access MILA through one of the registered brokers that have access to the consolidated trading platform for buying and selling securities in any of the four countries. In the same way, the companies participating in MILA have increased availability to raise capital by means of accessing new investors.

Some regulatory and legal steps were necessary for the implementation of MILA such as the recognition of the foreign securities in the local market for public offering. The level of information disclosure by issuers was also a point of attention in order to avoid information asymmetries among investors located in the different countries.

Regarding clearing and settlement procedures such as settlement cycles, delivery and payment arrangements and timeframes as well as collateral posting obligations, the rules and operational procedures employed are those of the local market where the trade takes place.

With respect to account holding arrangements, the CSD members establish a bilateral agreement where each CSD maintains an omnibus account for the other CSDs where the local securities traded by the foreign investors are deposited when transactions are settled in the local market. This arrangement requires the reconciliation of the CSDs' accounts in the host CSD with the registers of the foreign CSD.

As Cavali and Deceval hold a beneficial owner account holding system, in opposition to Indeval and DCV where the accounts are in the name of direct participants only, the breakdown of individual positions in the Peruvian and Colombian markets is carried out at the local CSDs.

Another example of operational agreement in the region is the one established between some **ACSDA members and Iberclear**. The unilateral link supports the listing and trading of Latin-American securities in the Spanish Market - Latibex. Currently, CVSA, B3, Cavali and Indeval maintain operational agreements with Iberclear. CVSA, B3, Cavali and Indeval play a role that is similar to a custodian institution in a DR program and Iberclear as the depository institution. In order to be traded in Latibex, securities must be transferred from the owners' account to a Latibex custody account in the Latin-American CSD. Analogously, when securities are no longer traded in Latibex, they can be transferred from the Latibex custody account to the owner's account in the CSD. The agreement covers the necessary communications to ensure that the securities are made available in the Spanish market provided that they are duly blocked in the Latibex custody account in the Latin-American CSD.

Also, B3 and CVSA signed an operational agreement to allow Brazilian and Argentinian securities to be mutually traded in the other market. Although a bilateral agreement, materially it only worked one way: Brazilian issuers with Cedears traded in Argentina, B3 acting as the custodian institution and CVSA as the depository. The

agreement between B3 and CVSA is still in place, however the last Brazilian company to have Cedears issued in Argentina has recently announced the cancelation of the program thus putting at stake the continuance of the agreement as it is.

## Ownership

A CSD can expand its international presence by means of participating directly or indirectly in another CSD as a shareholder. There are some relevant examples of this model among ACSDA members.

B3 holds an indirect equity participation in Indeval, Deceval, Cavali and DCV as a shareholder of the respective exchanges which are parent companies or the main shareholder of the CSD. Similarly, BMV holds an indirect equity participation in Cavali, also as a shareholder of the Peruvian exchange. Cavali on its turn has a direct equity participation in both EDV and Cevaldom.

## 2. The European experience with Target-2 Securities (T2S)

Cross-border links have been very proliferous around the world as a mechanism to promote investors, intermediaries, and issuers access beyond local markets. The intention in this section is not to make an inventory of those links; it would not be very useful for our purposes and would rapidly become out-dated. The main goal here is to summarize the European experience with T2S after a year of the implementation.

T2S is a European securities settlement engine, owned and operated by the Eurosystem<sup>43</sup>, which offers centralized DVP settlement in central bank money across European securities markets.

The T2S project was launched in 2008 and the platform was initially scheduled to start operations in 2015. The T2S Framework Agreement, negotiated between CSDs and the Eurosystem, has been signed by 21 CSDs, which migrated to the T2S platform in four waves between June 2015 and September 2017.

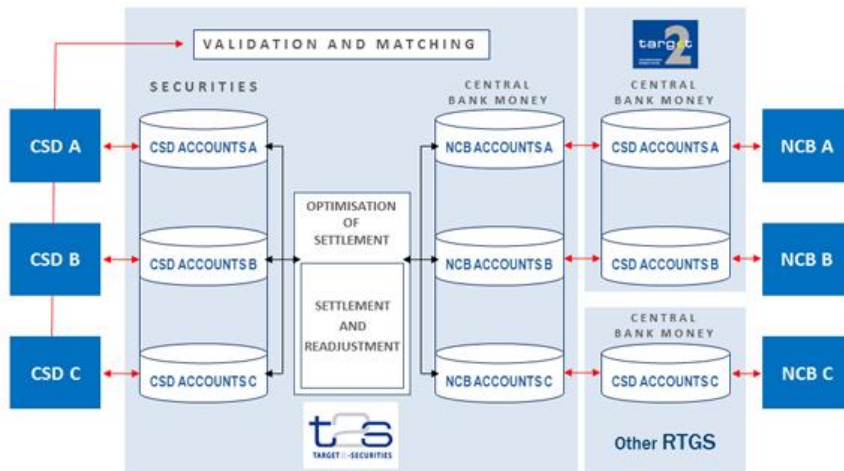
The fundamental objectives of T2S were to integrate and harmonize the highly fragmented securities settlement infrastructure in Europe and to reduce the costs of cross-border securities settlement. It is important to take note of the fact that as T2S separates the settlement infrastructure from the services offered by CSDs and CCPs, competition in the provision of those services was expected to increase.

