Challenges of DLT-enabled Scalable Governance and the Role of Standards

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Abstract

Distributed Ledger Technology (DLT) and its blockchain subclass are emerging as a disruptive innovation with an expanding range of potential applications. While DLT systems promise significant benefits to participants and diverse industries, their use of cryptography and incentive models to displace intermediaries and central authorities present significant challenges to conventional models of institutionally-oriented governance. This is due to the disintermediation of such governance bodies displacing the accountabilities and decision rights such parties typically provide. This paper addresses the emerging research question of how standards can address the assurances lost by the displacement of conventional institutional governance mechanisms in DLT systems.

Keywords: DLT, blockchain, Bitcoin, standards, scalable governance, decentralization.

1 Introduction

Distributed ledger technology (DLT) systems such as Bitcoin claim to provide transactional integrity without recourse to central governance authorities [1]. Atzori [2] describes this shift to decentralized governance as being driven

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by diminishing societal trust in central authorities and intermediaries. This loss of trust was exacerbated by socio-economic events such as the 2008 Global Financial Crisis (GFC) and resulting social discord. DLT systems such as Bitcoin facilitate decentralized governance using novel applications of cryptography and incentives. Such DLT-enabled decentralized systems allow participants to conduct trusted transactions between unknown parties without recourse to intermediaries or authorities. This transition away from reliance on trusted central parties presents significant challenges to conventional mechanisms for governing systems.

Weill & Ross [3] define governance as the decision rights and accountabilities to encourage behavior in the use of Information Technology (IT). Beck [4] applies this definition of IT governance to the context of DLT governance, placing additional emphasis on the role of aligned incentives between participants and stakeholders of DLT systems. This system-enabled decentralized governance approach enables a scalability of operation beyond the constraints of institutionally-oriented governance [5]. While the promise of DLT-enabled decentralized scalable governance is appealing to many, it presents challenges to participants who have relied on conventional institutionally-oriented accountabilities and decision rights to manage risks and ensure equitable outcomes. A key emerging research question is 'What should be the role of standards in supporting the DLT-enabled transition to scalable decentralized governance?'

The scope of this paper is the role for standards in addressing the challenges presented by decentrally-governed DLT systems. This paper is organized as follows. Firstly, it discusses the challenges faced by conventional institutionally-oriented governance. Secondly, it discusses the DLT-enabled transition towards scalable decentralized governance. Thirdly, it discusses the challenges introduced by decentrally-governed DLT systems. Finally, it describes the role standards can play in addressing the emerging challenges of decentralized governance.

2 Conventional, Institutionally-Oriented Governance

The ability to trust unknown others has been a distinguishing feature of human society. In such situations, parties are unable to rely on the experience of previous interactions and must overcome the perceived risk of engaging with unknown others [6]. Modern society has industrialized the mitigation of such risk through the endowment of 'seals of approval' from trusted centralized institutions [7, p. 4]. The allocation of such seals through centrally-held

public registers (or 'ledgers') has provided society with an efficient means of recording changes of economic state transactions such as those relating to property matters [8]. These centrally-held ledgers and the institutions that oversee their operation have become a cornerstone of the modern industrial state and centrally-assured governance. The centrally-assured governance of trust, however, does not come without cost. Scott [9] notes that centrally-led government processes often come at the price of overly simplistic standardization that is not reflective of the inherent heterogeneity of society. At a small scale, centrally-administered governance may have been efficient, however when applied at scale across modern societies, such central governance can be both expensive and unwieldy [8, 9].

As society has grown in complexity, institutions have evolved to more efficiently enable societies to coordinate processes needed to support more complex forms of economic activity and address the inefficiencies of state-based resource allocation [10]. Institutions have further allowed the specialization and consolidation of resources needed for societal achievements otherwise beyond the reach of individuals operating in isolation or inefficient state institutions [11]. Similar to the described weaknesses of states however, the rise of institutions to orchestrate complex economic activity has also come with costs. These include rent-seeking opportunism, costly organizational hierarchies, the tendency to concentrate wealth and power, and an unwieldiness of administration [8, 11]. These limitations have been attributed to the outstripping the capacity of existing institutional mechanisms to provide requisite social coordination, and have been exacerbated by public perceptions of declining ethics and the emergence of technologies facilitating increased information transparency and dissemination [12]. These weaknesses have contributed to the increasing societal alienation from institutional entities such as banks and regulators that have been conventionally entrusted with the transfer of value in society [2, 9]. See Table 1.

