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PREFACE

Preface to the special issue on "Enterprise and organizational applications of distributed ledger technologies"

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Introduction

In the fast-evolving landscape of digital technologies, distributed ledger technologies (DLTs)—commonly known as blockchain—have emerged as a highly disruptive force that holds the potential to change how transactions are conducted fundamentally and assets are managed. Drawing comparisons with the revolutionary impact of the internet's foundational TCP/IP protocol, DLTs have opened up new horizons regarding security, speed, and decentralization.

DLTs offer unique features such as improved accountability, pseudonymity, and the ability to operate in a decentralized network environment. These features have implications far beyond the initial context of cryptocurrencies, initially exemplified by Bitcoin (Nakamoto, 2009), a cryptocurrency that introduced a new way of conducting transactions without a central authority, thus lowering costs and improving efficiency.

Yet, as with many emerging technologies, DLTs have navigated a cycle of inflated expectations, followed by a critical assessment phase. This cycle has underscored the need for systematic evaluation of the real-world applications and implications of DLTs beyond theoretical or conceptual frameworks. The questions that beg answers range from their impact on existing business models and value chains to the more complex governance (Lumineau et al., 2020; Ziolkowski et al., 2020) and regulatory issues (Alt, 2020; Bons et al., 2020; Ostern, 2019). Moreover, the technology has seen waves of innovation, with the advent of smart contracts and decentralized autonomous organizations (DAOs), pushing the boundaries of what can be achieved through programmable secure transactions. Bitcoin's success triggered a broader exploration of the potential of DLTs. Ethereum, another significant milestone, expanded the scope by introducing smart contracts, i.e., self-executing contracts where the terms of an agreement are programmed in the code. This innovation enabled various use cases, from automated legal processes to streamlined supply chain management.

Today, DLTs are explored to be used in various sectors such as supply chains (Bauer et al., 2022; Chod et al., 2020), healthcare and secure patient records (Cunningham & Ainsworth, 2017), decentralized finance (Anker-Sørensen & Zetzsche, 2021), and energy markets (Albrecht et al., 2018; Andoni et al., 2019). In these industries, DLT is not only used for revolutionary changes, such as automating processes through smart contracts to increase organizational efficiency (Eggers et al., 2021) but can also lead to evolutionary changes impacting an organization's business model (Weking et al., 2020).

Based on these changes, DAOs have begun to challenge traditional organizational structures (Hassan & De Filippi, 2021), offering a new model of governance based on collective decision-making (O'Mahony & Karp, 2022). Non-fungible tokens (NFTs) are another interesting area where large organizations like Starbucks or Siemens are exploring the value of tokenization for securing ownership of digital assets (Regner et al., 2019; Trautman, 2021; Zaucha & Agur, 2022).

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For this special issue, we called for contributions to the growing body of knowledge addressing various aspects related to the design, use, and management of DLTs across various enterprise sectors. Additionally, the special issue called for research that examines the technological aspects, organizational challenges, social implications, and governance mechanisms associated with DLTs. Last, we also welcomed contributions of different methodological approaches as we wanted to foster interdisciplinarity, which is important for understanding the complex and multi-faceted phenomenon of DLT.

In the following sections, we introduce the selected papers that contribute to this special issue, each contributing to different aspects of DLTs—from decentralized organizational structures and identity management to the use of blockchain in electronic businesses. We conclude with an outlook on future research directions in this domain.

Despite the rapid growth and a growing number of potential applications, a considerable gap exists between academic research and the practical implementation of DLTs. While academic research actively theorized about the technical and organizational capabilities and limitations of enterprise DLTs, much of this research has yet to move beyond the conceptual stage. On the other hand, in practice, organizations in business and government started their DLT projects, often forming blockchain consortia (Zavolokina et al., 2020), but sometimes lacking an understanding of the strategic and operational implications, leading to failing projects and initiatives (Bauer et al., 2022; ESG Intelligence, 2021; Hacker et al., 2023).

Moreover, the existing literature often examines DLTs from a singular perspective, usually technological, economic, or organizational. However, DLTs, especially embedded in a business context, are complex systems that influence and are influenced by various factors, from technical protocols to social norms (Hacker et al., 2023). This complexity calls for a multidisciplinary research approach, combining insights from information technology, management science, economics, and social sciences.