Undeniably, it was a critical step forward in the creation of the single market for financial services in the region. The expectation was and still is that T2S will have a positive impact on European economic growth and financial stability through the reduction of risks affecting the settlement of cross-border transactions.

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<sup>43</sup> The **Eurosystem** is the monetary authority of the eurozone, the collective of European Union member states that have adopted the euro as their sole official currency. The Eurosystem consists of the ECB and the national central banks (NCB) of the 19 member states that are part of the eurozone.

The general scheme of T2S is displayed below:



Source: Banque de France

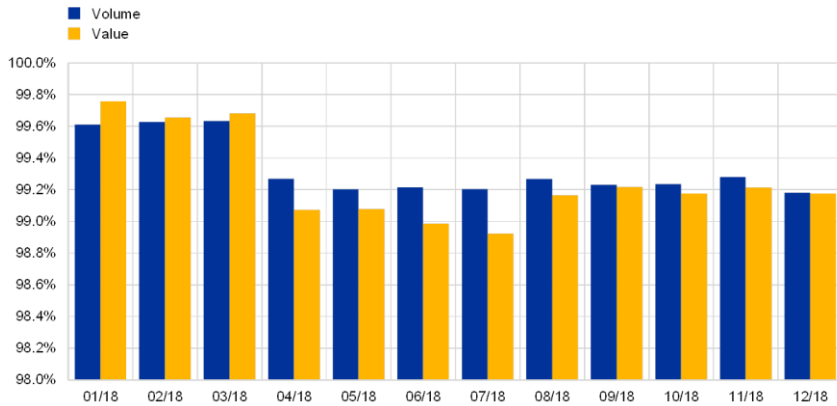
Market participants settling through T2S need a securities account with one of the European CSDs connected to T2S and a dedicated cash account with one of the central banks connected to the platform. These accounts live side by side in T2S platform that coordinates DVP settlement in an integrated way across Europe. For each transaction, settlement instructions from the CSD and the central bank are matched by T2S when they enter the system. T2S then settles the transaction on a DVP basis.

The ECB advertises that “T2S revolutionized securities settlement in Europe because it brought an end to complex cross-border settlement procedures and the problems caused by different settlement practices among countries. Instead with T2S we have a common platform on which securities and cash can be transferred between investors across Europe, using harmonized rules and practices.”<sup>44</sup>.

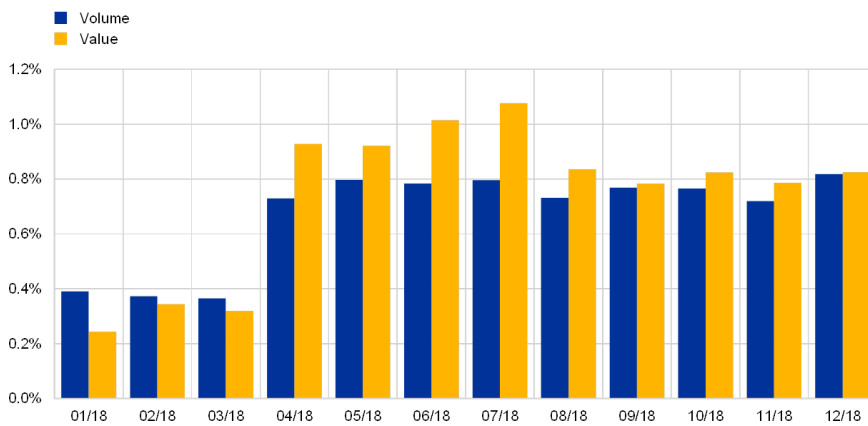
Nevertheless, after one year of T2S operations, the diagnosis is that post-trade securities processing in Europe remains fragmented, as evidenced in the graphs below comparing the proportion of transactions settled intra-CSD and cross-CSD in 2018.

