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Security token offering – new way of financing in the digital era

SEEN-MENG CHEW | FLORIAN SPIEGL

NEW WORKING PARADIGMS

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DEAR READER,

Welcome to edition 52 of the Capco Institute Journal of Financial Transformation.

Transformation has been a constant theme in our industry for several decades, but the events of 2020 have accelerated change in employee working patterns, and in the very nature of the workplace itself. This Journal examines three key elements of these new working paradigms – leadership, workforce, and organization.

As we explore in this edition, a key part of any firm's transformation agenda centers around digital leadership and how to tackle the novel challenges created by changes within organizations and society. Leaders need advanced organizational skills to build teams that use digital technologies, as well as to inspire millennial workers who have grown up in a digitally transformed world. They also need deeper technology skills to lead, and a broader understanding of the ethical paradigms introduced by the challenges created through new technologies such as AI. These enhanced skillsets will help today's leaders and their teams fully realize the benefits of new working models.

The topics reviewed in this Journal offer flexibility for employees, increased agility for teams, and a combination of both for organizations. When supported by the right technology, these can create collaborative, outcome-driven environments. Through the resulting remote or hybrid models, organizations can transform their workforce and operations to boost productivity, cost effectiveness and employee engagement, while enhancing resilience and customer experiences.

As always, our contributors to this Capco Journal are distinguished, world-class thinkers. I am confident that you will find the quality of thinking in this latest edition to be a valuable source of information and strategic insight.

Thank you to all our contributors and thank you for reading.

Lance Levy, **Capco CEO**

SECURITY TOKEN OFFERING – NEW WAY OF FINANCING IN THE DIGITAL ERA

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ABSTRACT

In this article, we compare the fundraising processes of initial public offerings (IPOs) and security token offerings (STOs) and explain how the STO process can be operationally more efficient and less costly using distributed ledger technology. We also highlight recent technological advancements surrounding STOs and the world of decentralized finance. We collate information about recent developments in regulation and digital exchanges to support the growth of STOs. We emphasize some important issues to tackle before STOs can be widely accepted as the new way of financing for companies. Finally, we argue that although STOs have the potential to revolutionize the security value chain, they do not have to replace IPOs completely, and the two channels can coexist to provide more opportunities for businesses.

1. THE LENGTHY AND EXPENSIVE IPO

For many decades, the initial public offering (IPO) was seen as the beacon of success for many new companies ready to build a public image and expand their investor base. It is an important medium for raising fresh capital for a company's growth, and also a way for some owners to cash out and enjoy the fruits of years of hard work.

But the IPO process is both very time consuming and costly. The actual listing itself typically takes an average of six to nine months, and that is after about 12 to 18 months of thorough planning to assess a company's readiness for going public. Based on a survey of 705 IPOs in the U.S. during the period 2015 – June 2020,[1] PwC found that, on average, companies incur an underwriter fee of between 3.5% and 7.0% of gross proceeds. In addition, firms can incur an additional U.S.$4.2 million of offering costs directly attributable to the IPO. Legal and accounting fees also add up and can increase significantly for larger companies that may face additional complexities in preparing for an IPO. The underwriter fee usually makes up the majority of total IPO costs, and mega deals generate significant earnings for the investment bankers working on them – explaining why many business school graduates are competing for the most coveted investment banking jobs on Wall Street to this day.

Once listed on an exchange, there continues to be expenses that are associated with being a public company. These include costs of running and maintaining financial reporting systems, incremental internal staffing costs, professional fees for legal and accounting advice, and incremental auditing fees. A separate analysis from PwC found that two-thirds of the CFOs surveyed indicated spending between U.S.$1 million and U.S.$1.9 million annually on the costs of being public.

In summary, the costs of becoming a public company can be classified into four main components:

1. **Pre-IPO direct costs:** underwriter fees, legal and accounting fees, incremental roadshow expenses, listing and registration fees, and printer fees.
2. **Pre-IPO indirect costs:** restructuring costs, including the audit committee charter, costs to make financial statements compliant with local legal requirements, valuation services and reports, and articles of incorporation.

[1] https://pwc.to/2Z7AKgL

3. **Post-IPO one-time costs:** costs incurred from developing new financial reporting system and implementing new controls, new board of directors, and new compensation plans.
4. **Post-IPO recurring costs:** new staffing expenses, advisor fees (tax, accounting, and consulting), and other organizational and unanticipated costs.

Being a public company suddenly looks less glamorous when we take all these costs into account.

2. DIRECT LISTING

A related point about the pricing and listing mechanisms of IPOs is balancing the interests of different stakeholders: investors aim to buy shares of a company at a low price, while the company wants to sell shares at a high price. Investment banks hired by the company build on their market experience to advise on the best pricing approach, and to underwrite the offering, in exchange for fees. In the traditional underwriting process, the initial offering price is set by the investment bank, in alignment with the company, and an order book of demand is built. In many cases, the shares of the company are underpriced to trade up on the first day of trading (called an "IPO pop"), which suggests that most public investors may have been willing to pay more for the shares in the first offering. It also implies that private owners of the shares, such as founders, employees, and private equity investors, would typically forego some of their profits in an IPO.

