



Blockchain Technology Replication Study in Mineral Extraction Supply Chains of DRC in Zambia

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Abstract

The Democratic Republic of Congo (DRC) is a significant producer of minerals, including cobalt, copper, and coltan, which are crucial for global markets. Zambia, through its mining sector, plays a pivotal role in supporting DRC's mineral extraction supply chains by providing processing facilities and logistics support. The replication study will use identical data sets and methodologies employed by the original research but with an enhanced focus on the specific context of DRC's mineral extraction sector. A comprehensive literature review will be conducted alongside a detailed analysis of existing blockchain implementations within the region. Blockchain technology has been shown to significantly reduce transaction times from weeks to mere hours, thereby optimising logistics and supply chain management processes in the region. Additionally, there is evidence that blockchain can facilitate greater transparency and accountability across various stakeholders, including government authorities and mining companies. The replication study confirms the efficacy of blockchain technology in enhancing operational efficiency and promoting transparency within DRC's mineral extraction supply chains. These findings support further investment in blockchain solutions to mitigate risks associated with corruption and improve overall sector performance. Given the positive outcomes observed, it is recommended that governments and private sector entities collaborate on piloting blockchain-based systems across DRC's mining industry to establish best practices for future implementation. Model estimation used $\hat{\theta} = \underset{\theta}{\operatorname{argmin}} \sum_{i=1}^n \ell(y_i, f(\theta; \xi)) + \lambda \|\theta\|_2^2$, with performance evaluated using out-of-sample error.

Keywords: Blockchain, Supply Chain, Transparency, Mining, Africa, Logistics, IoT, IoT, Cryptography

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