Table 1 Challenges of conventional, centralized governance

	Challenges of Conventional Institutionally-oriented Governance	Research
1	Inefficiency and unwieldiness of regulatory enforcement	[8, 9]
2	Rent-seeking opportunism & concentrations of power	[8, 11, 12]
3	Societal alienation	[2, 12]
4	Overly simplistic standardization not reflecting societal heterogeneity	[9]

Emergence of DLT-enabled Scalable Decentralized Governance

The decline of trust in central institutions has driven the pursuit for alternative means of establishing trust among otherwise unknown parties [13]. DLT and the subclass of blockchain technologies that underpin Bitcoin's design have received significant attention from industry and academia for their potential to address concerns with conventional institutionally-based governance. The use of technically-enacted scalable, decentralized governance affords DLT participants relief from the friction of organizational interactions, allows increased democratic coverage, and mitigates rent-seeking opportunism by intermediaries [13–16]. Abramaowicz [17] notes the growing popularity of Bitcoin and other DLT-based systems such as Ethereum demonstrate a societal willingness to arrive at consensus on agreed economic states without the presence of conventional central authorities or institutional intermediaries.

As a technology of decentralization, DLT systems portend a more sophisticated and efficient means of making complex decisions with integrity and enabling scalable resource transfers among unknown participants [14]. Benkler [13] notes that DLT's displacement of institutional intermediaries with cryptographic assurances and incentives signifies a technological advancement that addresses the underlying complexity and needs of today's societies while mitigating the inefficiencies and costs associated with state, firm and market-based approaches to societal governance. By eliminating the need for central authorities and intermediaries, distributed ledger systems upend modern society's dependence on these parties to provide assurance and trust among unknown parties. Perhaps not surprisingly, DLT is increasingly described as an institutional technology of decentralization [5]. See Figure 1.

From a governance perspective, a lasting legacy of Bitcoin and its underlying blockchain technology may be its ability to assure trust among unknown parties without recourse to central authorities and reputable third-party intermediaries. Yet despite their compelling possibilities, DLT systems

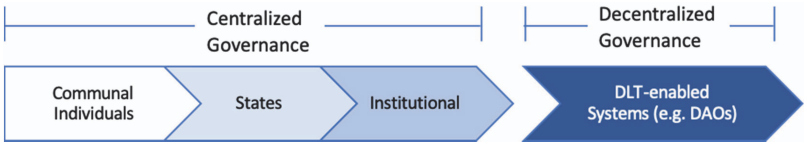

Figure 1 The evolution of minimizing participant opportunism in markets.

themselves introduce their own governance challenges that require addressing if they are to realise their full potential. Specifically, they introduce the question 'Where does the buck stop when the entities in whom accountability and decision rights conventionally vest are displaced by technology and their replacements unclear?'

Challenges of Decentralized Governance

Decentralized governance that relies on the displacement of assurance-providing central authorities and intermediaries introduces governance challenges that must be addressed if the shift to DLT-enabled governance is to be succeed [18, 19]. These governance challenges include the concentration of authority and decision-making power into unaccountable, often non-transparent entities [2]; the rise of extra-judicial autonomous agents and smart contracts for whom the sanctions and constraints of existing regulating frameworks hold limited influence [15]; and the loss of points of regulatory control resulting from the displacement of central authorities in regulated environments [13]. Without effective mitigation, such challenges are likely to impede the DLT-enabled transition to decentralized governance. See Table 2.

Emergence of Unaccountable, Oligarchic Governance Structures

Atzori [2] notes that DLT systems that eliminate central authorities and intermediaries risk the emergence of a 'techno-elite' that lack formalized legitimacy [2, p. 18]. In this case, powers invested in central authorities and intermediaries such as central banks and financial institutions are replaced by those that create and enforce the rules that govern a DLT system. In the case of DLT systems such as Bitcoin, this power is concentrated among a handful of parties including core developers and miners that are largely unaccountable to Bitcoin participants [2, 20]. Perhaps ironically, Nakamoto's stated intent of to remove intermediaries has over time resulted in the investiture of power in other arguably unaccountable entities.