This situation has led to more innovation in listing and pricing mechanisms, most notably the emergence of direct listing, which has accelerated in recent times. In a direct listing, the business sells exiting shares by current owners and investors directly to the public without involving any underwriters or other intermediaries; thus, there are no new shares issued. The opening price is determined in a standard market opening auction on an exchange and the price of this quasi-IPO is determined by whatever clears the market first. It can be argued that private holders of shares in the company benefit from this type of listing, when compared to a traditional IPO. That is why direct listings have become more popular in recent years, with successful listings from technology companies such as Spotify and Slack, as well as planned direct listings by Airbnb and Palantir, amongst others.

While these developments reflect important innovations from within traditional capital markets, there has been a separate and parallel development in what can be considered a new form of capital raising, which originated in the cryptocurrency space. In an era of decentralized finance, where technology is accelerating, the security token offering (STO), founded in 2017, has emerged and received widespread attention. People are excited because STOs could potentially save time and money, and also reduce the operational complexity of fundraising. Just as importantly, in a broader sense, STOs and their capital allocation methods are reaching a different and rapidly growing group of younger investors, most of whom are not active participants in IPOs.

3. THE BLOCKCHAIN-BASED STO

An STO is the process whereby the digital representation of a financial security is issued and recorded on a distributed ledger, subject to securities laws and regulation in the jurisdiction where the STO is conducted. The "token" issued in such a process is called a security token because it represents ownership, and in some cases voting rights of the investor, in the underlying company. Security tokens function much like a stock or share, where the owner is entitled to a share of future profits or cash flows. For example, a security token may represent partial ownership of a specific property or financial instrument, such as a government bond or other debt security, in addition to an equity share comparable to those in an IPO.

STO seems to be an evolution from the initial coin offering (ICO), which peaked in popularity in 2017, when bitcoin prices rose dramatically. However, after a short period of hype, the ICO market has almost disappeared, owing to a lack of regulation and the consequent rampant project scams and failures. An important difference is that in an ICO, investors receive "utility tokens", which give them consumptive rights for products or services developed by the token issuing company but not ownership or voting rights like equity security tokens. As they do not exhibit security-like features, tokens issued from an ICO fall outside the scope of most financial regulation. Technologists then realized that in order to make it work, compliance to regulation is key. Subsequently, security tokens emerged as the better alternative, because they are closer to traditional capital market frameworks and traditions.

But why are security tokens defended as superior to regular shares by their supporters? One could say that most financial securities today are stored digitally in the computer system anyway – we do not hold paper forms of these securities anymore, so how are security tokens different? One important difference is that security tokens are created and stored on a blockchain system, and can be transacted via smart contracts. The technology behind them, "distributed ledger technology" (DLT), enables financial information to be securely transferred

peer-to-peer, leaving a digital record that is almost impossible to alter (immutability). This mechanism also allows for greater transparency, where selective and controlled disclosure of facts that are stored on DLT systems can be considered a golden source of truth. In addition, in our current financial system there are a number of centralized gatekeepers to maintain accuracy and legitimacy of financial transactions: central banks, commercial banks, clearing houses, etc. But with the application of DLT, it becomes possible for digital tokens to change hands directly without going through these centralized gatekeepers, potentially reducing the layers of intermediation and transaction fees (decentralization and disintermediation).

4. THE STO PROCESS

Let us take a look at the STO process a little more closely, which has evolved to adopt some of the traditional capital fundraising principles but yet exhibits some distinct features. While firms have to go through similar due diligence steps like an IPO, different technologies and players are involved. Here are the six essential steps according to Lambert et al. (2020):[2]

Step 1: Preparation: at the first stage, the business team will start to draft a project white paper or prospectus, prepare investor presentation materials, and identify the target investor base.

