

Regulatory changes for redesigned securities markets with distributed ledger technology

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Abstract

Distributed ledger technology (DLT) is regarded as a revolutionary solution that offers immutability, transparency, trust, and efficiency while ‘transcending law and regulation’. One of the potential applications of DLT is in the securities market. Share registration, settlement, regulatory compliance, information disclosure, payment systems, and market service requirements can be redesigned with the use of DLT. This paper will examine the impact that such changes will have on legal theories and governance, while also discussing the effects on enforcement techniques. In addition, general blockchain-legal issues will be critically analyzed in the context of securities markets.

1 Introduction

Blockchain is a clever amalgamation of a few different technologies: a distribution of data for redundancy, a consensus mechanism for verification and validation of single source of truth, a ‘block’ and ‘chain-link’ for traceability, and a hashing algorithm and public-key cryptography for immutability (integrity) and partial authentication. The resulting characteristics are attractive as they potentially offer an efficient solution to most ‘trust-related’ problems. Applications of blockchain have evolved into two types of distributed ledgers (DLs): public and permissioned. A public DL allows anyone to freely join, participate, and leave. A permissioned DL allows only selected participants to perform certain functions (join/read/write), through pre-established protocols or operator validation. The main challenges associated with DL technology (DLT) applications include scalability, integration with legacy systems, and computational costs associated with consensus mechanisms, in addition to security due to implementation gaps. Brute force attacks are still possible in hash-based integrity protocols, though the time and cost may be prohibitive. Other potential security issues include compromising 50% of the nodes (though the ‘supra layer’ is secure, ‘underlying layers’ are less secure and more susceptible to attacks) and exploitation of code vulnerabilities (Zetsche *et al.*, 2017).

The above limitations and the lack of maturity of cross-disciplinary research hinder the adoption of technology by businesses, financial institutions, and government organizations. Technology can transform the way digital asset transfers take place and the interactions happening among individuals, businesses, and governments across multiple jurisdictions (Buchanan, 2017). This revolution will challenge existing legislations and expose potentially dire consequences. The need for new legislations and clarification on how to define, interpret, and enforce value transfers of digital assets is becoming more evident. How stakeholders can effectively be managed in a real-time transaction environment without conflicts may require a revisiting of existing regulations and policies or the creating of new ones.

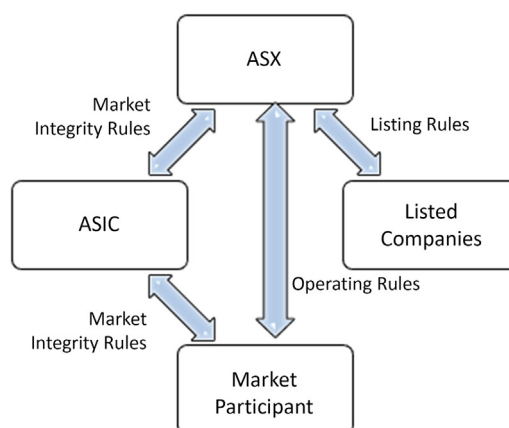


Figure 1 Summary of relationships between different actors and the rules that govern those relationships in the securities settlement industry. The ASX refers to the administrator of the multi-asset class exchange. Its activities include capital formation, trading, price discovery, central counterparty risk transfer, and securities settlement (ASX, 2018a). ASIC is the Australian Securities and Investments Commission, an independent government body set up as a corporate regulator protecting consumers, investors, and creditors. Listed companies refer to any companies listed on the ASX and whose shares are quoted on the ASX. A market participant refers to an individual who has been given direct access to markets via a direct connect to the ASX trading platforms and normally provides execution services to their own clients/organizations (ASX, 2018b). Many market participants are ‘brokers’ offering trading services to the other millions of traders. The arrows indicate the set of rules that dictate the relationship between those parties. There are no rules governing the interaction between market participants and listed companies as there is no direct relationship. The Corporations Act 2001 does contain provisions regarding the interaction between ASIC and listed companies; however, they are not relevant for the current discussion

A good understanding of evolving technologies and proactive views on the likely impact on policies and legal frameworks would facilitate society in harvesting the full benefits of innovations without delay and much constraint. In this study, one such case is considered—securities market and the blockchain.

