ABSTRACT

Title: **Blockchain-Based Fake Product Detection Using Dynamic Token Verification**

Counterfeit goods in the supply chain lead to economic losses, brand damage, and consumer safety risks. This paper proposes a blockchain-based, multi-layered authentication framework to ensure product originality from manufacturing to final sale. Each unit is assigned a unique identifier (UID) linked to two security elements: an outer QR code (public) and a hidden inner serial number (tamper-evident). Products are grouped into batches, each with a Batch QR, and the complete batch manifest is immutably recorded on-chain along with a hashed activation code. Upon delivery, the retailer must scan the Batch QR and enter the manufacturer-supplied activation code—securely transmitted outside delivery documents—to activate the batch. Without activation, units remain "Not Activated" and cannot be sold. At the point-of-sale, the retailer must also provide sales consent, enforced through blockchain smart contracts, to change a unit's status to "Sold." Customers can perform pre-purchase verification via the outer QR and post-purchase authenticity checks by entering the hidden inner serial. The system's audit trail enables precise dispute resolution, allowing administrators to trace counterfeit insertion points and enforce penalties. This architecture provides tamper-proof, transparent tracking while reducing counterfeit risks at delivery, retail, and customer levels.

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