Table 2 Challenges of decentrally-governed DLT-enabled systems

	Governance Challenge	Research
1	Emergence of unaccountable, oligarchic governance structures	[2, 17, 20, 21]
2	Resistance of smart contracts and DAOs to regulatory sanctions	[2, 15, 22]
3	Displacement of central control points	[3, 13, 23]

In Bitcoin, governance decision-making in Bitcoin is consolidated in the form of core developers and mining entities who decide what code changes to accept promote into the Bitcoin systems core protocols, and miners, who decide which protocols to operate and execute transactions against [2, 17, 20]. This issue of Bitcoin's powerful elite is a manifestation of a more general observation that many peer-to-peer systems exhibit entrenched, unaccountable concentrations of authority that frequently leads to oligarchic governance structures [21]. As an early implementation of DLT, Bitcoin can be argued to have demonstrated this tendency towards oligarchic consolidation of control over governance mechanisms [2, 17]. Unlike intermediaries and central authorities however, powerful participants in distributed ledger systems like miners and core developers, are limited by lesser oversight and regulatory constraints. This presents challenges to the stakeholders and participants to distributed ledger systems, who have relatively limited recourse to hold the decisions of such parties to account. While the early proponents of DLT such as Bitcoin's Satoshi Nakamoto and Ethereum's Vitalik Buterin arguably demonstrate socially conscience, what happens when the benevolent dictator is replaced by one altogether less benign?

Efficacy of Jurisdictional Sanctions over DAOs and Smart Contracts

Among other capabilities enabled by the introduction of distributed ledger systems is the growing deployment of self-executing smart contracts and human-independent Decentralized Autonomous Organisations (DAOs) [15]. These constructs build on the core technologies underpinning Bitcoin and extend them with artificial intelligence and self-executing code. The novel nature of these capabilities presents challenges to the historical sanctions regulators and governing authorities have used to regulate the activities of individuals and organisations. DAOs portend the emergence of new economic institutions that stretch the ability of existing legal and regulatory controls that are grounded in the ability to sanction human actors or otherwise accountable institutional entities [2, 15]. With such parties displaced however, conventional governance oversight through sanctions and controls are less effective in their ability to influence outcomes and behaviours. DAO operations could also be a cause of harm to others, potentially leaving affected parties without effective legal recourse due to the inability to ascertain culpable human actors [15]. Such uncertainties present challenges for the decentralized governance inherent to many DLT systems and warrant addressing before such governance can be fully embraced.

Smart contracts are self-enforcing code that execute autonomously on DLT systems [2, 15]. The benefits of smart contracts are compelling. They offer efficiencies in the form of reducing the cost of contracting and increase the speed of contractual execution [15]. Kiviat [22] notes that smart contracts in distributed ledger system contexts allow unknown parties to transact at arm's length, with reduced risk of fraud and costs of third-party enforcement. In this manner smart contracts provide an efficient means of addressing the costs and uncertainties associated with counterparty risks. Smart contracts conversely introduce key governance challenges in the form of uncertainty of their interoperability with existing legal and regulatory frameworks, and the enforceability of legal rulings on their operation [15]. The uncertainty of their interoperability with exiting existing governance frameworks presents a further governance challenge that must be overcome if the benefits of DLT-enabled smart contracts are to be fully realised.

Displacement of Central Control Points

Technology governance is often applied in institutional contexts to address how technology decisions are prioritised, implemented and managed in an efficient and effective manner. In these contexts, decision rights and accountabilities are often invested in hierarchical power structures such as executive management and boards [3, 23]. DLT systems disrupt the conventional approach to hierarchical, centralized governance. By removing intermediaries and central authorities however, DLT systems also remove key control points relied on by regulators and broader DLT stakeholders to promote governance accountability and standards [13]. Without recourse to regulating intermediaries through licences, operational oversight, sanctions or otherwise imparting controls through central authorities, where do regulators otherwise target controls to assure participants and manage risks? The efficiency of large institutional objects of regulatory attention risk being replaced with far more distributed entities such as individual users, some of which may operate outside the reach and jurisdiction of regulators.

