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FINTECH: DISTRIBUTED LEDGER TECHNOLOGY (DLT) TRANSFORMATION IN THE FINANCIAL MARKETPLACE OF TODAY

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Introduction

Today's financial marketplace is an intricate and complex system. It involves numerous parties, varying levels of trust, and continuous flows of information. Crafted over time, the current system is reliable, efficient, and provides transparency and certainty. The financial marketplace is currently facing a modernization that aims to enhance its efficiency, transparency, and reliability. Businesses have maintained transaction ledgers the method of recordation from stone to paper, from paper to a digital format (e.g. computers), and is now changing once again to a distributed ledger system. Each transition brought both improvements and impairments to the overall process. The move towards integrating DLT into today's financial marketplace would extend traditional systems' capabilities and offer more accuracy and security (Government Office for Science, 2016).

The purpose of this paper was to discuss and explore DLT and its impact on the financial marketplace in order to establish a more secure financial marketplace structure. Specifically, the research focused on three areas of DLT. The first area was to explore how the financial industries offering DLT-based products could best utilize the technology. In order to do so, financial market participants and regulators need to understand the technology, including current use cases as well as how it will influence current and future business models. The second area of research addressed understanding and addressing the security surrounding the technology. Specifically, the industry must consider and evaluate whether DLT can sufficiently mitigate the risk of cybersecurity vulnerabilities and whether DLT-based products are worth the potential cybersecurity threats and vulnerabilities. The third and final area of research sought to explore how DLT users could mitigate potential fraud or misuse of DLT-based products. The research herein focused on government research and industry white papers as well as industry publications and news articles. Several global entities, including governments, messaging services, and financial market participants extend resources in an effort to better understand the technology and start a conversation on how to best integrate it into our current

financial marketplace and system. The target audience of this research project is those individuals attempting to better understand this technology and how it can and will affect the financial marketplace.

Distributed Ledger Technology (DLT) and banking system

Regulators and developers need to establish and sustain open communication to discuss related opportunities, risks, and impacts of the technology (Brainard, 2016). The blockchain of Bitcoin is merely one example of a DLT. It is difficult for many to distinguish blockchain from Bitcoin, which is a limitation for blockchain and DLT generally. Despite this difficulty, industries are moving forward with DLT to enhance products, services, and procedures to reduce inefficiencies and enrich consumer benefits (ROBECO, 2016b). Blockchain Technologies (2016) described various uses of DLT, including finance and trade related services, property recordation, self-executing contracts, and identity protection. Financial markets are exploring this technology to as a means to utilize more cost-efficient processes as well as offer new products (World Federation of Exchanges, 2016).

The technology is currently finding opportunities in multiple market sectors, including payment and remittance processes, insurance, personalized government services, tax receipts, smart home networks, and crowd analysis. The important features of the technology to sustain these applications include decentralized networks, permanent records, large-scale coordination, and real-time accessibility (ROBECO, 2016b). Appendix A provides additional examples of potential DLT-based products, services, and applications as well as the necessary underlying DLT attributes. It is important to note that the technology will manifest itself and affect different industries differently (Brainard, 2016).

Each context will offer a different DLT structure; however, all share the outcome of a decentralized, verified, and distributed transaction database (McLean & Deane-Johns, 2016). The blockchain of Bitcoin is merely one example of a DLT. It is difficult for many to distinguish blockchain from Bitcoin, which is a limitation for blockchain and DLT generally. Despite this difficulty, industries are moving forward with DLT to enhance products, services, and procedures to reduce inefficiencies and enrich consumer benefits (ROBECO, 2016b). Blockchain Technologies (2016) described various uses of DLT, including finance and trade related services, property recordation, self-executing contracts, and identity protection. Financial markets are exploring this technology to as a means to utilize more cost-efficient processes as well as offer new products (World Federation of Exchanges, 2016).

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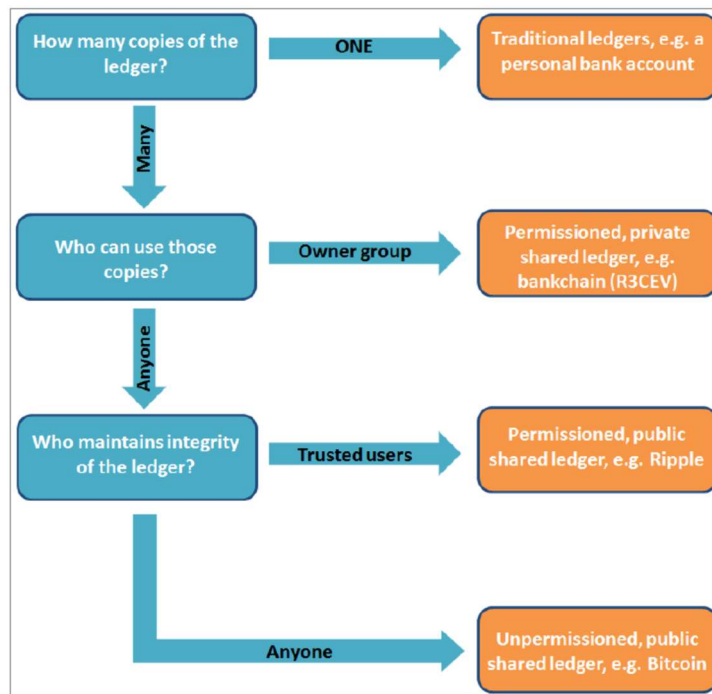


Figure 1: Permutations of DLT systems (ROBECO, 2016b)

DLT and Blockchain Technologies

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countries turn to this technology.