<sup>44</sup> <https://www.ecb.europa.eu/paym/target/t2s/html/index.en.html>

**Graph 10 – Volume and value of intra-CSD settlement (percentages, daily average)**



**Graph 11 – Volume and value of cross-CSD settlement (percentages, daily average)**



Source: T2S Annual Report 2018

In the end of 2018, the ECB published a report after one year of full operation<sup>45</sup> stating, among other things, that the post-trade space in Europe remains extremely fragmented, despite the launch of T2S. The report also evaluates that “volumes are below initial assumptions; total costs have not decreased as anticipated and real cross-CSD settlements remain marginal”. Regarding the last point, it was observed that “barriers still hamper cross-border settlement integration” and the obstacles include the gaps related to corporate action market standards and the lack of harmonization regarding tax regimes and processing.

While discussing initiatives that could foster T2S development, it was suggested that “T2S should accelerate its plans to bring European debt into T2S by creating a centralized European infrastructure – such as a European CSD – that will settle such instruments”. The issue of further consolidation at the CSD level is to be followed up closely by all industry stakeholders.

<sup>45</sup> T2S Special Series – One year of full operation, December 2019

### 3. Experiences in Asia

The Asian region congregates some interesting experiences of operational agreements and consolidation.

Shanghai Stock Exchange, China Financial Futures Exchange and Deutsche Börse entered a joint venture and set up the **China Europe International Exchange (CEINEX)** to market and trade financial instruments based on renminbi-denominated underlying assets. The cash market is the focus of CEINEX with products that include bonds, ETFs, and Deutschland Shares (D-Shares), referring to shares issued by companies incorporated in China and listed in Germany. ETFs on CEINEX track the most important Chinese indices. RMB bonds are issued by blue chip companies or large financial institutions. Debt securities are in the process of planning, which support China's "Belt and Road Initiative" projects facilitating investment and development along the ancient silk road from China to the West.

CEINEX offers clearing, settlement, and depository services, based on Deutsche Börse Group's infrastructure. Memberships of Frankfurt Stock Exchange and Eurex provide direct access to CEINEX products for cash and derivatives trading. All products are issued and traded under German and European capital market regulations and exchange rules.

Another example was the establishment in 2014 of **Shanghai-Hong Kong Stock Connect**, which connected Shanghai Stock Exchange with Hong Kong Stock Exchange, enabling investors in each market to trade in the other using local brokers and clearinghouses<sup>46</sup>. Trading northbound and southbound increased substantially after the inception of the program, and Hong Kong Stock Exchange has seen more listings and an increase in trading volumes. The tie-up was followed in 2016 by Shenzhen-Hong Kong Stock Connect, formed by subsidiaries of Hong Kong Stock Exchange, Shenzhen Stock Exchange and China Clear.

For northbound trades, ChinaClear acts as the host CCP and Hong Kong Securities Clearing Corporation is a participant of ChinaClear. HKSCC will take up settlement obligations of its clearing members in respect of northbound trades and settle the trades directly with ChinaClear in the mainland. The same applies for southbound trades; HKSCC is the host CCP and ChinaClear is its clearing members. ChinaClear takes up settlement obligations of its clearing members with respect to southbound trades and settles the trades with HKSCC in Hong Kong.

Another more circumscribed but successful example of cooperation in the international arena is the agreement between Korea Exchange and Eurex Exchange in 2010 in order to offer round-the-clock trading of KOSPI 200 Options, which is the world's most liquid index option.

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<sup>46</sup> The operational arrangement is not very different from the one in MILA, except for the use of a single currency – the renminbi.

#### 4. Internationalization as a factor of development

It is a consensus that opening access to international investors and issuers and allowing domestic firms and investors to issue and invest abroad can generate positive effects in securities markets. Firstly, because this expands the savings available for investment, allowing more space for securities issuance. Second, entry of foreign investors and issuers has the potential to promote local market liquidity and depth and to reduce volatility by lowering sensitivity to local developments, although it increases exposure to global spillovers. Third, the prospect of foreign competition tends to promote the implementation of international best practices and standards.

According to the document published in January 2019 by the BIS (Committee on the Global Financial System) on the development of capital markets<sup>47</sup>, there is evidence suggesting that the presence of foreign issuers in local markets “brings diversity to local credit markets and depth to local hedging markets, since such issuers typically seek to exchange their proceeds back into their home currency, which creates a natural counterpart to domestic firms wishing to hedge foreign currency borrowings”. Also, internationalization of capital markets promotes “better institutional quality – stronger rule of law, better accounting standards and increased transparency of government policy – also dampens the effects of global risk shocks”.

However, opening the market requires a certain level of development and maturity. If the level of internal securities liquidity is rather low, the economic conditions are not sufficiently attractive for foreign issuers and investors are not sophisticated enough to demand international products, the existing market can be exported to other more attractive venues. The issuance of securities abroad through depository receipts, for instance, would most likely further reduce the liquidity as a result of fragmentation.