Articles in the special issue

We have accepted three articles for publication in this special issue. Each article explores different aspects of DLTs, yet they are interconnected in their overarching theme of enterprise use. These articles offer a comprehensive view of blockchain's impact by exploring topics from DAOs to enterprise identity management and e-business.

Each paper in this special issue tackles distinct facets of enterprise operations reshaped by DLT. The first paper examines the potential of self-sovereign identity (SSI) on enterprise identity management, suggesting that DLT could bring about more secure and efficient verification processes. This has implications for organizational security and streamlining interactions with stakeholders, ranging from employees to external partners. The second paper addresses the organizational structure, focusing on DAOs. The paper clarifies the concept and functioning of DAOs, which can fundamentally alter how decisions are made and resources allocated within enterprises. The third paper, by concentrating on electronic business, extends the conversation to the very architecture of value chains. Through multiple case studies, the paper reveals how blockchain can improve the transaction of tangible goods and intangible services, thus offering

Table 1 An overview of the accepted articles in the special issue

Article	Applied methods	Key contributions
"Understanding decentralized autonomous organizations from the inside" by Nils Augustin, Andreas Eckhardt, and Alexander Willem de Jong	Netnographic techniques, Topic modeling	1. Diverse governance models in DAOs and practical use cases 2. Contribution to the debate between "Code is law" vs. "Code is constitution" 3. Overview of the challenges and potentials of DAOs in the digital age
"Designing a cross-organizational identity management system: Utilizing SSI for the certification of retailer attributes" by Tobias Guggenberger, Daniela Kühne, Vincent Schlatt, and Nils Urbach	Design science research	1. Four design principles for SSI aimed at making SSI scalable, flexible, and user-centric while maintaining privacy 2. Real-world application of SSI for online retailers 3. A roadmap for SSI development, highlighting both its potential and implementation challenges
"Blockchain technology in e-business value chains" by Josepha Witt and Mareike Schoop	Multiple case study	1. In-depth analysis of blockchain's role in four e-business models 2. Eight propositions for blockchain integration in businesses

a new model for stakeholder responsibilities in value chain activities. The three papers collectively suggest that DLTs are poised to disrupt various aspects of enterprise operations, from identity verification and organizational structure to value chain management. Table 1 provides an overview of the three accepted articles, their research focus, applied methods, and key contributions. Furthermore, we describe next the articles in more detail.

The first article in this special issue, *Understanding decentralized autonomous organizations from the inside*, by Nils Augustin, Andreas Eckhardt, and Alexander Willem de Jong, examines decentralized autonomous organizations (DAOs) and their role within the broader context of blockchain technology. The study examines how DAOs challenge conventional organizational structures and shifting towards decentralized operations. Combining netnographic techniques with structural topic modeling, the authors aim to capture the views and perceptions of DAO community members. This perspective provides a nuanced understanding of how DAOs operate on the ground, bridging theoretical concepts with practical realities.

Unique aspects of DAOs discussed in the article include the diverse governance models, the ongoing debate between the "code is law" and "code is constitution" paradigms, and a range of practical use cases, from the Decentralized Finance (DeFi) space to collective ownership models.

The study also compares DAOs with open-source software (OSS) communities. While there are characteristics in common, such as their decentralized approach and community-centric spirit, each has unique challenges like high transaction fees or risks of centralization. Altogether, this article offers readers an engaging perspective on DAOs, demonstrating their challenges and potential in today's digital landscape.

The second article, *Designing a cross-organizational identity management system: Utilizing SSI for the certification of retailer attributes*, by Tobias Guggenberger, Daniela Kühne, Vincent Schlatt, and Nils Urbach explores the potential of blockchain for enterprise identity management, emphasizing the SSI approach. Within the European Union's backdrop and its eIDAS regulation for digital identities, the piece seeks to understand the limited adoption rate of electronic identities across member nations.

SSI, an identity model underpinned by blockchain, promises to hand individuals greater control over their data. With the upcoming eIDAS 2.0 regulation, there is anticipation that SSI might provide improved privacy, security, and broader accessibility to digital services.