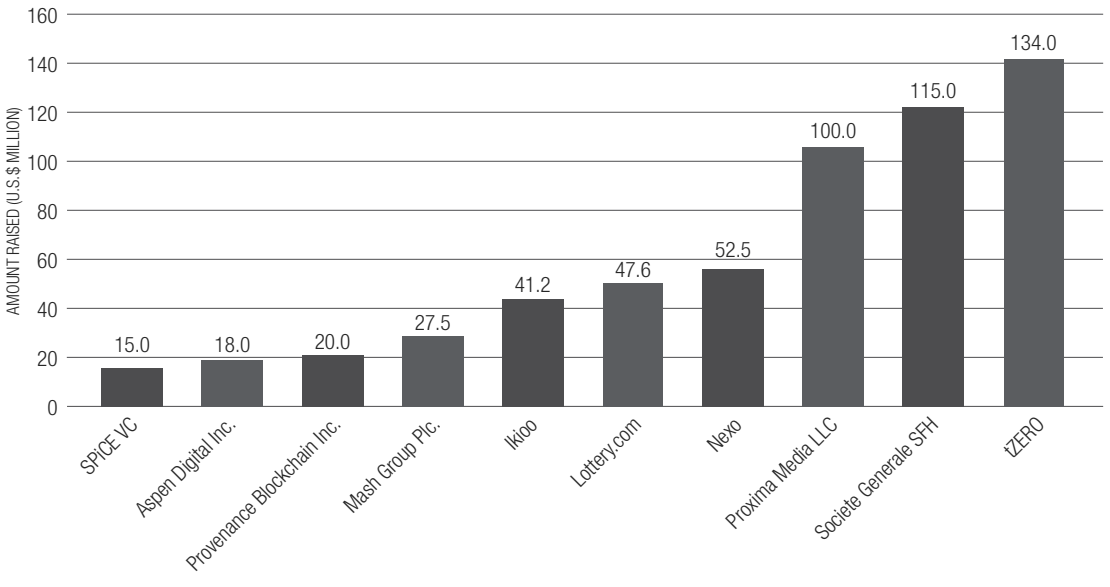
Step 2: Design of the offering: the team will start to appoint corporate finance, legal, and accounting advisors to plan and decide on issues such as type of security, investor rights, soft cap use, valuation, regulation compliance, mandatory lock-up periods, etc.

Step 3: Selection of technologies and service providers: at this stage, the company needs to decide on the appropriate blockchain platform, select the technology provider to develop the platform, and build the mechanism for KYC/AML checks, token distribution, and digital wallets for tokens custody.

Step 4: Selection of financial services providers: here, the company needs to appoint a broker for the sale of securities, a custodian for safekeeping, and payment providers to facilitate money transfers (fiat and cryptocurrencies) related to the fundraising.

Step 5: Capital raising: at the main event of capital raising, firms will organize roadshows either physically or online to pitch their businesses to potential investors; or conduct private meetings with some of them. The offering documents will be released and shared with prospective investors. Investors who are interested will complete registration of their profiles, sign the necessary documents, and wire funds (fiat or cryptocurrencies) to the company. At the completion of sale, tokens will be distributed to investors' digital wallets.

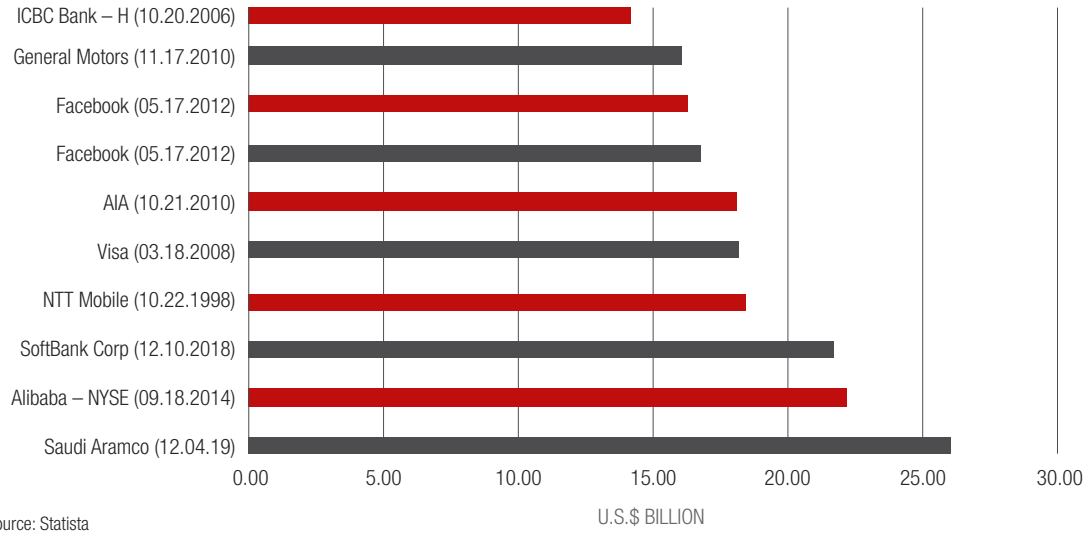
Figure 1: Top 10 STOs by funds raised



Source: Digital Asset Network

[2] Lambert, T., D. Liebau, and P. Roosenboom, 2020, "Security token offerings," SSRN, https://bit.ly/2ZdBYa7

Figure 2: Top 10 IPOs by funds raised



Source: Statista

Step 6: Listing of security on trading venue: at the final stage, suitable exchanges will be selected for the listing of the tokens. Additional promotional activities will be held to announce and market the tokens. Market makers will also be appointed to provide liquidity for the trading of these tokens.