Therefore, although the internationalization has the capability of promoting capital markets’ development, as well as economic growth and stability, the experience shows that some concrete circumstances and specificities will determine whether those outcomes will materialize or if the results will be rather neutral or even negative in terms of local markets’ progress.

Some sort of cross-border links involving FMIs can be key or even necessary to operationalize the internationalization of markets. The willingness of issuers, intermediaries and investors is a crucial driving force, but the implementation of cross-border links involves the FMIs and the regulators of linked markets. The design, depth and features of cross-border arrangements among CSDs/SSSs presupposes a certain level of regulatory harmonization, process standardization and, sometimes, technology integration.

As the *devil is in the detail*, promising initiatives may take time to produce results or the results might be below expectations. Bottlenecks such as corporate actions processing, and taxation rules and procedures may hold back the potential of internationalization as a factor of development.

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<sup>47</sup> CGFS - *Establishing viable capital markets*, CGFS Papers, No 62, January 2019



## VIII. Issues for consideration and recommendations

According to McKinsey&Company (2017), FMIs have been growing steadily in recent years and above the average in the financial services industry. The growing revenues and increasing margins were based on the significant expansion of certain asset classes and rising demand for risk management and data services. Also, the competitive environment would have swung in favor of FMIs since “as the sell side has been hit with heavier capital and cost burdens, infrastructure providers have stepped in to offer new services and develop fresh relationships”.

However, in a time of disruptive technological change and evolving regulation, FMIs are called to permanently evaluate their strategies in order to leverage the existing capabilities and to perform new roles. It is not a matter of survival or maintenance of the *status quo* within the FMI landscape, but rather the recognition of FMIs natural vocation to play an important role in the future development of capital markets as an orchestrator of change.

ACSDA members have played a key role in the development of their local capital markets and financial systems. In a scenario where potentially, disruptive technologies are imminent and financial systems everywhere are being challenged to provide products and services in a more efficient way and at lower costs, ACSDA members should step forward as leaders in this changing environment.

The considerations and recommendations presented below aim at providing ACSDA members with material for reflection while developing growth strategies over the next years. These points should be taken into consideration in the pursuit of models to step up services and tap new revenue streams whilst enabling the fulfillment of the leadership role mentioned before.

### 1. Reevaluation of the core business model

Before exploring the diversification opportunities, it is important to recognize that a key element for growth is the strengthening and optimization of the FMIs’ core business. More specifically to the context of ACSDA members profiles, the central depository, settlement and, sometimes, collateral management functions should be the focus of attention.

Considering the PFMI, it is recommended that ACSDA members undertake a broad and detailed analysis of their business models in those areas, considering their current and prospective market characteristics.

#### ***Clearing and settlement model***

In the clearing and settlement arena, this recommendation applies more directly to those CSDs that employ netting settlement schemes and/or are involved in the development of central counterparty functions.

Considering the PFMI, especially the requirements imposed by the principles on credit and liquidity risks<sup>48</sup>, the CSD/SSS that adopt a deferred netting schemes for clearing and settlement – DVP models 2 or 3 - should calculate the netting efficiency of such arrangements, i.e., the level of financial resources saved in comparison to the scenario where transactions would be settled on a gross basis. As exposed in previous chapters, in markets with a low volume of transactions the netting efficiency tends also to be low.

The PFMI requirements for the CSD/SSS in terms of risk management tools and systems are significant. The investments and controls that need to be developed can only be compensated if the efficiency achieved by the netting is also relevant. From the participants perspective, once an adequate level of guarantee is constituted according to the principles, there is the risk that market participants enjoy a small reduction in terms of settlement obligations that does not compensate the collateral required by the CSD/SSS.

In cases where simulations prove that the netting efficiency is not sufficiently strong, CSD/SSS should consider adopting gross settlement model – DVP model 1.

### ***Central counterparty***

A similar reasoning applies to the development of central counterparties. Those are fairly sophisticated structures that demand a certain level of market development in order to justify their implementation. Markets where netting proves to be inadequate for the reasons explored above should not engage in projects related to the building of central counterparty functions.

As small and developing marketplaces are more likely to be the object of these recommendations, one relevant aspect to be considered is the likelihood of combining several smaller markets in order to generate the sufficient scale that would justify the adoption of netting and even a central counterparty structure. This reflection is related to the volume of transactions that could be combined in such arrangements. Evidently, other aspects such as regulatory and operational harmonization would have to be overcome.