2 Redesigning securities markets

Cryptocurrency is the one of the biggest public blockchain applications currently in operation with wide participation. There are also several applications of permissioned blockchains such as R3 Corda. One of the most attractive applications of permissioned blockchain system is in the securities market. Use of a public blockchain as a platform for the securities market lacks feasibility due to barriers arising from the need for a strict and complex regulatory framework. A public blockchain would contain no ‘administrator’. Therefore, the key role that the Australian Securities Exchange (ASX) and other enforcement agencies play in regard to enforcement and execution of the operating rules would need to be absorbed through an alternate arrangement. It is not possible to incorporate all these rules into pre-established protocols.

Figure 1 depicts the relationship between the main actors in the securities markets and the rules that govern those relationships. The ASX acts as the hub between these entities. The arrows indicate the type of rules and the nature of the relationship.

The operating rules (operating rules and listing rules) bind the ASX (market licensee—a sort of ‘administrator’) with the ‘market participants’ as a contract under seal. The Market Integrity Rules allow Australian Securities and Investment Commissions (ASIC) to bind both the ASX and market participants to its supervisory powers. These rules regulate the conduct of market participants, the appropriate disciplinary action, the quotation of securities, and the requirements to maintain listing. If a truly public blockchain is implemented for the ASX, the rules binding both market participants and listed companies cannot be enforced by some administrator. Though some of these enforcements may be possible off the exchange (such as directly enforcing disclosure obligations with the corporation), some obligations are directly linked to the settlement and exchange of securities. For example, the prohibitions relating to

direct trading by brokers cannot be monitored nor enforced without an administrator that clearly examines trades. Though it may also be possible for some prohibitions to be codified through a computer software module and executed automatically, there are many issues which are discretionary and thus cannot be codified. In many circumstances, the disciplinary action for the breach of the operating rules does not involve a reversal of the trade and instead a sanction such as a fine or removal as a market participant. In a public blockchain, the removal of a node cannot be employed as a sanction. Changing the laws to match a public blockchain is not feasible as many critical features and laws could not be implemented by a regulatory body if it were not to administer the blockchain. On the contrary, the permissioned blockchain may not offer some of the fundamental characteristics of a public blockchain—such as the characteristics stemming from the removal of a centralized authority.

The securities market plays a crucial role in the global economy as a whole and in the growth and investment of an individual's wealth. There is potential for clearance, settlement, asset registration, information releases, and payment processes to be dramatically redesigned by blockchain technology (ASX, 2018a). The ASX has been experimenting with overhauling the Clearing House Electronic Sub-register System (CHES) since 2015. The securities market in Australia has a market capitalization of AUD \$ 1.6 trillion, which is regarded as the world's 15th largest market. It services millions of people directly and many others indirectly. Consequently, the transition from an electronic register to a blockchain-based clearing system is a task that has many consequences. In fact, other exchange operators are closely following the proposed implementation, in an attempt to swiftly introduce changes to their own exchanges based on the lessons learnt through the overhaul process in Australia.

CHES has an average monthly serviceability of 99.9%. However, outages and hardware failures have caused relatively lengthy trading halts. Though the stability of CHES may seem to be reasonable, the efficiency of the securities market is significantly reduced mainly due to the T + 2 settlement process (2-day settlement time for transactions). The Dole Foods Case is an example of the systemic issues that stem from delayed settlement processes. In this case, the Chairman and biggest shareholder of Dole Food Co. wanted to take the company private and was found guilty of driving the price down to buy the company for a lower value. The Delaware Chancery Court ordered the Chairman to pay an extra 2.74 per share to the class action of 36 793 758 shares. However, the class came back claiming the shareholders actually held 49 164 415 shares. This inconsistency in the records of the market participant, shareholder, and listed company arose due to the multi-day settlement time for transactions. The judge held that finding the exact ownership would be too arduous and that future cases may have similar issue. It was deemed to be impossible to ascertain the true ownership of shares at a specific point in time (Cayatas, 2017). In addition, a report following the 2016 ASX equity market outage saw the exchange admit to a need for improvement in technology governance and operational risk management standards (ASX 2015). These events clearly indicate an appreciation of the need for change.