It could take anywhere between six to twelve months to complete these six steps. About 185 STOs have been recorded by Digital Asset Network[3] between 2017 and Dec 31, 2019. Figure 1 shows the top ten by funds raised. Collectively, these ten STOs had raised less than U.S.$1 billion – smaller than even a mid-size IPO deal. Of course, this is based on a short period of activity and the market is still very young. Companies that have launched STOs tend to be small, as compared to traditional IPO candidates, and hence their STO size is also correspondingly small. Compare these with the top ten IPOs on record in Figure 2 – each of these IPOs had raised more than U.S.$10 billion, with the largest, Saudi Aramco's IPO, raising U.S.$25.6 billion in December 2019.[4]

In terms of the costs of launching an STO, they include the following key components:

- **STO direct costs:** legal and accounting fees for audit and compliance procedures, technology development for token structuring and platform technicalities, financial advisory fees for securitization and offering, and marketing and distribution expenses.
- **Post-STO costs:** fees for token listing, custody services, secondary trading, and other expenses on digital asset management.

Analyses from Lambert et al. (2020) show that the total cost of an STO can range between U.S.$180,000 and U.S.$750,000, excluding fees of 1-8% of the offering paid to bankers and brokers. Without the significant expenses of maintaining a public company, post-STO costs are expected to be much lower than the typical IPO.

5. REFORMING SECURITIES BUSINESS THROUGH TECHNOLOGY

An additional implication of innovation in capital markets, beyond the original fundraising mechanism, is the trading of securities. It is worth considering how DLT is helping to simplify this essential step, particularly given that direct listings, as discussed above, share some similarities with STOs. We have already learned that data of an STO is digitally recorded on a blockchain during the primary market offering. To the extent that only one master ledger is kept to record all information, and any changes can be simultaneously updated for all parties, it can help to speed up the book building process for the offering. The ledger provides transparency and avoids duplication of efforts by the participating banks and syndicate members in reconciling their books.

[3] DAN, www.assetnetwork.com
[4] This could be surpassed by Ant Financial's planned IPO of U.S.$30 billion, scheduled for launch in October 2020.

5.1 Settlement

Traditional securities settlement is complicated, as it involves many intermediaries, resulting in long clearing and settlement cycles (generally T+2). Part of the settlement process today is operated manually, which is error-prone. The involvement of multiple parties (banks, custodians, clearing houses, etc.) in a transaction across different time zones adds to the inefficiency and complexity of the whole process.

There are various studies and debates in the market about the potential of achieving T+0 settlement using DLT.[5] By reducing multiple layers of intermediation, it should theoretically reduce settlement times, and as a result help mitigate counterparty and settlement risks. A number of regulators have shown some willingness to consider using DLT in simplifying post-trade processes. For example, ESMA (2017)[6] states that "in theory, clearing and settlement could become almost instantaneous with DLT, as trade confirmation, affirmation, allocation and settlement could be combined into a single step and reconciliations would become virtually superfluous."

5.2 Structuring token terms[7]

Like a traditional security, tokenized securities will also carry legal terms, such as currency denomination, ranking on insolvency, and rate and nature of dividends or interest payments, but it is possible to design more flexible and unique terms on tokenized securities:

- **Form of distributions/dividends:** the "dividends" of tokenized securities can take the form of digital assets instead of fiat currencies.
- **Voting:** different classes of tokenized securities can be programmed to be identical in economic terms except for number of votes attached to a tokenized security.
- **Trading restrictions/lock-ups:** smart contracts on blockchain can facilitate the enforcement of trading restrictions or lock-up periods.
- **Convertibility:** smart contracts can be used to design sophisticated convertible features of securities. For example, in mortgage debt, they can help to create hybrid debt-equity-based home ownership.

6. REGULATION OF THE STO ACROSS SELECT FINANCIAL CENTERS

As security tokens possess security-like features, regulators around the world have approached them in an enthusiastic yet careful manner. In the U.S., they are now subject to U.S. Securities and Exchange Commission (SEC) regulations, and in Europe they are governed by the E.U.'s Markets in Financial Instruments Directive (MiFID II). Within the last two years, The Monetary Authority of Singapore (MAS) has published a guide on digital token offerings, and Hong Kong's Securities and Futures Commission (SFC) has issued statements about STOs and virtual asset trading platforms. These countries are generally taking a cautiously optimistic stance towards crypto assets.