Shortly, the message that is conveyed in this recommendation is that netting and central counterparty arrangements and structures are a natural result of markets' development and maturity and not a goal *per se*. By means of imposing unnecessary burdens on a still developing market, the adoption of such features can weaken the FMI's core business instead of strengthening it.

### ***Central depository***

In the CSD line of business, one important feature that should be reevaluated by ACSDA members is the account holding structure in place. Although the PFMI does not require explicitly the adoption of beneficial owner account structure, the preference for this model is relatively unambiguous, considering the concerns in terms of rights over securities, segregation of assets and reconciliation procedures.

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<sup>48</sup> The requirements apply to CSD/SSS that employ netting schemes even if not acting as a CCP.

Besides, one of the distressing outcomes of the 2008 financial crisis was to expose the weakness behind omnibus arrangements that give little protection to final investors' assets. Beneficial owner account structure have the benefit of better protecting investors assets but not only that. Know-your-customer and anti-money laundering practices are facilitated by this design which also contributes to inhibit tax evasion. Other identified risks are connected to unauthorized use of securities, theft and fraud and the creation of a favorable environment for trading internalization at the custodians' level.

Technology and complexity are usually the most appointed reasons for not implementing a beneficial owner account holding structure. Lack of adequate legal basis is also mentioned. However, for the last decade, the awareness of risks has grown, including among regulators. Technological barriers are not credible anymore, considering the current status of the debate involving DLT, artificial intelligence and machine learning capabilities. The main reason for not adopting such model might still be cultural and related to the resistance of some market players, such as custodians, that might fear to lose some part of their current business.

It is recommended that ACSDA members consider the progressive adoption of beneficial owner account structures. The adoption of this model can be implemented, for example, firstly for assets which ownership is typically more pulverized or for new instruments as they are being introduced in the market. As a reference for the discussion, the OECD – IADB published in March 2019 “*A beneficial ownership implementation toolkit*” in the Global Forum of Transparency and Exchange of Information for Tax Purposes.

## 2. Diversification of products and services

It is recognized that most growth and expansion opportunities for CSDs reside in diversification. Diversification into related business areas and driven by margin pressure in some core activities and the need for increase in revenue has been the primary modality of expansion. It offers FMIs the chance to generate new sources of revenue based on existing synergies. Expansion driven by diversification can also be achieved through mergers and acquisitions with adjacent businesses.

### ***Diversification around the core business***

The diversification to **other classes of assets** is a major driver of expansion for CSD/SSS businesses. According to McKinsey&Company (2017), FMIs have been expanding services to the buy side, where revenues have grown strongly along the last decade. A key buy side trend has been a shift towards passive investment such as ETFs. CSDs have a privileged position to leverage the rising popularity of ETFs, either through listings or data and index services for the buy side. Corporate bond trading has also been an area of intense focus, with a large number of bond platforms competing with market leaders Bloomberg, Marketaxess and Tradeweb. It is then recommended that ACSDA members consider those classes of instruments with special attention as an expansion strategy.

The expansion through the development of **derivatives markets** is a rather obvious recommendation. The countries where the financial market is more developed are also the ones with more prosperous economies. As

macroeconomic policies become more credible and there is confidence in a low inflation scenario, the demand for financial services and instruments grows. The growth of financial markets is followed by an increase in credit availability which fosters a sharper non-inflationary economic growth. As financial markets become more sophisticated, managing risks becomes a central aspect of the financial system and economies can handle volatility more efficiently. Derivatives instruments play a crucial role in this positive economic development cycle.

Derivatives instruments can be exchange traded or OTC. Since exchange traded derivatives are supported by a CCP, the markets that do not count with this type of infrastructure are in a less favored position to develop such market. Nevertheless, OTC derivatives are a fast-growing market in many countries.

It is recommended that ACSDA members which do not count with a CCP, and are not yet in the process of constituting one, consider the possibility of supporting the development of OTC derivatives either through the concomitant development of collateral management services for the participants or through the establishment of centralized registration functions in a TR. The effort involved in the creation of a TR is significantly lower than in creating a CCP. Besides, a TR can render services to a vast array of financial instruments.

The introduction of **securities lending services and repo transactions** is beneficial to the development of capital markets since it promotes liquidity, an additional source of revenue for investors holders of securities and a mechanism for reducing settlement failures. A relevant obstacle for the development of those markets is the presence regulatory barriers for institutional investors to access them thus reducing the potential offer of securities. The association of such markets to disruptions experienced during the 2008 turmoil with market manipulation through naked short sales also contributed -slow down their development.