In fact, following the Dole Foods Case, Delaware began a Blockchain Initiative to develop a DL for share registration that would crystallize property rights and potentially automate corporate actions such as stock splits and dividends (Klayman *et al.*, 2017). A DLT platform could solve many of the issues that are being faced.

The ASX is also expected to transition to a blockchain-based system for settlement of securities transactions in early 2021 (ASX, 2018a). A settlement on the ASX can be regarded as a transferring of cash and 'property'. However, shares are standardized and far simpler than other property such as land, making the packaging of information far less demanding. In fact, a subsidiary company of the ASX has developed a 'smart contract language that sits on a harmonised database' called DAML - DA Platform and Digital Asset Modelling Language (ASX, 2019). DAML is regarded as a 'domain-specific language for modelling financial products and processes which has been designed for distributed ledgers'. The new ASX system has the potential to reduce the settlement time to T + 0 (immediate), saving investors money and increasing the buying potential and liquidity in the marketplace. There are some that believe that a reduced settlement time will reduce business opportunities such as leveraging. However, merely because 'value-adding' business streams will be removed does not necessarily result in a shrinking economy. Another proposal by the ASX is direct access via a node. Some of the potential benefits of direct

interaction include ‘common database stacks allowing for new applications to work across the market’, creating workflows catered towards an individual’s preference and real-time liberation of data to entitled parties. Direct interaction could also remove the need for intermediaries.

DLT could also be applied to redesign the face of regulatory compliance—for example, through more public and cohesive detection of ‘dark’ trades. At the same time, initiatives such as the ‘Australian National Blockchain’ (ANB) are necessary to harmonize functionality with processes outside the securities market. The ANB seeks to develop a platform that will provide many businesses with smart legal contracts to trigger business processes. Other potential areas that may be redesigned include information disclosure systems, payment systems, and market service requirements (Paech, 2017). Such redesigning will have numerous consequential effects on compliance, transaction monitoring, and regulatory reporting.

3 Impact on governance and regulatory theory

DLT was initially represented as a technology that supported deregulation and the removal of central authorities. However, with the creation of permissioned blockchain systems, governments are able to reap the rewards while maintaining regulatory control. Governance in such permissioned systems is simplified as there is a notion for a ‘clear legal and technical authority’ through the pre-approval process of nodes (Yeoh, 2017). Most regulators have chosen to take a hands-off approach to prevent stifling of innovation (Ducas & Wilner 2017). When DLT is applied to an ecosystem that already contains a regulatory framework as is the case with securities markets, governments have indicated that they would and should favour an accommodating and non-interventionist approach such as a sandbox model (Ordoriso, 2017). The sandbox model allows for regulatory barriers to be lifted and for innovative testing to occur in a free environment. Nonetheless, this freedom needs to be balanced with regulatory changes that reflect and adapt to systemic issues and changes.

3.1. Systemic effect of redesigning on insider trading

Justification for insider trading laws is centred around fairness and morality. While some regard DLT systems as increasing anonymity and potentially increasing criminal activity, the opposite may be true. In a permissioned blockchain, know your customer (KYC) requirements are readily satisfied by administrators who have well-refined initiation processes. Currently, the chain for KYC processes involves brokers, clearinghouse members, and the exchange (Miraz & Donald, 2018). Implementation of DLT to company information releases will increase transparency and speed of information dissemination to the wider public. This is achieved through the distributed network and public-key cryptography. Thus, insider trading may be exploited to serve as a method of effectively communicating information to the public (Fischel & Carlton, 1982). In addition, investors may be able to better assess the credibility of insider trades. This is possible as the executed and the non-executed trade volume (like a limit order book) will be readily available to all investors, allowing for increased transparency of trades. Transparency due to three-dimensional company information (horizontal, vertical, and sequential) on DLT and reduction in dark pool markets (as artificial dark market transactions can be detected swiftly using machine learning and DLT) may potentially align the interests of managers and shareholders (Tapscott & Tapscott, 2017). Regardless, the need for fairness is too strong of an incentive to outweigh the potential increases in information efficiency. Consequently, insider trading laws in the Australian jurisdiction are unlikely to change though the enforcement of such provisions may be easier due to the harmonization of regulatory provisions through smart contracts.

