The impact of blockchain technology on the nature of trust: A pharmaceutical supply chain perspective

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Blockchain Technology (BCT) is considered one of the most disruptive technologies behind Industry 4.0 (Mathivathanan et al., 2021; Wang et al., 2021). Practitioners and academics suggest that BCT impacts businesses by creating a single source of trust, a decentralized model, increasing transparency and visibility, improving security and privacy, and enabling data sharing in supply chains (Ahmed et al., 2022; Batwa and Norrman, 2021). The technology is still novel, and applications are nascent. The impact BCT has on trust is debated in the literature and lacks practical and experimental evidence (Bai and Sharkis, 2020; Wang et al., 2021). The academic and practitioner

communities have called for further empirical research on BCT-enabled trust (Batwa and Norrman, 2021; Batwa et al., 2021; Chang et al., 2020).

It is interesting to study BCT-trust integration in the context of the pharmaceutic supply chain. The pharmaceutical supply chain is vital to the global economy and society. Its operations, however, are challenging to manage, due to the complex financial flows and reverse flows of medicine, and the many entities used to deliver drugs to patients, including manufacturers, distributors, wholesalers, government agencies, and biotech companies (Yaroson et al., 2021). One of the significant issues is the poor buyer/supplier relationships which stem from a lack of trust in the industry. The lack of trust reduces data sharing in the supply chains. It decreases the visibility of drugs shipped worldwide and leads to many subsequent bottlenecks within the industry, fuelling a growing counterfeit drug market, which was already estimated to be worth $75 billion in 2010 (World Health Organization, 2010). Such supply chain trust issues also extend to the downstream point of sales, resulting in low consumer confidence in the pharmaceutical industry (Chang et al., 2020).

With the growing deployment of blockchain, it is vital to shedding light on the impact and change BCT has and will have on trust, as a promising solution to the operations issues in pharmaceutic supply chains. The integration of trust and BCT has only become a research agenda within the last few years and currently lacks clear definitions and conceptualization (Tandon et al., 2020). It is little known the impact and applications of BCT-trust on the complex and global pharmaceutical supply chain operations. In this study, we build on conceptual work from the literature and on Batwa and Norrman (2021) to investigate the nature of trust as BTC is deployed. We use the MediLedger network as the case to investigate this application in depth. MediLedger is a blockchain solution currently being implemented in the US pharmaceutical industry comprising many industry leaders such as Pfizer, GSK, Walmart, FedEx, and Sanofi. We intend to provide evidence of the evolving nature of trust within supply chain networks operating with BCT.

In this study, we focus on *how and to what extent BCT impacts the nature of trust in the pharmaceutical supply chain*. This is achieved through i) the analysis of the context behind the implementation of MediLedger and ii) the evaluation of how MediLedger supports the development of trust within the pharmaceutical supply network and influences the supply chain performance. We rely on the social-technical system (STS) theory (Griffith & Dougherty, 2001; Minshull et al., 2022) to investigate the nature of trust.

The study was designed around seven exclusive semi-structured interviews with MediLedger key executives and triangulated with secondary data from company reports. The data was analyzed abductively to achieve the aims and objectives and address the research question set. We used a combination of thematic and template analysis to generate new understanding and knowledge 'grounded in human experience' through interviews (Braun and Clark, 2006). We also included techniques from template analysis due to the flexibility of each method (King, 2004).

Our findings suggest that BCT significantly impacts the nature of trust by creating an eco-system enabling swift trust and aggregating a newly developed level of trust labeled 'trust in network', impacting supply chain performance. A hierarchical BCT-enabled trust-performance framework is developed as a blueprint to assess and operationalize the impact BCT has on trust and performance.

This study has important contributions. We add understanding to the social-technical system of trust at the supply chain level. We demonstrate that trust development is socially and technically constructed. Supply chain partners can initiate transactional-level trust formation and development (e.g., reducing redundant transactions and improving operational efficiency) by using the BCT-enabled performance-trust framework. The advanced social-technical system concepts through BCT-trust integration can be used at the relational level to initiate and motivate supply chain strategies (e.g., swift trust and supply chain visibility). Our roadmap provides supply chain executives and strategists with clear BCT-trust development pathways in dynamic markets. Especially in the increasing regulatory and market pressure of adopting

innovative pharmaceutic supply chain practices (e.g., product safety), operations agility and efficiency are more likely to be established in the BCT-enabled trust context.

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