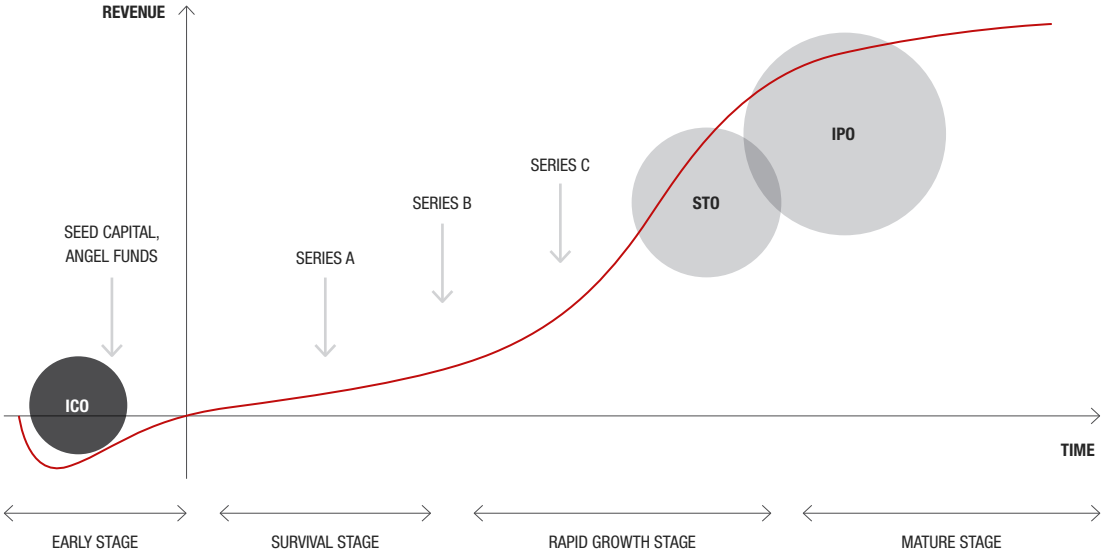
Malaysia and Thailand, two developing southeast Asian nations, are dealing with this new asset class with a friendly yet lawful approach. The Securities Commission (SC) of Malaysia has recently (January 2020) issued guidelines for digital token offerings to ensure that such offerings comply with Malaysian financial regulation. In Thailand, the Royal Decree on digital asset businesses came into effect in 2018. In addition, the Thai Stock Exchange announced in 2019 that it is building a new platform to support the trading of digital assets. Meanwhile, the central banks of Thailand and Hong Kong (Bank of Thailand and Hong Kong Monetary Authority) have been working closely on the Inthanon-LionRock project to examine the feasibility of cross-border digital funds transfer on the blockchain system.

There are many more examples. It is interesting to see that within just a few years, as the application of blockchain technology expands and the number of STOs increases, more countries are joining the field and developing the accompanying regulation to create new business opportunities and to protect investors.

These are positive developments. With a regulatory shield, tokens issued via STOs will become safer for investors – issuing firms, in most STOs, need to pass several due diligence hurdles set by the regulators before the offering, making them more likely to launch an STO later in the startup cycle. It is worth contrasting this with the earlier forms of ICOs. ICOs

[5] See for example: Priem, R., 2020, "Distributed ledger technology for securities clearing and settlement: benefits, risks, and regulatory implications," Financial Innovation 6, 11, https://bit.ly/2Dzhv8a
[6] ESMA, 2017, "The distributed ledger technology applied to securities markets," European Securities and Markets Authority, February 7, https://bit.ly/3i6V614
[7] See details in ASIFMA, 2019, "Tokenised securities – a roadmap for market participants and regulators," Asia Securities Industry and Financial Markets Association, November, https://bit.ly/3jKdopk

Figure 3: Startup financing cycle and example timing of STO



are usually launched very early in a startup's life, sometimes even without a product (and, therefore, in an earlier stage than traditional angel and seed funding rounds). At that stage, the risk of failure is highest, as there is no proper regulatory requirement for the ICO. Figure 3 shows this difference on a typical timeline of a startup financing cycle.

Regulation ensures that STOs are offered to accredited investors who have greater capacity for taking investment risks, unlike ICOs which tend to be marketed to anyone. Moreover, a clear regulatory guidance lays the groundwork for securities advisory firms to provide underwriting services to companies intending to raise funds through STOs. Over time, this convergence of a new fundraising form to the traditional capital markets frameworks will help to boost the acceptance of security tokens.

7. DIGITAL EXCHANGES FOR TOKENS

A central element of bringing a security public is to allow active trading. In the context of STOs, this means that in order to increase the liquidity of tokens, stable platforms that can facilitate their transactions efficiently are needed.

Today's global equity market is very vibrant, thanks to the powerful stock exchanges that have evolved and matured over 400 years, since the founding of the world's first stock exchange in 1602 – the Amsterdam Stock Exchange. Can the same happen for digital tokens? And perhaps over a shorter time period?

Some of the traditional exchanges, such as the SIX Swiss Exchange and the London Stock Exchange, have begun integrating blockchain technology into their systems, and developing new platforms for the trading of security tokens. However, as their main revenue source continues to be traditional securities, such as stocks and bonds, the STO business is unlikely to be their primary focus for now.

Small exchanges catered specifically for cryptocurrencies, meanwhile, have mushroomed since the advent of bitcoin. On Feb 6, 2010, the first bitcoin exchange, "The Bitcoin Market", was created by bitcointalk.org forum user "dwdollar". This was followed by numerous other crypto exchanges, with varying degrees of scale and success – and their fair share of scandals, such as the collapse of bitcoin exchange Mt. Gox in Japan.[8] Many were merely websites to match buyers and sellers of cryptocurrencies, and as most of them were unregulated, institutional participation was low.