In order to foster the development of those markets, it is recommended that CSDs work together with regulatory authorities in order to eliminate, or at least reduce, regulatory barriers. It is also recommended that in countries where naked short selling is allowed, CSDs have a high level of settlement enforcement through the implementation of buy-in processes with a defined settlement cycle. Mandatory or voluntary securities lending can reduce delivery failures significantly.

### ***Diversification beyond the core business***

#### **Trade Repositories (TRs)**

TRs have gained relevance in the global financial marketplace since the 2008 crisis, especially for OTC derivatives. The value of central registration has been recognized for other types of assets and contracts. As assets are used as collateral, centralized registration assures the unicity of the lien created over those assets, therefore preventing frauds. This can be key for the development of credit markets<sup>49</sup> based on the income inflow provided by the receivables, for instance.

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<sup>49</sup> All markets have the potential of securitizing receivables such as forward purchases' instalments or credit or debit cards bills. The securitization of receivables is beneficial for the development of the credit market.

It is recommended that CSDs consider the expansion of activities through the implementation of TR functions. Such development can be much easier in comparison to the effort involved in establishing a CCP, for example, since it does not involve credit and liquidity risk management. The main risk involved in TR activities is of operational nature and managing operational risk is one of the main CSDs' expertise as well as the record keeping of positions and transactions. As said before, OTC can be a sizable and growing market for different types of instruments. Furthermore, initiatives like this are likely to receive support from regulators considering the higher level of transparency it generates.

### **Funds' services**

It is recommended that CSDs consider leveraging on their existing systems and communications network to support a series of processes in the investment fund management. The expertise involved in recordkeeping, asset servicing and DVP settlement can be used to automate, standardize, and centralize processes related to funds management with gains in terms of efficiency and cost reduction. Elements such as automation and standardization are powerful tools in the investment funds sector where many companies still rely on phone calls.

### **Issuers' services**

ACSDA members should expand service offerings for issuers. This potential source of diversification can be particularly relevant for the CSDs with a strong primary markets business. Some categories of service that deserve consideration are:

- **Pre-IPO advisory:** business-support program can help issuers position for the IPO, increase visibility and boost the relation with potential investors<sup>50</sup>.
- **Communication solutions:** Services may include press releases and digital media distribution. NASDAQ, for example, offers a full suite of multimedia offerings.
- **Management services:** CSDs can help boards and support governance with media analysis, risk management and compliance, internal reporting, collaboration tools, and document management solutions.

Another category of service that is not directly rendered to issuers but can have a great impact on their governance performance is **remote/proxy voting**. Leveraging on the communication network already established with both custodians and issuers, CSDs can function as a hub for receiving and consolidating voting instructions thus reducing the bureaucracy, the costs and the risks involved in the voting process. The reach of such services can be even greater in a beneficial owner environment where individuals can cast their votes directly to a centralized system and the CSD can consolidate information to the issuers.

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<sup>50</sup> In one example, London Stock Exchange's ELITE program prepares companies for raising equity finance. Other Europe-based players, including Euronext, NASDAQ, OMX and Deutsche Börse, have been active in this area.

## **Data services**

Exchanges have been commercializing their market data for a while as investment decisions became less and less an individual choice but rather a result of algorithms and robots. Abundant and accurate information provided in a timely fashion adds a lot of value to the entire intermediation industry, exchanges and, of course, investors.

It is recommended that ACSDA members seize the opportunity for developing data services as soon as possible or, for those already active in this area, it is important to be attentive to the increased competition from fintechs and others. Value-added information services offer the potential to boost revenues and generate higher margins, particularly for CSDs that have the monopoly of the information as it is the case in some ACSDA markets.

In this direction, partnerships with fintechs are also an option to be considered, although it is important to ensure that the partnerships are aligned with the mission of the CSD.

## **Utilities as core service offerings**

ACSDA members should consider scaling up and venturing into utilities such as developing solutions for parts of the client's business that are common ground amongst institutions. Cost pressure and regulation have boosted the attractiveness of those services for non-differentiating elements of the value chain. Potential areas for scaled up and shared solutions include post-trade operations (clearing, tax, custody, collateral management, transfer and reconciliation), credit (processing and trading) and data services.

By adopting a similar strategy, it is recommended that CSDs focus on core areas of competence and adopt an open source approach, which will help create network effects. Other strategical advantages CSDs might have in this field are the platform neutrality and a broad potential customer base. The possible challenges in this strategy could be the weight of legacy systems and the need of new pricing models for those services.

## **3. Expansion of relationships base – participants, issuers, and investors**

It is recommended that ACSDA members assess their current base of relationships and evaluate the opportunities of diversification to expand the capital markets ecosystem.