3.2 Systemic effect of redesigning on mandatory disclosure

Current mandatory disclosure laws are based on the need for investor confidence, protection of unsophisticated investors, and the non-optimal outcomes that would occur from voluntary disclosure (Coffee, 1984). A prisoner’s dilemma is likely to arise as competitors in the same industry will look to free-ride

off disclosed information. Information could be placed on a blockchain, but this would not solve the free-riding problem. Information still needs to be disclosed to the public and consequently a reduced level of disclosure is very likely (Van der Elst & Lafarre, 2018). On the other hand, there is potential for automated continuous and periodic disclosure to become a reality. This system would operate through a combination of DLT and ‘smart contracts’ between listed companies and the exchange—leading to enhanced traceability and auditability. For example, companies could use DLT, smart contracts, and machine learning to recognize price sensitive information and release such documents to the public. In fact, the UK Financial Conduct Authority (FCA) is experimenting with distributing their analysis software to entities such as banks. Entities would run the FCA’s software and send back the results. If this process was run with smart contracts, results could be analyzed immediately with breaches dealt with simultaneously. In a DLT system, an exclusive reconciliation is not needed, as there would be no siloing of agreed classes of information, no multiple points of failure and three-dimensional financial data (Lamarque, 2016). However, automated disclosure may lead to the release of information that is too fast. This would prevent investors from properly speculating (Easterbrook & Fishel, 1984). Mandatory disclosure requirements would still be necessary, but the enforcement of such provisions, compliance requirements, and detection of violations could be significantly redesigned by a combination of smart contracts, DLT, and artificial intelligence (AI) technology (Micheler & Whaley, 2018).

3.3 Systemic effect of redesigning on market abuse

Market abuse laws will not be affected significantly, as KYC protocols still exist with the administrator in a permissioned system. In fact, crossings and other improper conduct could be more easily identified, since siloing of information will be reduced due to the combination of data onto a single ledger. For example, cases such as *ASC v Nomura* (1998), where several brokers worked under the direction of a large company to create the appearance of active trading and the false appearance as to a future price, could potentially be pre-emptively or immediately stopped using DLT and AI technology. That is, occasions when ‘genuine supply and demand’ are not reflected in the market, DLT could adaptively detect such transactions (through machine learning) and raise red flags for further investigation or potentially halt trading (*North v Marra Developments*, 1981). Complex webs of transactions that are aimed at creating artificial prices or markets are likely to be more easily detected and enforced due to the reliability of transactional data from the ledger. In fact, it may be possible that the process of authorising of transactions involves a run to detect fraud. This would consequently increase the deterrence of market abuse.

Overall, governance and regulatory theories are not significantly effected by redesigning securities markets with blockchain. Nonetheless, DLT will have an impact on the operation of the ASIC, ASX, and private individuals. The impact of the increased market power to the ASX may require appropriate variations to manage conflicts of interest (Deloitte, 2016). Furthermore, there will need to be an evolution of general legal principles to the redesigning of securities markets that incorporates new types of evidence and new systems of detection.

4 General legal issues arising from the redesigning of securities market

This section analyzes general blockchain-legal issues such as disintermediation, smart contracts, and privacy in the context of redesigning the securities market.