[8] See the details of various digital exchanges in Lewis, A., 2018, *The basics of bitcoins and blockchains: an introduction to cryptocurrencies and the technology that powers them*, Mango Publishing

But this is slowly changing, with institutional activity on regulated exchanges gaining traction in recent years. Notable exchanges that have recently taken steps to become licensed include Archax in London, with a multilateral trading facility (MTF) license, and OSL in Hong Kong, which recently received an approval-in-principle from the SFC to operate a virtual asset trading platform under a license for Type 1 (dealing in securities) and Type 7 (automated trading service) regulated activities.

With security tokens coming to the market, there are now also exchanges built specifically for security token issuance and trading, such as Polymath, tZero, Swarm, Harbor, Securrency, Securitize, OpenFinance, iSTOX, Fusang Exchange, etc. To increase investors' confidence, some have worked closely with regulators to obtain the necessary approvals and licenses. For example, iSTOX in Singapore has passed the fintech regulatory sandbox test by MAS, while Fusang Exchange has obtained a license from the Malaysian authority – see Box 1 for more details.

Having a dynamic community of regulated exchanges is vital for the liquidity and continued growth of the security token market. Instead of the sporadic creation of new digital exchanges, some of the more successful ones can collaborate or even merge their services with traditional exchanges in the future to scale up quickly. Furthermore, with the pace of technological developments today, accompanied with the right regulatory framework, the market for STO could take a much shorter period to mature – certainly less than 400 years.

8. OTHER CONSIDERATIONS FOR THE STO TO BECOME MAINSTREAM

There are a few other important issues to tackle before STOs can fully take off. The first concerns the non-fiat form of payment for tokenized securities. While most STOs will probably raise funds in fiat currency, some have also made it possible to accept cryptocurrencies, such as bitcoin and ether, as payment. To the extent that cryptocurrency values are volatile and not anchored by traditional economic fundamentals, valuation of tokenized assets could become complex and include an additional element of market risk for investors. Fortunately, payment technology has advanced, and technologists have introduced stablecoins, cryptocurrencies whose values are pegged to a basket of "stable" assets, with the most well-known being Facebook's Libra. Concurrently, numerous central banks around the world are planning to introduce "central bank digital currencies" (CBDC) as an alternative to fiat money. A modern payment infrastructure using stablecoins and CBDCs could catalyze the adoption of security tokens.

Second, the interoperability and standardization across many DLT platforms remain a critical issue. As companies are still inclined to protect their proprietary information, the public blockchain system, which underpins the bitcoin, has largely been shunned for corporate use, although private blockchains developed by various consortiums (e.g., R3 or Hyperledger) have become more prevalent.

Case study – Fusang Exchange

Fusang Corp (FSC),[9] established in 2014, is the first fully-regulated platform in Asia providing end-to-end infrastructure to support STOs, allowing both retail and institutional investors to access the digital asset markets in a secure, compliant, and convenient way.

In February 2020, Fusang Exchange Ltd, a subsidiary of Fusang Corp, was licensed in Labuan, Malaysia as a Securities Exchange under Part IX, Section 134 of the Labuan Financial Services and Securities Act 2010 (LFSSA). Fusang Exchange is the first fully operational stock exchange in Asia that allows companies to go public through a digital IPO accessible by both retail and sophisticated investors globally. Fusang supports the trading of both digital securities and cryptocurrencies.

The company has also launched the Fusang Vault, a secured digital asset custody platform, and Fusang Digital Identity, an AI-powered KYC/AML solution, operated by Fusang Custody Limited – a Hong Kong Trust company. Fusang Custody also acts as transfer agent for STOs, providing a full platform to manage and operate digital security issuances.

Fusang Corp has issued all of its own equity directly as digital shares (see fsc.fusang.co for the real-time blockchain-based cap table) and has raised U.S.$7.5 million through its digital shares. In June 2020, Fusang Corp launched a pre-IPO fundraising round of U.S.$6.0 million, and is planning for an IPO of U.S.$20 million in 2021. It is important to note that these are actual digital shares, where the digital token directly represents the share certificate, as opposed to mapping to an offline paper share. Fusang Corp has also received approval to keep a fully blockchain-based register of members.

"The future of securities is digital, and we have proven this through issuing our own digital equity" – Henry Chong, CEO of Fusang.

[9] You can learn more about Fusang here: https://bit.ly/3k4DwLV

In time, we might see various clusters of different blockchain systems and philosophies used by different companies, similar to the numerous digital exchanges that have sprung up in the last few years. Consequently, it is essential to ensure interoperability between these different concepts, platforms, and networks, so that tokens can be easily listed and traded across multiple venues, and new financial products can be created and distributed in new pipes.

Third, it is important for token issuers to identify specific operational processes that should be migrated onto the blockchain, because there is no need to use DLT for everything. For instance, pre-trade processes, such as trade matching and confirmation, are already efficient using the current centralized matching systems. As member firms tend to consolidate orders to find the best price during pre-trade, there could be many cancellations, thus making such matching processes unsuitable for migration onto the blockchain. Instead, it may be more efficient to just use blockchain for post-trade processes, namely clearing and settlement.