The development of products and services specifically oriented towards retail investors are also an important business opportunity to CSDs. This might be even more relevant where the institutional investors base is in earlier stages of development and individuals are looking for new investment opportunities. Although retail investors' transactions may correspond to a relatively small volume, they have a great potential of developing the investment culture in the marketplace.

One important source of opportunities is regulation. In many cases, regulatory requirements create new businesses to CSDs that can be related to their core business or not at all. In the latter cases, the CSDs usually leverage on their expertise to create value added services to institutions that may not yet belong to their

ecosystem. All needs related to recordkeeping of information or contracts can generate opportunities for CSDs even if the information or contract belong to an entirely different type of asset class or another other industry.

Educational initiatives are paramount and CSDs should dedicate time, financial and human resources to improve the level of financial knowledge of participants, issuers, and investors. CSDs should also support participants' educational initiatives or even create requirements related to educational programs that must be implemented by participants.

#### 4. Adoption of new technologies

New technologies have already generated enough noise to threaten current business models<sup>51</sup>. It was previously presented that the adoption of DLT can generate important benefits such as improve transactions' processing speed, eliminate the need for reconciliation across multiple infrastructures, increase transparency in transaction record keeping and enhance network resilience. However, DLT has not yet been proven sufficiently robust for wide scale implementation. Such being the current status, although DLT has the potential to reduce some of the traditional risks involved in securities transactions processing by FMIs, it may introduce new or different risks or concerns.

Considering this scenario, the recommendation for ACSDA members is to elect one new product or service that is not core to the business but involves enchain processing to introduce DLT technology. This could work as a sand box for further developments and a learning environment for the people involved, without affecting the core of the CSD. It could then be progressively expanded to other existing businesses from more satellite processes to ones that are closer to the core. Meanwhile, the expectation is that DLT implementation cases would multiply and the current challenges would have matured if not been solved.

It is likely that FMIs change their business models at some level through the adoption of DLT, but it is far from certain that this will reach the core of their functioning. Central depository functions are more likely to be affected than settlement and central counterparty functions. CSDs that are organized as SSSs and/or CCPs might be better positioned to play a central role in the governance of the DLT arrangement. As much as DLT can be disruptive, the management of DLT arrangements represent an opportunity for FMIs.

Another recommendation is that CSDs consider the adoption of cloud solutions since they provide a more collaborative and agile approach in opposition to large and expensive mainframe databases and processing capabilities currently in place. Although not a source of revenues, it could represent a significant simplification of IT infrastructure with a positive impact on costs. The transition from one environment to the other will involve investments but this can also be done progressively, starting with new products and services.

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<sup>51</sup> According to McKinsey&Company (2017), it was estimated in 2017 that 45 percent of global finance is capable of being automated by existing technologies, with 13 percent susceptible to new technologies.

One possible issue about the use of cloud solutions might be regulators' resistance due to security concerns. CSDs could contribute to improve the awareness about the benefits of such solutions.

## 5. Cybersecurity

One important feature about cybersecurity is the level of interdependency among all types of institutions in the value chain. Cyberattacks can initiate in any part of the financial ecosystem and affect a large number of entities. As said before, the aggregate risk is the risk of the weaker link in the chain. It ensues that cybersecurity strategies should follow the rules of a cooperative game where all participants are interested in the best possible performance of the other. Therefore, cooperative initiatives should be fostered across the financial industry and regulators should promote such cooperation.

It is recommended that ACSDA members work together, possibly in a dedicated specific task force, in order to discuss and eventually adopt a shared solution for dealing with cyberattacks. However, this is a rather medium or long-term project and the approaches to cybersecurity should differ significantly depending on the size and amplitude of the market. A first step could be to implement an information sharing agreement and protocol through which cyberattack events or attempts could be communicated without compromising the safety and reliability of the CSDs.

One important concern is the level of harmonization among markets connected through specific operational links in the region, as in the case of MILA since a breach in one market have a stronger potential of affecting others.

## 6. Internationalization and regional integration

Although it has been proved hard to build revenues outside home markets, and the European experience with T2S is one example, deepening of the existing partnerships and developing new ones can be the better way for ACSDA members to expand business beyond their geographic frontiers. The creation of new distribution networks through partnerships and operational agreements is where developed market exchange groups have accelerated activities in recent years.

The alternative route would be through mergers and/or acquisitions. Besides the risk of not being cost effective, many governments regard capital markets as critical domestic infrastructures that are unsuitable for foreign majority involvement, reinforcing the case for partnerships rather than acquisitions.