Role of Standards in Enabling Scalable, Decentralized Governance

Beck, Müller-Bloch & King [24] note the importance of standards in expanding the adoption of DLT systems. While not addressing all of the challenges introduced by decentrally-governed DLT systems, DLT standards will have an important role to play in realising the benefits of scalable, decentralized

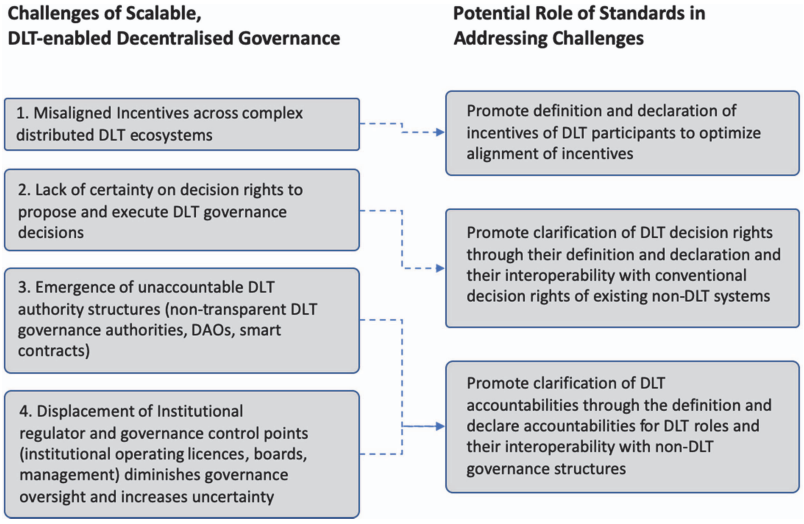

Figure 2 The role of standards in addressing the challenges of DLT-enabled scalable decentralized governance.

governance. Specifically, standards have three roles to play in addressing the governance challenges attributable to the advent of scalable, decentralized governance enabled by DLT systems. These are the alignment of incentives across diverse DLT participant and stakeholders, the clarifying of decision rights in DLT-enabled systems, and the establishment of accountabilities. See Figure 2.

Aligning Incentives Across Diverse DLT Participants

Beck, Müller-Bloch & King [24] note the challenges of aligning incentives among the diverse participants and stakeholders of DLT systems. Weill & Ross [3] note the importance of aligning incentives across participants to encourage behaviours that are conducive to the overall effectiveness of the system. Standards can contribute to the alignment of incentives across stakeholders by seeking to identify, define and declare the incentives of participants and relevant stakeholders. Standards that promote the clarification of the incentives operating in DLT systems allow participants and stakeholders to identify the risks associated with specific DLT systems, and allow for informed decisions in their joining and participation. Anjum, Sporny & Sill [25] note that the clarification of such design attributes reduces the uncertainty of would-be investors and participants in a DLT systems' assurance, increasing the likelihood of both DLT investment and adoption. This ability for standards

to reduce the uncertainty associated with a DLT systems stands to increase trust in these systems without recourse to intermediaries or central authorities. Standards therefore have an important role to play in the displacement of intermediaries and central authorities, a key attribute that [14] note as allowing DLT-enabled governance to scale beyond the constraints of conventional, institutionally-oriented governance.

Clarifying DLT Decision Rights

Standards can serve to provide certainty to DLT participants and stakeholders in where decisions rights reside within a distributed system. In the context of IT governance, [3] note the importance of decision rights in clarifying whom can propose key governance decisions and how such decisions can be implemented. In DLT systems, these decision rights encompass various key decisions, including determining what the consensus rules are that govern the making of DLT decisions and performance of key functions including participant voting, forking, and conflict resolution.

Where uncertainty exists in how such decisions can be made, this affects the overall confidence of participants in the use of the system [25]. Such uncertainty risks impeding the early adoption of DLT systems by participants, and lack of investment decisions by investors and existing organisations. Similarly, for decisions relating to the use and adoption of smart contexts, [19] note the lack of clarity regarding the enforcement of smart contract rights may restrict their application to simple agreements, limiting the benefits afforded by their fuller adoption.