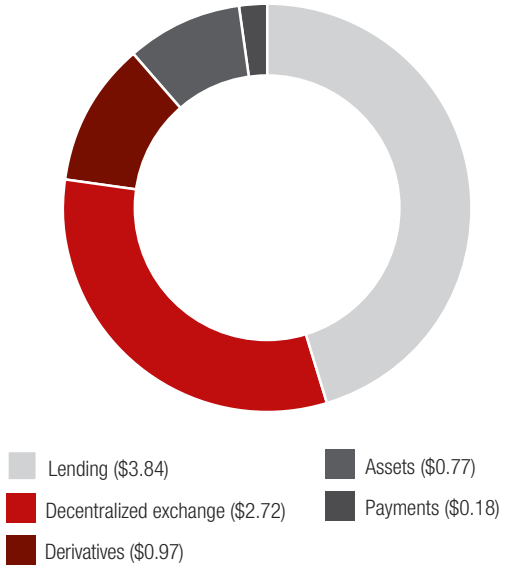
9. THE BROADER MOVEMENT OF "DECENTRALIZED FINANCE" (DEFI)

While the original aim of cryptocurrencies is to create a decentralized store of value different from fiat currency, an STO is the offering of a digital token that represents the rights in an underlying real-world asset.

Decentralized finance, or DeFi, can be considered the next iteration of this development, which focuses on the creation of a broad range of financial instruments separate from traditional centralized institutions, i.e., decentralized financial products. From a capital markets perspective, most of these new instruments show characteristics of securitization or value structuring, and hence may be considered securities. They generally share the qualities of creative new mechanisms for offering investors a specific exposure, spanning a range of traditional product categories. This space is emerging dynamically, with fluid boundaries, and terms and definitions still taking shape.

As of today,[10] products considered under the DeFi umbrella hold more than U.S.$8 billion in value. This "locked value" is the value of the new digital securities created using a particular DeFi framework to support some underlying assets or services – a figure likely to be considerably lower than the value of total managed and transacted assets in DeFi products. While the market volume is still relatively small, it is growing rapidly. Some observers consider the industry to be at the tipping point of reaching critical mass and compare the state of DeFi with the internet 20 years ago. New products and innovative solutions are being built on top of the original innovation of blockchain, DLT, and mechanisms like STOs.

Figure 4: DeFi "locked" value by sector (U.S.$ billion)

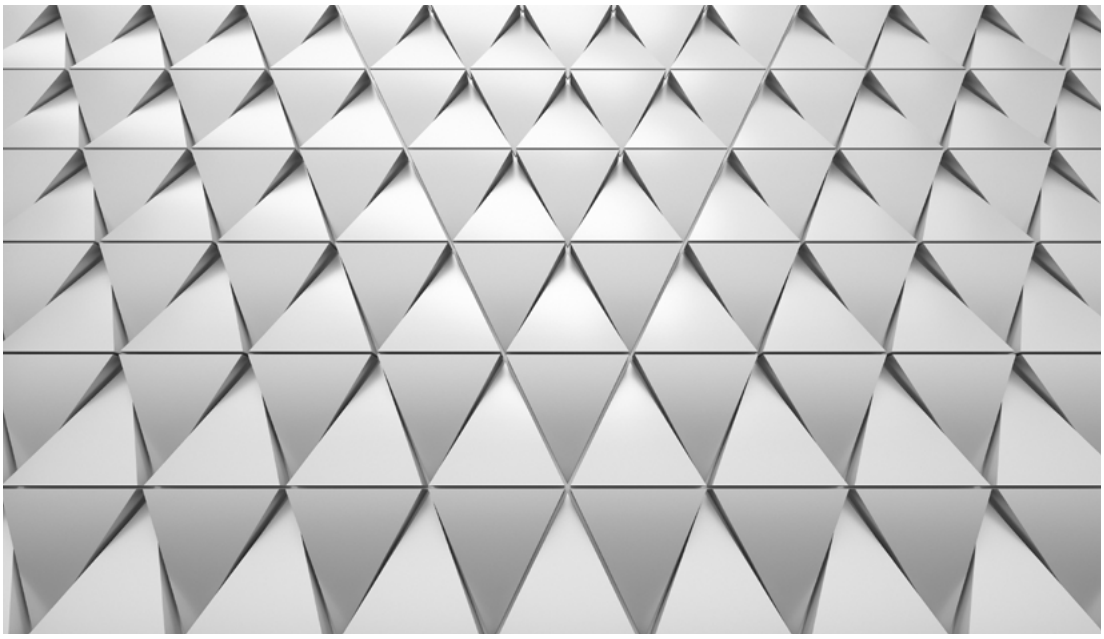


Source: www.defipulse.com

The DeFi universe comprises of a broad range of services that can be mapped to categories as shown in Figure 4.