Nevertheless, it is recommended that CSDs evaluate carefully the benefits of partnerships against the required investment. If the tie-up is limited to order-routing and cross-trading, or perhaps a form of cross-membership, it is not likely to lead to a step change in volumes or revenues. Other challenges include diverse tax regimes and unmatched clearing and settlement processes.

Moreover, regional diversification should in most cases not be the focus of expansion strategies, given the difficulty of achieving a significant increase in revenues.



## IX. Conclusions

In this Paper we discussed the future of FMIs considering the current trends, challenges, and perspectives – if and how the FMIs will continue to exist and how these trends and challenges can circumscribe ACSDA members’ decisions and actions. Although no final answer can be given to any of these questions that are at the center of the debate, the goal was to identify, considering ACSDA members’ realities, possible strategies for dealing with the challenges raised by new technologies and new sources of risk and competition.

*The main conclusion is that, although CSDs are not likely to disappear, their role and relevance in the future will depend on how the current challenges are incorporated in their business strategies.*

Financial markets everywhere depend on their local FMIs to ensure that transactions are properly settled, risks are adequately managed, and securities and positions are safely kept. The organization and structure brought by those entities to their respective marketplaces and economies are not likely to subside, despite the change in the technological paradigm with the surge of DLT and other breaking through novelties.

It was said that the reason for the creation of centralized managed structures rooted in the technical simplicity it represented when compared to decentralized ones. It is probably accurate to think that the technology on the rise has the capability of equalizing the level of complexity between the decentralized and centralized approach.

The role of FMIs in the future is related to their ability to absorb the technological revolution but also, and maybe more importantly, to aspects such as regulation, governance, risk management and neutrality. It is true that the use of DLT and instant payment, which configure a trend, might concur to the elimination of some types of risk. Nevertheless, new risks are created, and they must be managed in a neutral and efficient way.

The ability to play a central role in this new world will depend, though, on whether the FMIs will be able to incorporate, at some level, the new technological paradigm in their businesses, allowing for costs reductions; one of the main drivers of market participants. For this purpose, it was recommended an approach “from satellite to core” services and products to ensure an adequate level of security.

Diversification remains one of the most important tools of expansion. The examples of developments beyond the core business or even not related at all to the core business multiply across different countries and regions. The leverage of existing know-how to attend different products, needs and publics is a particularly important source of revenue and differentiation in the future. Innovation departments with people with different skills and not necessarily familiar with capital markets make more and more sense in a context where “thinking outside the box” is increasingly a strategic advantage.

Regarding the business model for clearing and settlement, including the possibilities offered by DLT, it is expected that gross instant settlement will replace the multilateral netting settlement. The same reasoning applies to the development of CCP functions that might be reevaluated as the previous movement evolves.

Many of the markets in the region have already adopted the beneficial owner account structure or a hybrid approach. This trend is expected to go forward for various reasons related to safety benefits such as better control of shareholders rights, but also associated with the business opportunities it might create or facilitate such as new products and services and operational agreements with other CSDs. This feature is also attractive for preventing internalization of trades and tax evasion issues.

Another aspect to consider is related to cybersecurity and how to proceed in order to ensure against attacks, considering all market players are interconnected either directly through multiple types of links or through participants that are players in basically all markets. Cooperation is the key concept FMI should evaluate the existing framework for cooperation in the banking system as a source of inspiration. ACSDA members should seek to create a specific forum of cooperation in this area.

Looking at ACSDA as a region and the potential of development based on an amplified level of internationalization of its members, the links already in place are probably the better way to advance. Links or operational agreements enabling the cross-border collateral acceptance are important to support foreign investments.

An international CSD across ACSDA member countries, as in the case of Euroclear, risks to be a very complex and not very rewarding project. The same applies to regional settlement schemes such as T2S. T2S lives in the context of the EU thus congregating countries that share the same market regulation and currency and is still a promise that has not materialized as expected. And there are still other issues, such as tax rules and operational diversity in areas like corporate actions, they are struggling with.

Some level of consolidation might occur in the region but the current equity participation across the CSDs does not indicate that this is a major trend. The relevance of FMIs as systemically important entities render them strategic from a governmental perspective.

Considering their profiles, sizes and natures, ACSDA members are obviously very heterogenous and, consequently, positioned differently for the future challenges. It was never ACSDA's goal to overcome the diversity of the region. Nonetheless, the current stage of development of the member markets was somehow influenced by their experience of growing within ACSDA's environment. Along the last two decades, the cooperation and the experience and knowledge exchange promoted by ACSDA have been key to shape individual markets and existing alliances. The challenges of the next decade will require action and boldness from CSDs. Collective thinking and discussion over the nature, risks, impacts and opportunities of the changes to come can only contribute to all markets' preparedness.

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