



Editorial

# Editorial for the Special Issue on Blockchain: Applications, Challenges, and Solutions

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Blockchain is believed to have the potential to digitally transform and disrupt industry sectors such as finance, supply chain, healthcare, marketing, and entertainment. However, obstacles and challenges can be observed with its widespread applications. The Special Issue, “Blockchain: Applications, Challenges, and Solutions”, in the Journal of Future Internet, covers the trending research topic of Blockchain applications, the challenges it faces, and the value it brings to different industry sectors. We received 15 submissions; nevertheless, after the initial screening and the peer review process, only eight papers have been finally accepted for publication. Accepted articles can be divided into two sets: (1) the review of applications and (2) technical solutions addressing the challenges of the technology.

The first set presents reviews of Blockchain applications in different domains. Rocha et al. [1] review blockchain applications in the agribusiness sector using a PRISMA-based systematic review. In 71 articles, they identified Blockchain applications for finance, energy, logistics, environmental, agricultural, livestock, and industrial support. They conclude that the research into blockchain applications in agribusiness is at an early stage, as most of the prototypes are in the developing or laboratory phase. Nevertheless, the applications could mature and promote greater reliability and agility in information with a reduced cost in the future. A comprehensive overview of Blockchain applications, challenges, solutions, alternatives, and usage for developing decentralized applications is presented in Antal et al. [2]. They employed a three-tier architecture for Blockchain applications to systematically classify the technology solutions. The paper presents a multi-step guideline for decentralizing the design and implementation of traditional systems. Leiding et al. [3] present the Machine-to-Everything (M2X) Economy concept, which follows an open, decentralized, and distributed smart-contract-based approach. M2X supports the corresponding multi-stakeholder ecosystem and facilitates M2X value exchange, collaborations, and business enactments. Kapassa and Themistocleous [4] use a systematic literature review (SLR) approach to analyze Blockchain applications in the area of Demand-Response Management (DRM) in the Internet of Vehicles (IoV). They end up with research challenges on blockchain-based DRM in IoV.

The second set of articles addresses technical solutions to the current challenges of Blockchain technology. Sun et al. [5] present an off-chain solution to relieve the storage burden of blockchain nodes while ensuring the integrity of the off-chain data. The solution is implemented based on Hyperledger Fabric (HLF). The authors' experimental results show that their solution significantly outperforms the original HLF. Akbar et al. [6] propose a hybrid algorithm that combines Proof-of-Stake (PoS) and Proof-of-Work (PoW) mechanisms to provide a fair mining reward to the miner/validator. The proposed algorithm can reduce the possibility of intruders performing double mining based on the



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experimental results. Xu et al. [7] propose EconLedger, an Electrical Network Frequency (ENF)-based consensus mechanism that enables secure and lightweight distributed ledgers for small-scale Internet of Video Things (IoVT) edge networks. The proposed consensus mechanism relies on a novel Proof-of-ENF (PoENF) algorithm. A proof-of-concept prototype is developed and tested in a physical IoVT network environment. The experimental results on the designed prototype validate the feasibility of the proposed EconLedger to provide a trust-free and partially decentralized security infrastructure for IoVT edge networks. Finally, the key areas of decentralization, fundamental system requirements, and feasible mechanisms for developing decentralized product anti-counterfeiting and traceability ecosystems utilizing blockchain technology are identified in Yiu [8] via a series of security analyses compared with solutions currently implemented in the supply chain industry with centralized architecture.

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