4.1 Need for intermediaries

The consensus mechanism used for verification and private key cryptography used for validation allow for immediate trust formation from an ‘untrusted environment’, leading to increased speed and efficiency. Consensus mechanisms such as Proof of Work (PoW) allow participants in an open untrusted environment to trust that records of transactions will not secretly or easily be altered after its

creation and to trust that cryptocurrency will not be double spent. PoW provides the means by which an open blockchain can agree on a single source of truth. PoW is normally not needed on permissioned blockchains because participation is not anonymous. To join a permissioned system, each participant needs to provide appropriate identity information. Permissioned systems typically use computationally less expensive consensus mechanisms such as proof of stake or proof of authority validation protocols. There may be no need for intermediaries or third parties neither in regard to secondary trading of shares nor in regard to the exercise of shareholder rights (Van der Elst & Lafarre, 2018). The need to absorb default risk is significantly reduced in a DLT network, and thus the role of the intermediary can be eliminated. The removal of the intermediary or broker would ensure that there is no siloing of information, leading to increased efficiency and reduced transaction costs. However, responsibility and enforcement will be shifted towards the exchange and potentially be distributed among market participants. For example, KYC requirements are currently satisfied by a long chain of ‘vetting’ entities. Eliminating the broker will shift majority of the requirements to the exchange. The ASX has already proposed a direct node access that may eliminate the need for the existing chain of intermediaries. However, intermediaries such as brokers serve the supplementary purpose of offering a form of leveraged finance. This role, may have to exist in a ‘chain-and-link’ arrangement, as incorporating this within the proposed ASX model is not feasible as it introduces significant credit risks that the ASX would not be willing to take on. Nonetheless, brokers may opt to run their network on the blockchain as an application—unifying data and simplifying currently complex processes.

Disintermediation will remove broker–client fiduciary obligations. Such obligations will not be placed on the buyer–seller relationship, as there is no such trust and confidence. Trading on the blockchain will provide greater transparency, speed, and certainty. This will reduce the investor’s risk to a very trivial level. Consequently, the need for absorption of these risks by intermediaries is not essential. Thus, the need for fiduciary obligations to protect trading relationships in the securities markets is not vital. Nonetheless, total disintermediation is not likely due to the supplementary roles that brokers play in the securities market.

4.2 Agency theory

The divergence of shareholder interests and board member motivations gives rise to a problem known as the agency problem—a conflict of interest inherent in any relationship where one party is expected to act in another’s best interests. This problem is the cause for several regulatory rules protecting shareholders and incentivizing decision makers. Blockchain has been regarded as a possible solution to this corporate governance issue. Nonetheless, the DAO has shown us that a fully decentralized network can give rise to other unique governance issues (Mehtar *et al.*, 2019). Though it may appear that with a combination of trust and transparency the ability for shareholder interests to be at the forefront of corporate actions is inevitable, the practicality of leadership and the use of securities require there to be agency. Where there is agency, it is inevitable that some sort of agency risk and costs will exist. However, with a more transparent system, it may be possible that these costs are significantly reduced.

4.3 Code becoming the law—smart contracts

DLT-based recording of trades gives rise to a new level of reliability and transparency that can be used for the triggering of other processes. This is the fundamental concept of a smart contract. The combination of smart contracts and DLT can be used in regulatory compliance, paying of dividends, derivative contracts, and tracking of property rights. However, there are limitations regarding the execution of smart contracts based on inputs from different blockchains. Smart contracts secured through DLT also need to be afforded the proper legal effect as proposed in Delaware (Cayatas, 2017). However, there are contentions as to the flexibility of smart contracts and the ability to override them. In addition, there are issues associated with the change that is effected upon legal relationships and understandings.

Smart contracts are auto-executing software that rely on the ‘code as the law’. They embed the values of private actors into technology to appropriately constrain actions. Consequently, errors or

vulnerabilities in the code can be exploited to favour a party or benefit an external party. Such exploitations are difficult to override as there is a contention as to whether the code or the contractual intention will supersede. In ordinary contracts, words are read in the context of the intentions of parties. However, with code, there is no opportunity to read in the intention, it is deterministic. For example, many legal tests feature phrases such as ‘what a reasonable person would do’ and ‘foreseeable’. Furthermore, contracts themselves contain phrases such as ‘best efforts’ and ‘in good faith’. Such flexibility allows for contextual circumstances to be incorporated into the interpretation of clauses. Thus, at the current stage, smart contracts will not be able to offer this level of malleability. In addition, the courts’ ability to clawback money in transactions where smart contracts are operating may undermine the certainty of the agreement. DLT is designed to be certain and immutable. Creating laws to allow for clawbacks and fairness are necessary for the protection of unsophisticated actors and unforeseen situations, but this may undermine the central characteristics of blockchain technology.