- **Lending:** DLT protocols enable anyone to earn interest on stablecoins and cryptocurrencies transacted on lending platforms without intermediaries. Example: Aave (U.S.$1.5 billion), an open source non-custodial protocol for decentralized, collateralized lending and borrowing directly between users. Borrowers provide collateral in the form of digital assets and can borrow up to a specific loan-to-value ratio and at a variable interest rate. They are subject to a liquidation threshold.
- **Decentralized exchanges (DEx):** exchanges for cryptocurrencies that operate without a central authority or centralized order book, connecting traders peer to peer. Example: Uniswap (U.S.$1.2 billion), a

[10] Cf. defipulse.com as of 1/9/2020



decentralized on-chain protocol for token exchange that uses liquidity pools created by users instead of order books. Users can swap between the cryptocurrency Ether and any token created on the Ethereum protocol or earn fees by supplying liquidity.

- **Derivatives:** forms of digital assets that derive their value from the price of real-world assets, such as fiat currencies, commodities, stock indices, and crypto assets. Example: Synthetix (U.S.$880 million), a decentralized platform for the creation of so-called “Synths”: on-chain synthetic assets that track the value of real-world assets by following their price curve. After posting of collateral, users can create Synths that are freely tradable tokens based on Ethereum.
- **Payments:** new variants of payment systems that work by directly connecting parties and applying novel mechanisms for securing payments; for example, in the form of a collateral token provided by users. Example: Flexa (U.S.$150 million), a payments network for digital assets that allows users to pay with a variety of cryptocurrencies, Ethereum tokens, stablecoins, or reward points at regular merchants. The payments are secured with a collateral token provided by users who earn a transaction reward.
- **Assets**: typically, this category represents products that allow for the creation, management, and trading of tokens that represent a portfolio of assets themselves. Some of these products combine a number of underliers in a basket and resemble structured products or ETFs, with the benefit of being easily transferable in the form of tokens. Example: Set Protocol (U.S.$25 million), a platform that allows for the creation of tokens that represent a portfolio or basket of underlying assets. Each dedicated token periodically rebalances its portfolio according to a strategy coded into its smart contract.

While this section is an excursus into the latest evolution that emerged out of the original STO movement and reflects the sometimes exotic nature of the sector, it offers a glimpse into what lies ahead and the proliferation of innovative capital market products. This development may still be in its early days, but it is worth taking note that DeFi assets are increasing in volumes and attracting a broad base of active investors.

10. CONCLUSION AND OUTLOOK

In this article, we have seen the merits and challenges surrounding STOs as the new way of financing for companies. The powerful DLT offers an alternative to our current centralized system, and a blockchain-backed STO can be operationally more efficient and less costly than an IPO. By providing greater efficacy and transparency with respect to security issuance, trading, and post-trading processes, STOs have the potential to revolutionize the security value chain, and to drive a paradigm shift towards decentralization of financial services in the future.

The broader movement of DeFi has seen a healthy growth and development in 2020, where traditional financial products are transformed to achieve greater fluidity based on decentralized networks and new technology protocols. The major aim of DeFi is to take out the middlemen and connect financial actors more directly, building on transparency and efficiency.

We have also discussed the key drivers for the further growth and maturation of the STO market, including (i) strong legal and regulatory framework covering digital securities, (ii) efficient exchanges to facilitate listing and trading, (iii) modern payment and custodial infrastructure for the convenience of investors, and (iv) standardization of protocols and interoperability across multiple platforms.

As it may take several years before the STO market reaches a significant size, IPOs and direct listings will likely remain as the main fundraising methods for most companies in the foreseeable future. But we do not have to view STO as an alternative to replace IPO – they could very well coexist together, with STO playing the role of a precursor before an IPO or an alternative route for fundraising, depending on the nature of the project and company characteristics. For a smaller scale offering, the STO is perhaps more suitable as it is less arduous and less costly to execute. Hence, the STO can be used to "test the water" to gauge investors' appetite before a large-scale IPO with more institutional participation. This can help to time the IPO launch better and potentially reduce glitches or failure of the IPO.

Looking beyond security tokens, some experts have begun to think about the possibility of "programmable securities" [Shilov (2019), Singh and Long (2020)],[11] i.e., securities that embody flexible programming language which could depict all the possible features and variants of an investment product. Essentially, the security token can evolve and transform after being issued on the blockchain, where any unexpected corporate actions that would change its initial features can be executed on-chain efficiently. The details are beyond the scope of this paper and would call for more research, but we bring out this last point to show how far technology can bring us, and that the financial services industry will continue to be disrupted in ways that we cannot even imagine now. What an exciting time to be living in to witness all these changes!

[11] Shilov, K., 2019, "Programmable ownership: what security tokens mean for individuals," Medium, July 12 https://bit.ly/3IRJMZ3; Singh, M., and C. Long, 2020, "How programmable digital assets may change monetary policy," FTAlphaville, September 4, https://on.ft.com/2GFQIsd

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