Literature Review

The current financial marketplace evolved over many years to meet a variety of concerns and demands. The system is set up to address settlement, clearing, and risk within the proscribed regulatory confines. The process took time, coordination, and cooperation among participants, though initial efforts appeared drastic. Each change provided improvements to the overall processes while accounting for changing regulations, technology, and market concerns. The result was a well-designed, secure, and trusted market (Brainard, 2016). In April the U.S. Office of the Comptroller of the Currency (OCC) released a white paper providing its view on financial technology (fintech) and its place and role within the global economy. The project outlined significant criteria and structures necessary to address fintech and its future role. Specifically, it acknowledged the need to have a complete understanding of current markets, including structures, benefits, pitfalls, and regulations. The market cannot implement enhancements and improvements if it does not understand the current status. Equally, it must understand the proposed enhancements and their effects to maximize full potential. Only after obtaining this knowledge can the industry constructively move forward (OCC, 2016).

Distributed Ledgers

It is important to understand the technology behind distributed ledgers, including the distinction between the distributed ledger and blockchain technologies. Traditional ledgers maintain centralized authority. This centralized authority is responsible for verifying, adding, and distributing information. It also dictates the storage location and methods. In this environment, security of the information rests within limiting access to the data. Conversely, distributed ledgers maintain a peer-to-peer structure, with all nodes responsible for maintaining the data within the ledger. In a distributed ledger, the participating nodes share the verification, addition, and maintenance responsibilities. This environment requires consensus for information verification, rather than reliance on a centralized authority. All copies of the ledger are similar and those with the appropriate permissions can view the data (Deloitte, 2016).

Examining DLT Attributes DLT presents itself with benefits, limitations, and unknowns. It is a huge investment of an immature and currently non-regulatory compliant technology. There is a push to integrate DLT on an already functioning system (Brainard, 2016). Certain DLT benefits already exist in today's current systems (DeRose, 2016). There are many benefits seen as motivating factors to further investigate and develop the technology. Other benefits could exist in today's system, but do not because of regulatory constraints (WFE, 2016). It is too soon to tell if the technology can adequately address the market's current problems and inefficiencies, and whether it is worth the time and resources to invest towards developing DLT (ECB, 2016; WFE, 2016).

Distribution and replication of data

The decentralized nature of the technology offers potential to increase efficiency and reliability across the network. All nodes within a particular ledger are subject to the same programming and

codes, thereby following the same rules and validation protocols to verify and store data. The ledger distributes the same information across all working nodes, keeping the information distribution up to date. Localized outages will not affect the consensus validation process across the network (DTCC, 2016). A decentralized structure can also prohibit fraudulent transactions or the distribution thereof. The consensus verification protocols will reject inappropriate information. It is unlikely that a single user will be able to hack into, or otherwise compromise a majority of nodes on the network; thereby reducing the ability to alter previously entered data or introduce and disseminate inaccurate information to the entire ledger (ROBECO, 2016b).

The distributed nature of the technology may allow businesses to recover quicker from large or centralized system failures. All nodes across the network are involved in the system's maintenance. Recovery efforts will involve fewer data losses as there are numerous nodes within the network, acting as widespread backup (SWIFT, 2016). While the distribution creates redundancy of information and records, this redundancy provides resiliency should the ledger face outages, system compromises, or other functional disruptions (ECB, 2016).

Integration

Integrating technology with legacy systems presents a challenge. Extensive standards can ease implantation both across platforms and within legacy systems. The distributed ledger must incorporate older transactions, while the new system maintains new data. Otherwise, there remain two sets of records, which inefficient, time consuming, and leads to similar issues currently facing the industry. Segregating only specific business units to use distributed ledgers can be problematic, inefficient, and duplicative. However, this issue may become less significant as DLT's become thoroughly integrated into the business' practice (ROBECO, 2016b). Immutability and permanency. DLT must evolve to include protocols to deal with errors and mistakes (WFE, 2016). The current system requires transaction delays to allow a company time to reverse or correct errors or mistakes (DeRose, 2016). Laws require that companies maintain the ability to undo or cancel fraudulent or erroneous transactions.