However, while existing academic literature theorizes about SSI's potential such as full control and ownership of data and technical challenges, there is a need for further studies examining SSI's real-world applications.

This research article focuses on making SSI more applicable to real-world scenarios and exploring its value. More specifically, the authors used a design science approach (DSR) to create and test an SSI system for online retailers. This study proposes four key design principles for implementing SSI effectively. These principles focus on (1) encouraging a variety of roles to improve scalability, (2) using SSI's flexible credentials in different settings, (3) putting emphasis on the user's privacy and control, and (4) being selective in the use of public identifiers to maintain privacy. Altogether, these principles offer a clearer roadmap for SSI development, providing insights into its potential and the challenges in the broader context of e-government systems. Moreover, the article offers a structured perspective on SSI, balancing its potential benefits against implementation challenges.

The third article, *Blockchain technology in e-business value chains*, by Josepha Witt and Mareike Schoop, examines blockchain technology's potential within electronic business (e-business). This study concentrates on public blockchains and investigates how and why blockchain technology influences value chain activities, a framework used to enhance competitive advantage by identifying and improving value-added processes.

Using a multiple case study approach, the article examines the blockchain implementations of four e-businesses—Theta, OpenBazaar, Presearch, and Crypviser. First, the article looks at how blockchain technology improves various business activities, and second, it examines how this technology changes the roles and responsibilities of those involved.

The research provides insights into the extent and manner of blockchain integration in the organizations' operations through detailed analyses of the four e-business models. The cross-case analysis revealed several significant findings. First, businesses vary in how deeply they integrate blockchain technology, showing its adaptability to different needs. Second, introducing blockchain can change who is involved in a project and their roles, though this does not always relate to the level of technology use. Third, using token rewards as incentives is a game-changer for traditional business models, encouraging more active participation. Fourth, just because a system is decentralized does not mean it fully uses blockchain. Finally, not all aspects of a business, like design and after-sales services, may need or benefit from blockchain despite a general trend toward decentralization.

The authors subsequently derived eight blockchain technology propositions as potential guidelines for businesses

considering blockchain integration. These propositions include stakeholder dynamics, the potential for blockchain technology to reshape value creation, and the implications of decentralization.

Outlook

This special issue has provided valuable insights into the evolving research field of enterprise DLTs and their applications. The research topics in the special issue range from DAOs and SSI to blockchain's transformative potential in e-business. The selected articles offer a combination of theoretical contributions, practical applications, and forward-thinking discussions that enrich our understanding of DLTs' impact on various sectors.

Several avenues for future research become evident based on the articles in this special issue. One such area is the further empirical evaluation of SSI systems in diverse organizational settings, given the current focus on design principles and limited real-world applications. This could extend to sectors such as healthcare, finance, or even governmental services, examining how SSI impacts data governance and user trust. A second potential area could involve more granular studies on the governance structures and decision-making mechanisms within DAOs, drawing comparisons with traditional organizational models to assess efficiency, transparency, and stakeholder engagement. Lastly, considering the third paper's insights into value chains in electronic business, future work could focus on the longitudinal impact of blockchain technologies on stakeholder roles and responsibilities. Investigations could particularly explore how DLT influences the dynamics between different value chain activities and reshapes business models. Therefore, these papers collectively point toward a broad and interdisciplinary set of research opportunities that can further enrich our understanding of DLT in enterprise and organizational contexts.

Going beyond the three articles, future research could focus on the sustainability aspects of enterprise DLTs, address regulatory, governance, and ethical implications, especially in light of new regulations, and investigate how enterprise DLTs can contribute to solving societal and environmental problems. The interplay between DLTs and other emerging technologies like artificial intelligence, especially in light of the rapid adoption of large language models, or quantum computing, also presents exciting possibilities for future multidisciplinary research. Finally, to drive the adoption of the technology, it is essential to examine the integration of DLTs into the existing enterprise infrastructures, platforms, and platform ecosystems instead of stand-alone applications.

We would like to thank all the contributors for their work, the reviewers for their valuable and timely feedback, and the Electronic Markets Journal for making this special issue possible. These collective efforts have helped us bring new research insights into this rapidly evolving field.

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