Currently, clients accept most of the responsibility for understanding and consenting to contractual agreements. There is some liability accepted by lawyers when providing advice to clients. With smart contracts on DLT, there is an enormous issue in regard to understanding and interpreting code. One potential solution is the integration of natural language and computer language (Micheler & Whaley, 2018). This would allow lawyer–client relationships to stay the same, while additional interpretive responsibility is accepted by a translating software. Another solution would involve lawyers themselves writing the contract on a ‘high-level’ programming language. Consequently, additional liability would be taken aboard by lawyers. This field may open up the potential for specialized lawyers who are able to take on the responsibility of translating normal contractual agreements into code. The key in all potential solutions is ensuring that liability remains predominantly with the client or investor, with interpretive requirements spread between agents. Another potential solution may be provided by insurance companies, who can absorb the risk of poor coding and code vulnerabilities—similar to insurance provided for medical practitioners and drivers. However, the ability to accurately estimate and forecast future downfalls is very difficult in this context. Nonetheless, Nexus Mutual has worked around this issue by collectively insuring each other’s smart contracts and consequently risk sharing instead of risk transferring.

The other problem with coding the contract is that there is much difficulty in retrospectively invalidating a transaction. For example, a ‘right to be forgotten’ is needed as a remedy to some legal issues in securities markets. This feature is very relevant in relation to the General Data Protection Regulation as well (Berberich & Steiner, 2016). Unfortunately, in DLT, the ‘right to be forgotten’ or retrospective invalidity cannot be easily achieved due to immutability (Cermeño, 2016). DLT provides immutability through the distribution of data and cryptographically linked hashes of blocks that can detect alterations to the history. There may be a potential solution to achieve the ‘right to be forgotten’ if parties agree to change the code through a smart contract. For example, a procedure similar to a hard-fork could be executed—altering the block and accepting via a consensus mechanism as a pre-agreed contract. The Ether clawback following the DAO hack is an example of a hard-fork procedure. Unfortunately, this leads to the removal of certainty from the system. Consequently, monitoring of the interaction between RegTech and financial systems is needed to determine appropriate balances.

4.4 Privacy

When information or trades are run on a blockchain platform, there may be issues associated with the privacy of investors (Mainelli & Milne, 2016). A permissioned system can allow, with appropriate cryptographic mechanism in place, for the anonymity of investors to be maintained while making trading data and disclosure history publically available. Traceability is still possible as the certain authority will have access to the link between the data and pseudoidentities. Consequently, a large amount of data will be available to the exchange. This needs to be closely regulated and protected through privacy laws and mandatory data breach notifications. In securities markets, privacy is a vital feature as it allows individuals and companies to trade in exclusive fashions based on their proprietary technologies.

5 Conclusion

This paper detailed the potential redesigning that would occur in securities markets due to blockchain technology. It was found that DLT would most likely have no immediate effect on regulatory theories, but it would significantly impact the method of enforcement. The effect of disintermediation, distributing liability, coding the law, and privacy on blockchain securities markets was critically examined. LegalTech, RegTech, and FinTech are all at their infancy. More research into the specific implementation plans and their consequential effects are needed to accurately determine the full potential and regulatory impact of DLT on the securities market. The external environment such as the data-driven stakeholder participation in wider DLT systems may also have some consequential impact on the securities market. As this is a fast-evolving inter-disciplinary area, constant work and vigilancy are required from the legal perspective. Appropriate governance and regulatory frameworks would provide market participants the stability needed to fully engage and enable innovation to flourish. This would require regulators and industry to collaborate, experiment and learn, and then shape the future of the technology to benefit all. In fact, this pre-emptive and experimental approach to regulatory changes would be beneficial to all other applications of DLT.

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