The DLT permanently records every transaction, with limited ability to eliminate or tamper with validated transactions. Having the ability to adjust the ledger to account for mistakes and errors calls into question the immutability and permanency of the technology (Johnson, 2016). Efficiency. SWIFT highlighted several benefits DLT brings to the financial marketplace. Such benefits include exact replication of data across all nodes of the ledger, efficient distribution, traceability of transactions, real-time updates and changes, simplified reconciliation, and authenticated and validated data. These benefits create a trusted system that is highly resilient and durable (SWIFT, 2016).

Findings and Analysis

Today's financial market faces limitations due to its structure and imposed regulations. The system operates in distinct and separate environments with limited communication and duplicative information. These features create a complex environment with the potential for inconsistent and stale information. Further, the structures are not capable of handling or combating today's security issues and cyber threats, potentially leaving data subject to compromise. DLT addresses those concerns, as

it is a rule-based program with built-in features to address current security and data integrity concerns (DTCC, 2016). Accountability and accessibility. Current regulations require accountability, trust, and transparency, though consumers may not fully appreciate or understand these demands and requirements.

Regulated systems require protections and security of data, as demonstrated through limiting permission to access specific datasets and systems. It is difficult to determine whether the open source nature of DLT will provide the required protection and limited access. Permissioned ledgers take steps to address these concerns; however, it is too early to tell whether it goes far enough. Until the technology can adequately address those concerns, the marketplace needs trusted third parties to guarantee identity, ensure accountability, and facilitate claims processes and limit data dissemination (SWIFT, 2016). Regulations. Regulatory hurdles are the technology's biggest obstacle (ROBECO, 2016b). Any advancement of the technology requires reviews and analyses of legal risks, data privacy, individual privacy, and security (WFE, 2016).

There are discussions of the technology's current status. However, there needs to be a discussion of its future, including the information contained therein (Brainard, 2016; Digital Asset, 2016). While DLT is expanding services, it also needs to account for AML and KYC mandates (WFE, 2016). DLT purports to present a pseudo anonymous environment, wherein identities are not readily apparent. Current regulations prohibit this type of structure in regulated businesses, as it goes against transparency and traceability (SWIFT, 2016) AML and KYC. In the development of global standards and procedures, users need to account for localized laws such as AML and KYC policies.

Typically, AML and KYC protocols are time intensive and expensive, requiring weeks to obtain information from various sources. Different institutions conduct similar background checks on overlapping customers. Each investigation takes time, could yield different information, and requires updating. Proponents of the technology stated that an AML and KYC DLT could replace redundant paperwork and research. A DLT could ease background investigation procedures by maintaining a decentralized database of all customer information across institutions. This would eliminate the need for multiple and redundant background checks.

An institution could merely go to the ledger to obtain specific information. Given the decentralized data of the DLT and its reduced likelihood of compromise or attack, consumers' information would be safer and less prone to theft or other fraud. This in effect could actually reduce the burden on regulators while also increasing business efficiency (ROBECO, 2016b). Discussion of the Findings There are progressive features to DLT, immutable and traceable transaction history. It will provide a log when and how users will be able to home in on sections as well as identify the types of information. Having this knowledge will encourage forward movement and provide optimal circumstances for those using the technology. Any changes that incorporate DLT will take time to integrate into today's systems (SWIFT, 2016).

Summary and Conclusion

As the research moves forward, there needs to be an agreement among technology developers and users regarding all aspects of the technology, including acknowledgement and consideration of both benefits and pitfalls. It is equally important to define and consistently use the same terms. In this

regard, cooperation must go beyond a single industry to include input from the major participating industries and technology programmers and users. This will allow for a deeper understanding of the technology and, thus, establish the best and most appropriate means of utilization. As the technology continues to advance, it will address changing consumer demographics and needs. U.S. government regulators, such as the OCC, are striving to encourage these advancements and developments so long as those advances are regulatory compliant and protect consumers. To that extent, regulators need to be aware of new trends and cooperate with the industry to promote long-term benefits and relationships rather than stifle innovation (OCC, 2016).

Non-financial firms are in a better position to enhance the technology as there are less regulations with which to contend. These circumstances will create an environment ready for research and create a path from which to move forward (WFE, 2016). Numerous resources are available that address and attempt to explain DLT and related technology. Financial-based firms are considering the technology as a means of improving transaction processes and contract execution. These firms face regulatory constraints, such as privacy laws, customer protections, and settlement criteria, which present limitations of thorough exploration. Non-financial firms, which face fewer constraints, are going forward with developing the technology. Lessons-learned in these environments will provide insights and information on how the financial sector can modify and fully utilize the technology to enhance and remain regulatory compliant.

The research provides wide-ranging information, facilitating analysis and utilization procedures. Cumulatively, the data provides comprehensive information and creates a trajectory for forward movement. DLT's current capabilities and uses are under exploration as the technology continues to develop. Security features and protocols are continuously facing examinations and tests, highlighting both strengths and areas for improvement. These tests are critical for the technology's development. However, given there are unidentified features, such as potential security vulnerabilities, it is best to conduct research in controlled and defined systems.

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