In facing the uncertainties associated with the lack of identified authorities, explicit governing bodies and interoperability of DLT systems with existing legal and regulatory frameworks, standards are well placed to clarify whom can propose governance decisions and how such decisions should be made [19]. Beck, Müller-Bloch & King [24] note that DLT decisions are increasingly dependent on technical enactment due to the need to scale decisions across larger number of decentralized participants and the frequent lack of institutions that otherwise conventionally hold such decision rights. In this case, standards are likely to encourage the investment certainty required to build more scalable technically-enactable decision rights for DLT systems, a foundation necessary for the realization of scalable governance.

Establishing DLT Accountabilities

In the context of DLT systems, Beck, Müller-Bloch and King [24] note the absence of central authorities and intermediaries as presenting a DLT

governance challenge in the form of uncertainty as to where accountabilities reside. This uncertainty contributes to the risks stakeholders including regulators, investors and would-be DLT participants must incorporate into decisions on how to regulate, or whether to invest in or join a DLT system. For DLT systems, a lack of clarity of DLT system accountabilities can be further exacerbated by the presence of non-corporeal entities such as DAOs and functions such as smart contracts. Who would bear accountability for a DAO meeting its obligations in a jurisdiction otherwise requiring institutional disclosure of ownership and executive management positions?

Standards could address such concerns by requiring that compliant DLT-enabled systems declare where accountabilities for key DLT functions and governance decisions rights reside. This would inform decisions by regulators, potential investors and participants in DLT-enabled systems. The clarification of accountabilities for DLT-enabled multi-party supply chain and trade finance systems would in particular reduce uncertainty risk for decision makers. In these scenarios standards would be useful in clarifying mutual accountabilities, encouraging trust and building confidence which would otherwise be provided by trusted intermediaries and central authorities [19]. Such benefits of standards would be particularly important to build confidence and adoption for DLT systems that transfer responsibility from one party to another across organisational and potentially jurisdictional boundaries. Mainelli & Mills [19] note that in these cases standards would encourage investor confidence and participant adoption by clarifying how the accountabilities of DLT-enabled systems would co-exist and interoperate with the accountabilities associated with existing, legacy systems. Anjum, Sporny & Sill [25] note this would be beneficial in early-stage DLT investment in determining the legal responsibilities of existing governing authorities that invest and participate in DLT systems. By example, organisationally-operated DLT systems could receive guidance and certainty from standards on how the responsibilities of boards and executive management are affected by an organisation's trade participation using DLT-enabled systems.

Is it the Right Time for Standards?

A common argument observed against the release of DLT standards is that the release of such standards would be premature considering the relative immaturity of its underlying technology [19, 26]. Such arguments are largely based on the premise that the introduction of purportedly premature standards would stifle innovation or force adherence to sub-optimal technical designs. Given that Bitcoin is now a decade old and many of its underlying technical

foundations older, the case to delay standards on grounds of technical immaturity wears increasingly thin. This coupled with the significant amounts of value are being transacted over DLT systems such as Bitcoin suggests the benefits of standards-supported certainty is growing. The benefits of releasing standards now are amplified by calls of developers and investors for standards to encourage increased DLT investment, adoption and regulatory certainty – each essential ingredients for the transition to scalable, decentralized governance.

Conclusion

This paper examined how DLT systems supplant the role of increasingly distrusted institutions and central authorities by disrupting conventional institutionally-oriented governance. The displacement of intermediaries and central authorities introduces its own governance challenges. These include the emergence of unaccountable, oligarchic power structures, the difficulty of aligning incentives across diverse DLT participants and stakeholders, lack of clarity of DLT decision rights, and the disruptions to institutionally-oriented governance caused by the displacement of conventional governance control points such as institutional boards and executive management. This paper identifies specific roles that standards can play in addressing these governance challenges and contends the argument to delay DLT standards diminishes as the value of DLT-facilitated transactions rise and the demand for standards from investors, DLT participants and regulators grows.

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Biography

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