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Doctoral Dissertation

Doctoral Program in Computer and Control Engineering (36th cycle)

Blockchain and IoT Applications for Supply Chain and Transportation

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Vittorio Capocasale
2024

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Blockchain and IoT Applications for Supply Chain and Transportation

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Blockchain technology may solve current issues in supply chains related to the lack of timely, correct, standardized, authentic, accessible, and verifiable information. However, transitioning toward decentralized paradigms, as blockchain imposes, is not easy for companies due to strategic, managerial, technological, and environmental barriers. To overcome such barriers and support successful blockchain adoption, we discuss the development of a use case based on an electric vehicle supply chain and draw general insights from a technological standpoint, offering a practical guide for building blockchain-based applications. In particular, we propose a decision-making framework for blockchain suitability assessment; we present a methodology for comparing the performances of the various blockchain frameworks fairly; we analyze deterministic and parallel transaction execution in blockchain frameworks to enhance performance; we propose guidelines for smart contract standardization; and we discuss mitigating the “garbage in, garbage out” problem introduced by oracles in blockchain systems. Based on our results, we conclude that, with opportune design, technological barriers to blockchain adoption may be overcome, but this is insufficient to push companies to embrace decentralized paradigms.