Editorial: Blockchain Ecosystem—Technological and Management Opportunities and Challenges: Part II

I. Introduction

SINCE the publication of our first editorial in 2020 [A1], we are pleased to witness an increasing adoption of blockchain in many diverse application domains (beyond the financial sector), establishment of new blockchain and distributed ledger technologies ecosystems (e.g., IEEE Technology and Engineering Management Society's Technical Committee on Blockchain and Distributed Ledger Technologies[1]) and new publication venues (e.g., ACM *Distributed Ledger Technologies: Research and Practice*[2]), and many other exciting developments.

In addition, we are pleased to share that the following two articles accepted as part of this Special Issue received the "best paper awards" in 2021.

1) Article entitled "PREStO: A Systematic Framework for Blockchain Consensus Protocols" by Leonardos, Reijsbergen, and Piliouras [A2].
2) Article entitled "DeepCoin: A Novel Deep Learning and Blockchain-Based Energy Exchange Framework for Smart Grids" by Ferrag and Maglaras [A3].

In this second editorial, we will introduce the remaining four articles accepted in our "Blockchain Ecosystem—Technological and Management Opportunities and Challenges" Special Issue.

As previously discussed, there are many potential applications of blockchain. For example, in [A4], Kim *et al.* surveyed the extant literature from both academia and industry relating to the hybrid blockchain architecture, the connected hybrid architecture, the interoperable blockchain architecture, and the hard-forked blockchain architecture for organizational use, focusing on "semantic modeling support between private and public networks, data connectivity between networks, syntactic interoperability support between networks with heterogeneous codebases, governance model, and technical features."

As a potential use case, in [A5], Martins *et al.* demonstrated how one can build a customer-push e-marketplace using Ethereum, a widely used smart contract. In their approach, there are two key stakeholders, namely, customers and suppliers. The former will aggregate their proposals, and the latter seeks to "outcompete each other in reverse auction bids to fulfill the order."

The potential utility of blockchain is also partly evidenced by the number of patents filed in recent years, as reported in the patent analyses by Wustmans *et al.* [A6] and Ozcan and Unalan [A7]. In addition, in [A7], Ozcan and Unalan observed that blockchain (at the time of the article writing) did not fully satisfy the six key indicators (i.e., pervasiveness, improvement, spawning, prevalence, reallocation of resources, and inclusive democratization) to be considered as general purpose technology.

II. Conclusion

This second editorial concludes our Special Issue, and as we noted in our first editorial [A1], there remains a number of research and operational challenges and opportunities. This partly motivated us to establish the IEEE Technology and Engineering Management Society's Technical Committee on Blockchain and Distributed Ledger Technologies and ACM *Distributed Ledger Technologies: Research and Practice*, a blockchain and distributed ledger technology-dedicated journal, so that we have different platforms to engage our community and stakeholders from academia, industry, and government to expand our knowledge base on blockchain and distributed ledger technologies, as well as orchestrating new ideas and breakthroughs in future blockchain and distributed ledger technologies-enabled solutions.

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[1][Online]. Available: https://www.ieee-tems.org/tc-blockchain-dlt/

[2][Online]. Available: https://dl.acm.org/journal/dlt

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APPENDIX
RELATED WORK

[A1] K.-K. R. Choo, S. Ozcan, A. Dehghantanha, and R. M. Parizi, "Editorial: Blockchain ecosystem—Technological and management opportunities and challenges," *IEEE Trans. Eng. Manage.*, vol. 67, no. 4, pp. 982–987, Nov. 2020.

[A2] S. Leonardos, D. Reijsbergen, and G. Piliouras, "Presto: A systematic framework for blockchain consensus protocols," *IEEE Trans. Eng. Manage.*, vol. 67, no. 4, pp. 1028–1044, Nov. 2020.

[A3] M. A. Ferrag and L. A. Maglaras, "DeepCoin: A novel deep learning and blockchain-based energy exchange framework for smart grids," *IEEE Trans. Eng. Manage.*, vol. 67, no. 4, pp. 1285–1297, Nov. 2020.

[A4] H. M. Kim, H. Turesson, M. Laskowski, and A. F. Bahreini, "Permissionless and permissioned, technology-focused and business needs-driven: Understanding the hybrid opportunity in blockchain through a case study of insolar," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3003565.

[A5] J. Martins *et al.*, "Fostering customer bargaining and e-procurement through a decentralised marketplace on the blockchain," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3021242.

[A6] M. Wustmans, T. Haubold, and B. Bruens, "Bridging trends and patents: Combining different data sources for the evaluation of innovation fields in blockchain technology," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3043478.

[A7] S. Ozcan and S. Unalan, "Blockchain as a general-purpose technology: Patentometric evidence of science, technologies, and actors," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2020.3008859.

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